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Victoria to New South Wales Interconnector West (VNI West) (NSW)

Technical paper 1 – Biodiversity Development Assessment Report



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July 2025

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Rev	Date	Details
Final	July 2025	Final for exhibition

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This document is based on the Department of Planning, Housing and Infrastructure (DPHI) BDAR template

Summary

Project overview

Transgrid and Transmission Company Victoria (TCV) are jointly developing a new electrical connection between NSW and Victoria called the Victoria to NSW Interconnector West project (VNI West). Transgrid is responsible for seeking the required planning approval and delivering the NSW component of VNI West (referred to as 'the project' or 'VNI West (NSW)' in the Riverina Region of NSW. The project would provide the NSW 500 kV double circuit overhead transmission line component of the connection between the NSW/Victorian border near Murrabit and the future Dinawan substation (which is being constructed under the EnergyConnect (NSW – Eastern section) project approval (SSI-9172452)). The project would also include replacement of around nine kilometres of an existing overhead single circuit 330 kV transmission line (Line 51) with a double circuit 330 kV transmission line generally between Ivydale Road (south of the existing Wagga substation) and the future Gugaa 500 kV substation (which is subject to separate planning approval under the HumeLink project (SSI-36656827)). The project would also include an expansion of the future Dinawan substation and connection works at both the existing Wagga 330 kV substation and the future Gugaa 500 kV substation.

This technical paper assesses the potential impacts to biodiversity from the construction and operation of the project and has been prepared to support and inform the Environmental Impact Statement (EIS) for the project.

The impacts have been assessed in accordance with the Secretary's Environmental Assessment Requirements (SEARs) issued by the Department of Planning, Housing and Infrastructure (DPHI), and against the relevant legislation and guidelines as they apply to biodiversity.

Transgrid is seeking approval under Division 5.2, Part 5 of the *Environmental Planning and Assessment Act 1979* (the EP&A Act) to construct and operate the project. The project was declared as Critical State Significant Infrastructure (Critical SSI) under Section 5.13 of the EP&A Act on 19 June 2024.

The project was also declared a 'controlled action' on 4 September 2024 (EPBC Act 2024/09871) by the (Commonwealth) Department of Climate Change, Energy, the Environment and Water (Commonwealth DCCEEW) and as such also requires a separate approval under the Environment *Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act). As a result of the need for Commonwealth approval, the project would be subject to the bilateral assessment process that has been established between the Australian and NSW governments.

Key components

The key elements of the project would be located within the subject land with the overall scope of the project including the following key components:

- transmission line works comprising:
  - a new 500 kV double circuit overhead transmission line (around 240 kilometres) between the NSW/Victoria border near Murrabit (Victoria), and the future Dinawan substation (currently under construction as part of the EnergyConnect (NSW – Eastern Section) project)
  - replacement of around nine kilometres of an existing 330 kV single circuit overhead transmission line (Line 51), generally between Ivydale Road (south of the existing Wagga 330 kV substation) and the future Gugaa 500 kV substation (subject to a separate planning approval as part of the HumeLink project), with a new 330 kV double circuit overhead transmission line. The new transmission line structures for this section of the project would be up to around 56 metres in height

- substation works comprising:
  - connection and line diversion works of the existing the EnergyConnect (NSW – Eastern section) project 330 kV overhead transmission lines at the future Dinawan substation to allow for connection of the proposed 500 kV switchyard
  - expansion of the future Dinawan substation to include a new 500 kV switchyard and two new 330 kV transformer bays
  - connection and line diversion work at the existing Wagga 330 kV substation and at the future Gugaa 500 kV substation to allow for connection to the newly replaced Line 51
- ancillary activities comprising:
  - new and upgraded temporary and permanent access tracks
  - construction of utilities infrastructure and power supply
  - installation and operation of two telecommunication facilities (optical repeater sites) along the transmission line between the NSW/Victorian border and future Dinawan substation including connections to the local power supply
  - temporary facilities required for construction of the project including construction compounds, temporary worker accommodation facilities, laydown and staging areas, stockpiling areas, concrete batching plants, brake and winch sites, site offices, parking areas, and power supplies.

The transmission line between the NSW/Victorian border and the future Dinawan substation would be located within an easement approximately 70 metres wide except at two transposition locations (locations where the conductors of a transmission line swap positions to improve transmission voltage balance) requiring a 110 metre easement for around one kilometre in length at each of these locations. The section of the transmission line to be replaced generally between Ivydale Road (south of the existing Wagga 330 kV substation) and the future Gugaa 500 kV substation would be contained within the existing 60 metre easement for this transmission line. These easements would provide a right of access to construct, maintain and operate the transmission lines and other operational assets associated with these lines.

Indicative disturbance area

The indicative disturbance area includes areas where vegetation would be impacted during the construction and operation of the project. The indicative disturbance areas for the two locations include NSW/Victorian border to future Dinawan substation component and existing Wagga 330 kV substation to future Gugaa 500 kV substation component (network augmentation works). The indicative disturbance area has been identified based on realistic project component locations. Disturbance areas would be confirmed during finalisation of design and construction methodology and would be developed as part of the consideration of avoidance and impact minimisation.

The indicative disturbance area has the same meaning as ‘development site’ as defined in the BAM.

The indicative disturbance areas include the following categories:

- **Disturbance area A** – Vegetation clearance is assumed for all areas where complete removal of vegetation is proposed.
- **Disturbance area B (B4 and B10)** – assumed to have minimal ground disturbance. The partial vegetation clearing is restricted to clearance of vegetation with growth height potential of four metres or above in Disturbance area B4 and restricted to clearance of vegetation with growth height potential of ten metres or above in Disturbance area B10. For the purposes of this assessment, areas of impact to vegetation with a growth height potential of 10 metres or above have been amalgamated into disturbance area B4, while vegetation with a growth height potential of 10 metres or less have been identified as disturbance area B10 and are represented as retained vegetation avoiding impact.

- **Disturbance area HZ** – a hazard tree zone where there would be impacts to selected trees that are within the risk category height range 20 to 30 metre and have poor structural stability posing a risk of falling onto the transmission line.

As part of the indicative disturbance model development process, spatial data has been reviewed to reduce clearing overlaps, gaps or zones that are too small and impractical for large plant equipment to access areas. Furthermore, the assessment undertaken for this BDAR is a conservative estimate of likely impacts and additional disturbance areas may potentially be avoided during detailed design where there are small gaps of native vegetation that are likely to be avoided during construction but have been assessed as impacted.

These areas have been included as part of the impacted areas assessed in this BDAR. As a result, the vegetation clearance calculations entered into the BAM-C are conservative. The indicative disturbance areas assessed in this BDAR would be refined through detailed design and construction avoidance, following which, it is highly likely the currently identified impacts would be able to be reduced.

Figure ES.1 show the disturbance areas for the project during construction and Figure ES.2 shows the vegetation management approach during operation for the NSW/Victorian border to future Dinawan substation section of the project.

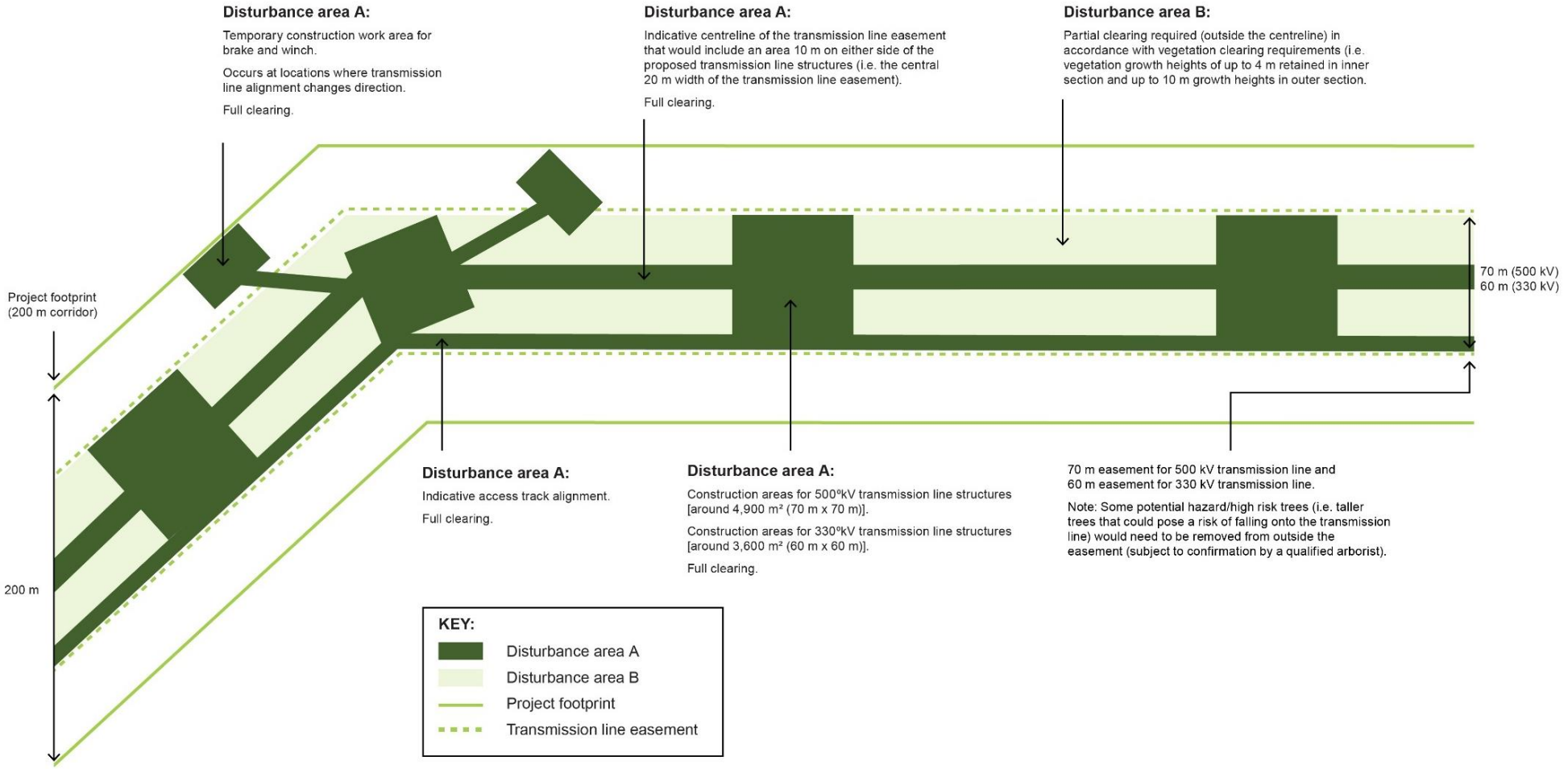


Figure ES.1 Indicative disturbance areas for the 500 kV line (NSW/Victorian border to future Dinawan substation) during construction

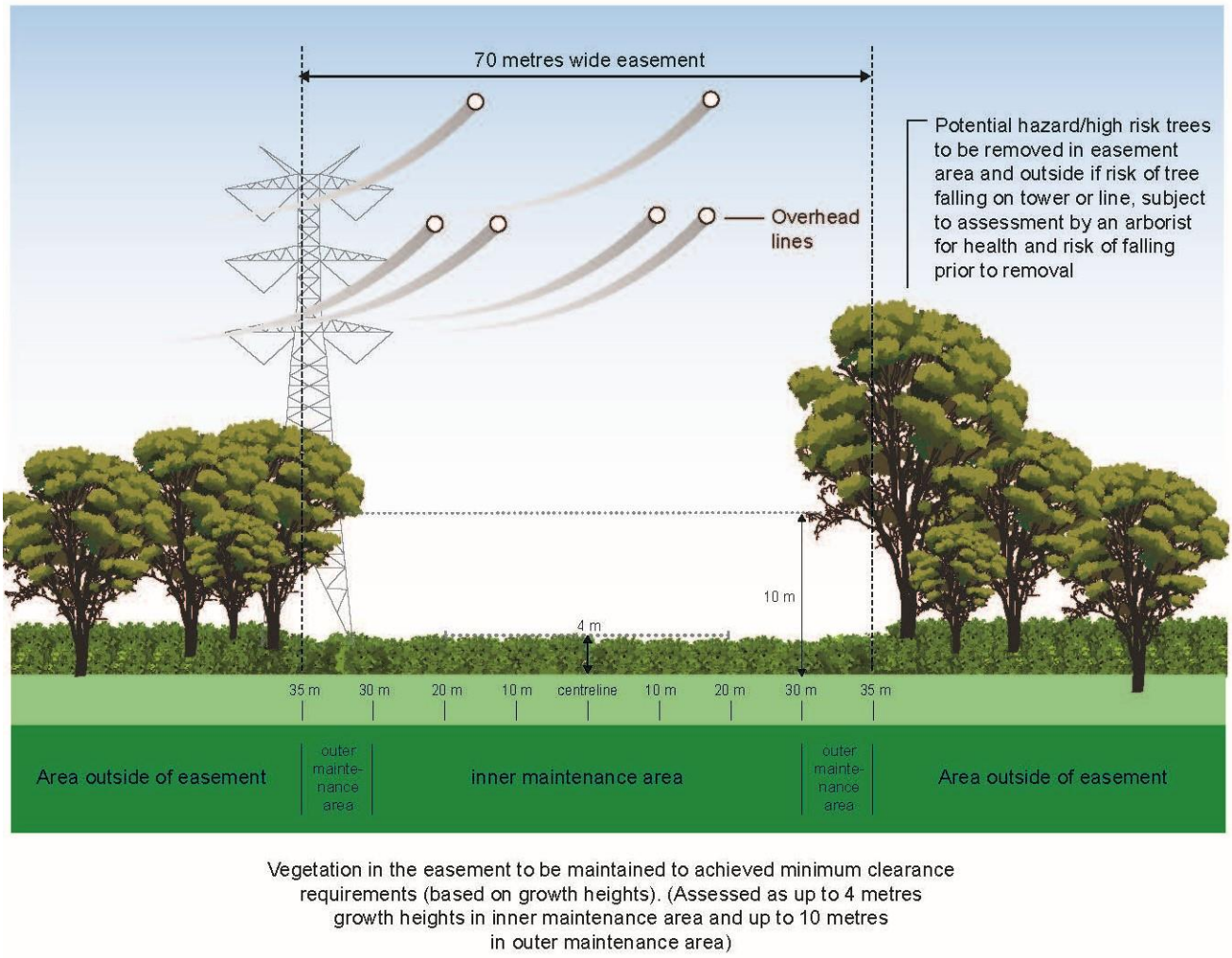


Figure ES.2 Illustration of the proposed clearing for the 500 kV line during operation

Subject land

As outlined in the BAM, the subject land is the land subject to a development, activity, clearing, biodiversity certification or a biodiversity stewardship proposal. It excludes the assessment area which surrounds the subject land (i.e. the area of land in a buffer zone around the subject land).

The subject land contains all areas impacted by construction and operation. Specifically, the subject land incorporates Disturbance areas A, B and HZ.

The subject land occurs as two disjointed proposed transmission easements largely within the Riverina region of NSW with minor network augmentation works to occur in the NSW South western slopes to the south of Wagga Wagga. Three IBRA subregions, being the Murray Fans, Murrumbidgee and Inland Slopes IBRA subregions, have been identified to occur within the subject land. Vegetation associated with the subject land comprises a number of vegetation communities but is dominated by Black Box and River Red Gum woodlands in the west, chenopod and acacia shrublands in central and eastern portion, and by Box Gum Woodland in the minor network augmentation works near Wagga Wagga.

Access restrictions

Some sections of the subject land were not accessible due to land access restrictions. Where access was not available, biodiversity values were extrapolated from desktop assessment using the NSW State Vegetation Type Map (SVTM). Due to the restricted access, areas where the SVTM was applied are subject to assumed benchmark condition (section 4.5.3).

Seasonal targeted threatened species surveys were also limited by access restrictions. The SVTM was used to identify PCTs and their extent within the unsurveyed area. All threatened entities associated with these PCTs were assumed present in these areas.

As this is a highly conservative approach, impact calculations associated with threatened communities and entities represent the maximum possible impact and may be reduced following one of the following two methods:

1 Field verification survey following future access is granted onto unsurveyed lands

2 Application of the *Remote assessment of biodiversity values* guidelines (DCCEEW, 2025).

Measures to avoid and minimise

Approach to VNI West corridor development

The VNI West corridor and route selection followed a transparent and consistent process throughout a number of phases to identify the final easement. In terms of ,biodiversity values steps were taken to avoid impacts to biodiversity at each phase including the corridor and route identification phases (refer to Appendix C (Options report) of the EIS). The phases identified include:

- identify project need
- identify strategic feasible options
- identify the 10 kilometre width corridor based on Technical (land use, engineering, tenure, bushfire), Environment (ecology, heritage tenure, hydrology and soils) and Social and Community (land use, visual and landscape)
- refining the corridor to a single preferred route up to around one kilometre in width
- environmental assessment – narrowing the preferred route to a transmission line corridor of around 200 metres in width
- identify the easement for the transmission line for the preferred route.

Summary of options assessment

Three preliminary corridors were considered within the final identified area of interest (refer to Figure ES.3).
These corridors consisted of the following:

- *Swan Hill North*: The corridor provides a crossing of the NSW/Victorian border to the east of the town of Swan Hill. The initial section would provide a northern alignment, within a widened area to the west of Moulamein to provide flexibility to minimise potential impacts to the Murray Valley National Park (including the Wetuppa Forest within the Noorong-Wetuppa area). East of Moulamein, the corridor would then travel south-east to run parallel along a section of Pretty Pine Road. From this point, the corridor traverses generally east within an expanded section of corridor (to provide flexibility in the area crossing the Cobb Highway and north of Wanganella). The corridor would traverse north of Conargo before aligning north-east to the future Dinawan substation.

- *Swan Hill Central*: This corridor provides a crossing of the NSW/Victorian border to the east of Swan Hill and would provide a similarly aligned corridor direction north towards Moulamein. The corridor would turn east, generally at a point where it crosses the Murray Valley National Park (including the Wetuppa Forest within the Noorong-Wetuppa area), and traverses north of Campbells Island State Forest. From this point, the corridor traverses a primarily east alignment towards Deniliquin, to the south of the former Werai State Forest and along the alignment of townships including Nooroong, Tullakool, Burraboi, Wakool and Calimo. At Pretty Pine (located at the junction of Pretty Pine Road and the Cobb Highway north-west of Deniliquin) the corridor would travel in a north-east alignment to the north of Conargo, continuing north-east towards the future Dinawan substation, aligning with the localities of Wandook, Conargo and Moonbria.
- *Swan Hill Central* (alternative): This corridor would follow the same alignment as the Swan Hill Central option until it reaches Pretty Pine, north-west of Deniliquin. At this point, the corridor would continue east, traversing to the south of Conargo before turning directly north and then north-east, generally parallel with the existing 132 kV transmission line, to reach the future Dinawan substation.

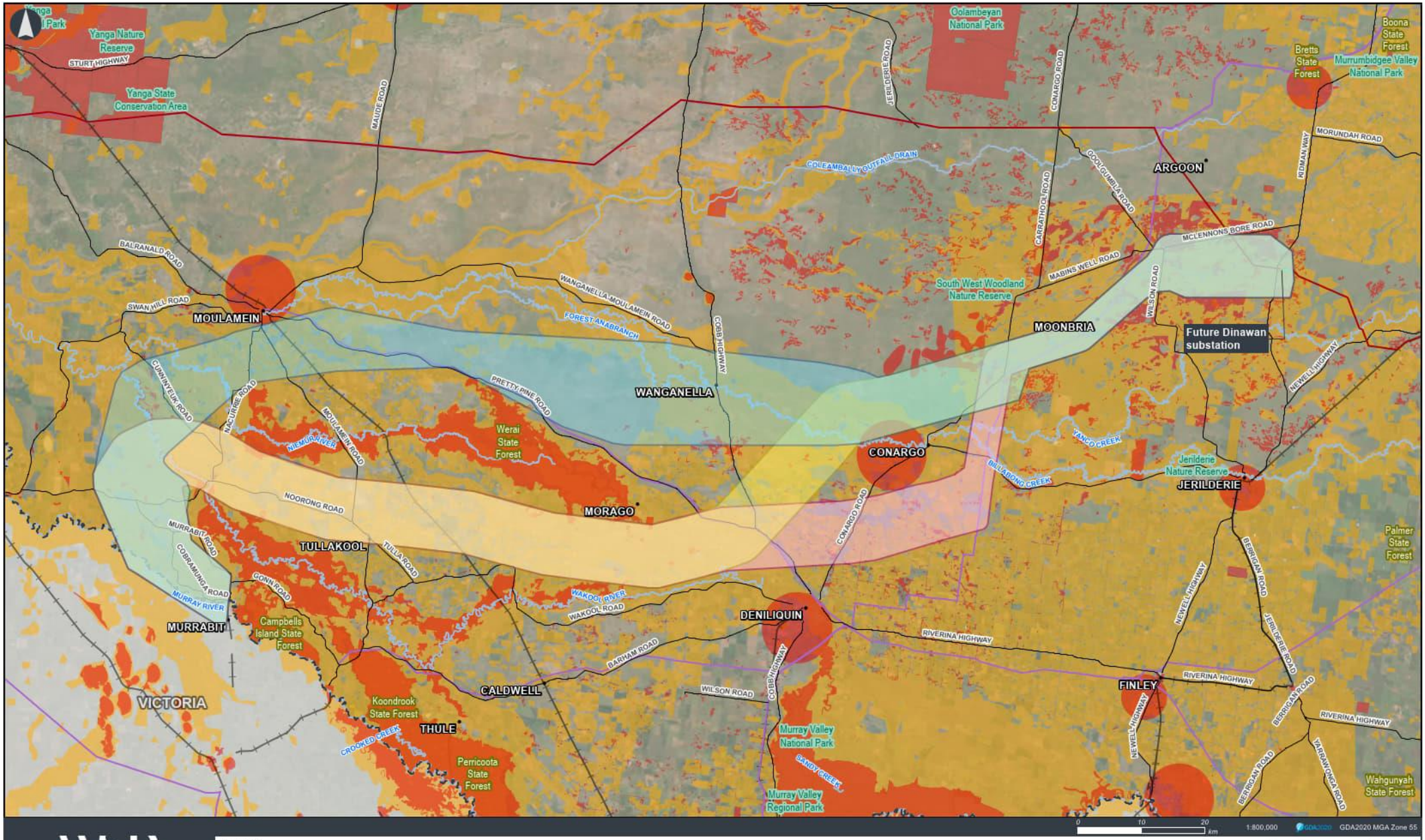
Following identification of the preliminary corridors, the following steps for the corridor assessment were completed:

- geo-spatial mapping of the identified high, medium and low constraints and taking into consideration potential opportunities
- a full comparative and multi-criteria analysis (MCA) scoring assessment of the options
- a range of workshops and stakeholder discussions including a series of workshops/sessions with the Regional Reference Group.

Final preferred corridor

Multiple refinements were made to produce the final preferred corridor as detailed in the *VNI West (NSW) Final Corridor Report* (Transgrid, 2023b). The technical, environmental, and social and community constraints, and community and stakeholder input refinements include:

- expanding (widening) the recommended draft corridor to the north. This supported potential future route options that would:
  - minimise impact to productive irrigation land and dwellings near Moulamein
  - further avoid areas of mapped Plains-wanderer habitat
  - maximise the potential to follow public land corridors including travelling stock routes
  - broadly align with road corridors including Wanganella Road and Mabins Well Road
  - minimise conflict with current renewable developments to the west of the future Dinawan substation
  - removing constraints around the Moulamein airport following feedback on the current use of the site
  - modifying the western section of the corridor to align the border crossing based on discussion with TCV to align the preferred corridor with the former Stony Crossing Railway line.



VNI West (NSW)

Figure ES.3
Initial corridor options considered within the final area of interest

Legend

- Main road
- Rail line
- Named waterway
- EnergyConnect (NSW - Eastern section) project transmission line (under construction)
- Existing transmission line
- Substation
- National park
- State forest

Corridor options

- Swan Hill North
- Swan Hill Central (Alternative)
- Swan Hill Central

Constraints

- High
- Moderate
- NSW/Victorian border

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Data sources: NSW EPI, DELWP, WSP, EnergyConnect

Plant community types

Native vegetation has been recorded by vegetation formation, class and associated plant community types (PCTs). The native vegetation recorded within the subject land has been assigned to seven vegetation formations being:

- Arid Shrublands (Chenopod sub-formation)
- Forested Wetlands
- Freshwater Wetlands
- Grasslands
- Grassy Woodlands
- Semi-arid Woodlands (Grassy sub-formation)
- Semi-arid Woodlands (Shrubby sub-formation).

Of the seven recorded native vegetation formations, these have been assigned to 10 vegetation classes, 33 PCTs and 94 vegetation zones. An overview of each PCTs and vegetation condition is presented in Table ES.1.

Table ES.1 Overall summary of PCTs identified within the subject land

PCT ID	PCT name	Condition classes[1]	BC Act TEC	SAII	EPBC Act TEC	Subject land area (ha)
2	River Red Gum-sedge dominated very tall open forest in frequently flooded forest wetland along major rivers and floodplains in south-western NSW	SVTM	Not Listed	No	Not Listed	0.12
7	River Red Gum – Warrego Grass – herbaceous riparian tall open forest wetland mainly in the Riverina Bioregion	Moderate-good	Not Listed	No	Not Listed	4.67
10	River Red Gum – Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Moderate-good	Not Listed	No	Not Listed	13.47
		Thinned	Not Listed	No	Not Listed	12.66
		SVTM	Not Listed	No	Not Listed	1.39
		Derived	Not Listed	No	Not Listed	3.52
		Derived_LCV	Not Listed	No	Not Listed	5.20
11	River Red Gum – Lignum very tall open forest or woodland wetland on floodplains of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Moderate-good	Not Listed	No	Not Listed	0.49

PCT ID	PCT name	Condition classes[1]	BC Act TEC	SAII	EPBC Act TEC	Subject land area (ha)
13	Black Box – Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Moderate-good	Not Listed	No	Not Listed	63.4
		SVTM	Not Listed	No	Not Listed	14.36
		Thinned	Not Listed	No	Not Listed	21.96
		Planted_NatVeg	Not Listed	No	Not Listed	0.2
		Derived	Not Listed	No	Not Listed	15.11
		Derived Low Conservation Value	Not Listed	No	Not Listed	49.33
15	Black Box open woodland wetland with chenopod understorey mainly on the outer floodplains in south-western NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Moderate-good	Not Listed	No	Not Listed	74.89
		Thinned	Not Listed	No	Not Listed	3.36
		SVTM	Not Listed	No	Not Listed	1.91
		Derived	Not Listed	No	Not Listed	13.18
		Derived Low Conservation Value	Not Listed	No	Not Listed	6.38
17	Lignum shrubland wetland of the semi-arid (warm) plains (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Moderate-good	Not Listed	No	Not Listed	12.63
		SVTM	Not Listed	No	Not Listed	2.38
19	Cypress Pine woodland of source-bordering dunes mainly on the Murray and Murrumbidgee River floodplains	SVTM	Not Listed	No	Not Listed	1.59

PCT ID	PCT name	Condition classes[1]	BC Act TEC	SAII	EPBC Act TEC	Subject land area (ha)
20	Buloke – Moonah – Black Box open woodland on sandy rises of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Thinned	*Allocasuarina luehmannii* Woodland in the Riverina and Murray-Darling Depression Bioregions – Endangered	Yes	Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions – Endangered	0.16
		Derived	Not Listed	No	Not Listed	0.99
		Derived Low Conservation Value	Not Listed	No	Not Listed	0.77
23	Yarran tall open shrubland of the sandplains and plains of the semi-arid (warm) and arid climate zones	Moderate-good	*Acacia melvillei* Shrubland in the Riverina and Murray-Darling Depression bioregions – Endangered	No	Not Listed	3.41
		Thinned	*Acacia melvillei* Shrubland in the Riverina and Murray-Darling Depression bioregions – Endangered	No	Not Listed	0.20
		Derived	*Acacia melvillei* Shrubland in the Riverina and Murray-Darling Depression bioregions – Endangered	No	Not Listed	2.71
		Derived Low Conservation Value	*Acacia melvillei* Shrubland in the Riverina and Murray-Darling Depression bioregions – Endangered	No	Not Listed	3.54
24	Canegrass swamp tall grassland wetland of drainage depressions, lakes and pans of the inland plains	Moderate-good	Not Listed	No	Not Listed	7.02

PCT ID	PCT name	Condition classes[1]	BC Act TEC	SAII	EPBC Act TEC	Subject land area (ha)
26	Weeping Myall open woodland of the Riverina Bioregion and NSW South Western Slopes Bioregion	Moderate-good	Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions – Endangered	No	Weeping Myall Woodlands – Endangered	91.32
		Thinned	Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions – Endangered	No	Does not meet listing criteria	84.09
		SVTM	Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions – Endangered	No	Weeping Myall Woodlands – Endangered	1.33
		Derived	Not Listed	No	Does not meet listing criteria	138.90
		Derived_LCV	Not Listed	No	Does not meet listing criteria	1.29
28	White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone	Moderate-good	Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregions – Endangered	No	Not Listed	2.94
		Thinned	Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregions – Endangered	No	Not Listed	5.65
		SVTM	Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregions – Endangered	No	Not Listed	6.04
		Derived Tall Shrubland	Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregions – Endangered	No	Not Listed	1.31

PCT ID	PCT name	Condition classes[1]	BC Act TEC	SAII	EPBC Act TEC	Subject land area (ha)
		Derived_LCV	Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregions – Endangered	No	Not Listed	5.03
		Derived	Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregions – Endangered	No	Not Listed	19.83
44	Forb–rich Spear grass – Windmill Grass – White Top grassland of the Riverina Bioregion	Moderate-good	Not Listed	No	Natural Grasslands of the Murray Valley Plains – Critically Endangered	14.77
		SVTM	Not Listed	No	Natural Grasslands of the Murray Valley Plains – Critically Endangered	18.96
45	Plains Grass grassland on alluvial mainly clay soils in the Riverina Bioregion and NSW South Western Slopes Bioregion	Moderate-good	Not Listed	No	Natural Grasslands of the Murray Valley Plains – Critically Endangered	3.58
		SVTM	Not Listed	No	Natural Grasslands of the Murray Valley Plains – Critically Endangered	5.96
46	Curly Windmill Grass – spear grass – wallaby grass grassland on alluvial clay and loam on the Hay Plain, Riverina Bioregion	Moderate-good	Not Listed	No	Natural Grasslands of the Murray Valley Plains – Critically Endangered	39.35
		SVTM	Not Listed	No	Natural Grasslands of the Murray Valley Plains – Critically Endangered	19.07

PCT ID	PCT name	Condition classes[1]	BC Act TEC	SAII	EPBC Act TEC	Subject land area (ha)
47	Swamp grassland wetland of the Riverine Plain	Moderate-good	Not Listed	No	Seasonally Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains – Critically Endangered	0.17
58	Black Oak – Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion	Moderate-good	Not Listed	No	Not Listed	0.26
		Thinned	Not Listed	No	Not Listed	0.70
70	White Cypress Pine woodland on sandy loams in central NSW wheatbelt	SVTM	Not Listed	No	Not Listed	0.16
76	Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	Moderate-good	Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions - Endangered	No	Does not meet listing criteria	0.30
86	Yellow Gum tall woodland of the Murray River floodplain, Riverina Bioregion	Moderate-good	Not Listed	No	Not Listed	0.05
157	Bladder Saltbush shrubland on alluvial plains in the semi-arid (warm) zone including Riverina Bioregion	Moderate-good	Not Listed	No	Not Listed	91.91
		SVTM	Not Listed	No	Not Listed	7.55
159	Old Man Saltbush shrubland mainly of the semi-arid (warm) climate zone (south western NSW)	SVTM	Not Listed	No	Not Listed	0.05

PCT ID	PCT name	Condition classes[1]	BC Act TEC	SAII	EPBC Act TEC	Subject land area (ha)
160	Nitre Goosefoot shrubland wetland on clays of the inland floodplains	Moderate-good	Not Listed	No	Not Listed	15.46
		SVTM	Not Listed	No	Not Listed	1.41
163	Dillon Bush (Nitre Bush) shrubland of the semi-arid and arid zones	Moderate-good	Not Listed	No	Not Listed	66.06
		SVTM	Not Listed	No	Not Listed	12.28
		Derived_LCV	Not Listed	No	Not Listed	0.68
164	Cotton Bush open shrubland of the semi-arid (warm) zone	Moderate-good	Not Listed	No	Not Listed	256.51
		SVTM	Not Listed	No	Not Listed	95.74
		Derived_LCV	Not Listed	No	Not Listed	5.48
170	Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones	Thinned	Not Listed	No	Not Listed	4.17
		Derived	Not Listed	No	Not Listed	1.42
216	Black Roly Poly low open shrubland of the Riverina Bioregion and Murray Darling Depression Bioregion	Moderate-good	Not Listed	No	Not Listed	10.46
237	Riverine Western Grey Box grassy woodland of the semi-arid (warm) climate zone	Moderate-good	Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions – Endangered	No	Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia – Endangered	0.84

PCT ID	PCT name	Condition classes[1]	BC Act TEC	SAII	EPBC Act TEC	Subject land area (ha)
266	White Box grassy woodland in the upper slopes subregion of the NSW South Western Slopes Bioregion	Moderate-good	White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions – Critically Endangered	Yes	White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland – Critically Endangered	0.16
		Thinned	White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions – Critically Endangered	Yes	Does not meet listing criteria	0.02
277	Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	Mod-good	White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions – Critically Endangered	Yes	White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland – Critically Endangered	0.19
		Thinned	White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions – Critically Endangered	Yes	White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland – Critically Endangered	3.01

PCT ID	PCT name	Condition classes[1]	BC Act TEC	SAII	EPBC Act TEC	Subject land area (ha)
		Derived_LCV	White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions – Critically Endangered	Yes	Does not meet listing criteria	40.86
319	Tumbledown Red Gum – White Cypress Pine hill woodland in the southern part of the NSW South Western Slopes Bioregion	Thinned	Not Listed	No	Not Listed	0.83
		Derived_LCV	Not Listed	No	Not Listed	11.66
343	Mugga Ironbark – Red Box – Red Stringybark – Western Grey Box grass/shrub woodland on metamorphic substrates in the Tarcutta – Gundagai region, NSW South Western Slopes Bioregion	Mod-good	Not Listed	No	Not Listed	0.01
		Derived_LCV	Not Listed	No	Not Listed	3.79
Total area						**1431.59**

(1) Condition classes as described in detail in section 4.4 where; Mod-good = Moderate-good, Thinned = Thinned, Derived_TS = Derived Tall Shrubland, Derived = Derived, Derived_LCV = Derived Low Conservation Value, Planted_NatVeg = Planted Native Vegetation, SVTM = State Vegetation Type Mapping

Threatened Ecological Communities (BC Act)

Six BC Act listed TECs were identified within the subject land of which, one is listed as Critically Endangered and two are identified as having Serious or Irreversible Impact (SAII). These are:

- *Acacia melvillei* Shrubland in the Riverina and Murray-Darling Depression bioregions
- *Allocasuarina luehmannii* Woodland in the Riverina and Murray-Darling Depression Bioregions
- Inland Grey Box Woodlands in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions
- Myall Woodlands in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions
- Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregions
- White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions.

Threatened Ecological Communities (EPBC Act)

Based on database searches and detailed vegetation surveys a total of six candidate threatened ecological communities listed under the EPBC Act were considered to occur within the subject land. These are:

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

One additional candidate threatened ecological community listed under the EPBC Act being, Plains mallee box woodlands of the Murray Darling Depression, Riverina and Naracoorte Coastal Plain Bioregions – Critically Endangered, was identified by database searches but was not recorded by detailed vegetation surveys.

Residual direct impacts to PCTs

The overall direct impacts to PCTs and habitat for the various threatened species is estimated at around 1,432.60 hectares (see Table ES.2). Within this area of direct impact:

- 269.68 hectares are within the Murray Fans IBRA subregion, with 193.29 hectares in Disturbance area A
- 1,102.08 hectares are within the Murrumbidgee IBRA subregion, with 981.85 hectares in Disturbance area A
- 60.83 hectares are within the Inland Slopes IBRA subregion, with 59.46 hectares in Disturbance area A.

Table ES.2 Summary of residual direct impacts to PCTs within the subject land

PCT ID number and name	Disturbance area A impact (ha)	Disturbance area B4 impact (ha)	Disturbance area B10 impact (ha)[1]	Disturbance area HZ impact (ha)	Total impact (ha)
2 – River Red Gum-sedge dominated very tall open forest in frequently flooded forest wetland along major rivers and floodplains in south-western NSW	0.02	0.10	0.00	0.00	0.12
7 – River Red Gum – Warrego Grass – herbaceous riparian tall open forest wetland mainly in the Riverina Bioregion	1.46	2.17	0.00	1.04	4.67
10 – River Red Gum – Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	19.63	10.97	0.00	5.64	36.24
11 – River Red Gum – Lignum very tall open forest or woodland wetland on floodplains of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	0.13	0.26	0.00	0.10	0.49
13 – Black Box – Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	116.23	48.12	0.00	0.00	164.36
15 – Black Box open woodland wetland with chenopod understorey mainly on the outer floodplains in south-western NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	58.84	40.88	0.00	0.00	99.72
17 – Lignum shrubland wetland of the semi-arid (warm) plains (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	15.01	0.00	0.00	0.00	15.01
19 – Cypress Pine woodland of source-bordering dunes mainly on the Murray and Murrumbidgee River floodplains	0.54	1.05	0	0.00	1.59
20 – Buloke – Moonah – Black Box open woodland on sandy rises of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	1.79	0.13	0.07	0.00	1.92
23 – Yarran tall open shrubland of the sandplains and plains of the semi-arid (warm) and arid climate zones	8.21	1.65	0.18	0.00	9.86

PCT ID number and name	Disturbance area A impact (ha)	Disturbance area B4 impact (ha)	Disturbance area B10 impact (ha)[1]	Disturbance area HZ impact (ha)	Total impact (ha)
24 – Canegrass swamp tall grassland wetland of drainage depressions, lakes and pans of the inland plains	7.02	0.00	0.00	0.00	7.02
26 – Weeping Myall open woodland of the Riverina Bioregion and NSW South Western Slopes Bioregion	239.87	77.06	15.66	0.00	316.93
28 – White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone	36.43	4.37	0.92	0.00	40.80
44 – Forb-rich Speargrass – Windmill Grass – White Top grassland of the Riverina Bioregion	33.73	0.00	0.00	0.00	33.73
45 – Plains Grass grassland on alluvial mainly clay soils in the Riverina Bioregion and NSW South Western Slopes Bioregion	9.54	0.00	0.00	0.00	9.54
46 – Curly Windmill Grass – speargrass – wallaby grass grassland on alluvial clay and loam on the Hay Plain, Riverina Bioregion	58.42	0.00	0.00	0.00	58.42
47 – Swamp grassland wetland of the Riverine Plain	0.17	0.00	0.00	0.00	0.17
58 – Black Oak – Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion	0.57	0.39	0.01	0.00	0.96
70 – White Cypress Pine woodland on sandy loams in central NSW wheatbelt	0.16	0.00	0.00	0.00	0.16
76 – Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	0.30	0.00	0.00	0.00	0.30
86 – Yellow Gum tall woodland of the Murray River floodplain, Riverina Bioregion	0.05	0.00	0.00	0.00	0.05
157 – Bladder Saltbush shrubland on alluvial plains in the semi-arid (warm) zone including Riverina Bioregion	99.46	0.00	0.00	0.00	99.46
159 – Old Man Saltbush shrubland mainly of the semi-arid (warm) climate zone (south western NSW)	0.05	0.00	0.00	0.00	0.05

PCT ID number and name	Disturbance area A impact (ha)	Disturbance area B4 impact (ha)	Disturbance area B10 impact (ha)[1]	Disturbance area HZ impact (ha)	Total impact (ha)
160 – Nitre Goosefoot shrubland wetland on clays of the inland floodplains	16.87	0.00	0.00	0.00	16.87
163 – Dillon Bush (Nitre Bush) shrubland of the semi-arid and arid zones	78	0.00	0.00	0.00	78
164 – Cotton Bush open shrubland of the semi-arid (warm) zone	357.73	0.00	0.00	0.00	357.73
170 – Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones	3.51	2.08	0.02	0.00	5.59
216 – Black Roly Poly low open shrubland of the Riverina Bioregion and Murray Darling Depression Bioregion	10.46	0.00	0.00	0.00	10.46
237 – Riverine Western Grey Box grassy woodland of the semi-arid (warm) climate zone	0.21	0.48	0.00	0.15	0.84
266 – White Box grassy woodland in the upper slopes subregion of the NSW South Western Slopes Bioregion	0.1	0.04	0.00	0.04	0.18
277 – Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	42.87	0.79	0.00	0.4	44.06
319 – Tumbledown Red Gum – White Cypress Pine hill woodland in the southern part of the NSW South Western Slopes Bioregion	12.41	0.04	0.00	0.04	12.49
343 – Mugga Ironbark – Red Box – Red Stringybark – Western Grey Box grass/shrub woodland on metamorphic substrates in the Tarcutta – Gundagai region, NSW South Western Slopes Bioregion	3.79	0.00	0.00	0.01	3.80
Totals	**1,234.08**	**191.10**	**16.86**	**7.42**	**1432.60**

(1) For the purposes of this assessment, areas of impact to vegetation with a growth height potential of ten metres or above have been amalgamated into disturbance area B4, while vegetation with a growth height potential of ten metres or less have been identified in disturbance area B10 and would be retained.

Residual direct impacts to TECs

The residual direct impact to BC Act listed TECs is outlined in Table ES.3. The direct impact across these six TECs is expected to be 276.29 hectares within the subject land, with 190.13 hectares within Disturbance area A.

Table ES.3 Summary of residual direct impacts to BC Act listed TECs within the subject land

TEC Name	Profile ID (from TBDC)	BC Act status[1]	IBRA subregion	Associated PCT and vegetation zones with the subject land	Disturbance area A (ha)	Disturbance area B4 (ha)	Disturbance area B10 (area retained)[1] (ha)	Disturbance area HZ (ha)	Impact within subject land (ha)
Acacia melvillei Shrubland in the Riverina and Murray-Darling Depression bioregions	20094	E	Murrumbidgee	23_Mod-good (3.41 ha) 23_Thinned (0.20 ha) 23_Derived (2.71 ha) 23_Derived_LCV (3.54 ha)	8.21	1.65	0.0 (0.18)	0.00	9.86
Allocasuarina luehmannii Woodland in the Riverina and Murray-Darling Depression Bioregions	20082	E (SAII)	Murrumbidgee	20_Thinned (0.16 ha) 20_Derived (0.99 ha) 20_Derived_LCV (0.77 ha)	1.79	0.13	0.0 (0.07)	0.00	1.92

TEC Name	Profile ID (from TBDC)	BC Act status[1]	IBRA subregion	Associated PCT and vegetation zones with the subject land	Disturbance area A (ha)	Disturbance area B4 (ha)	Disturbance area B10 (area retained)[1] (ha)	Disturbance area HZ (ha)	Impact within subject land (ha)
Inland Grey Box Woodlands in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions	20072	E	Inland Slopes	76_Thinned (0.30 ha)	0.30	0.00	0.00	0.00	0.30
			Murray Fans	237_Mod-good (0.84 ha)	0.21	0.48	0.00	0.15	0.84
Myall Woodlands in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions	10973	E	Murrumbidgee	26_Mod-good (91.32 ha) 26_Thinned (84.09 ha) 26_SVTM (1.33 ha)	99.68	77.06	0.00 (15.66)	0.00	176.74

TEC Name	Profile ID (from TBDC)	BC Act status[1]	IBRA subregion	Associated PCT and vegetation zones with the subject land	Disturbance area A (ha)	Disturbance area B4 (ha)	Disturbance area B10 (area retained)[1] (ha)	Disturbance area HZ (ha)	Impact within subject land (ha)
Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregions	20083	E	Murray Fans	19_SVTM (1.59 ha) 28_Derived (0.20 ha) 28_Derived tall shrubland (0.67 ha)	0.93	1.53	0.00	0.00	2.46
			Murrumbidgee	28_Mod-good (2.94 ha) 28_Thinned (5.65 ha) 28_Derived tall shrubland (0.64 ha) 28_Derived (19.63 ha) 28_Derived_LCV (5.03 ha) 28_SVTM (6.04 ha)	36.04	3.89	0.00 (0.92)	0.00	39.93

TEC Name	Profile ID (from TBDC)	BC Act status[1]	IBRA subregion	Associated PCT and vegetation zones with the subject land	Disturbance area A (ha)	Disturbance area B4 (ha)	Disturbance area B10 (area retained)[1] (ha)	Disturbance area HZ (ha)	Impact within subject land (ha)
White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions	10837	CE (SAII)	Inland Slopes	266_Mod-good (0.16 ha) 266_Thinned (0.02 ha) 277_Mod-good (0.19 ha) 277_Thinned (3.01 ha) 277_Derived_LCV (40.86 ha)	42.97	0.83	0.00	0.44	44.24
Totals					**190.13**	**85.57**	**(16.83)**	**0.59**	**276.29**

(1) For the purposes of this assessment, areas of impact to TECs with a growth height potential of ten metres or above have been amalgamated into disturbance area B4, while vegetation with a growth height potential of ten metres or less have been identified in disturbance area B10 and would be retained.

The residual direct impact to EPBC Act listed TECs is outlined in Table ES.4 with a total of 202.23 hectares of direct impact expected across the six TECs.

Table ES.4 Summary of direct impacts to EPBC Act listed TECs within the subject land

TEC name	Profile ID (from TBDC)	EPBC Act status	IBRA subregion	Associated vegetation zones within the subject land	Area within subject land (ha)
Buloke woodlands of the Riverina and Murray Darling Depression bioregions	20397	Endangered	Murrumbidgee	PCT 20_Thinned	0.16
				PCT 20_Derived	2.11
				PCT 20_Derived – low conservation value	1.23
Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	20395	Endangered	Murry Fans	PCT 237_Moderate-good	0.84
Natural Grasslands of the Murray Valley Plains	20371	Critically Endangered	Murrumbidgee	PCT 44_Moderate-good	14.77
				PCT 44_SVTM	18.96
				PCT 45_Moderate-good	3.58
				PCT 45_SVTM	5.96
				PCT 46_Moderate-good	39.35
				PCT 46_SVTM	19.07
Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains	20372	Critically Endangered	Murrumbidgee	PCT 47_Moderate-good	0.17
Weeping Myall Woodlands	20415	Endangered	Murrumbidgee	PCT 26_Moderate-good	91.32
				PCT 26_SVTM	1.33
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	20392	Critically Endangered	Inland Slopes	PCT 266_Moderate-good	0.16
				PCT 266_Thinned	0.02
				PCT 277_Moderate-good	0.19
				PCT 277_Thinned	3.01
Total					**202.23**

Residual direct impacts to species credit species

The project would have a residual direct impact on six recorded threatened flora species listed under the BC Act with a further 21 species assumed present. Impacts to threatened fauna species credit species includes three recorded species and 14 species assumed present. One additional species has suitable habitat identified by a species expert and is considered to be present within the subject land.

Under a conservative approach, presence has been assumed for 36 threatened species where suitable habitat has been identified in areas not subject to targeted survey effort due to property access restrictions and survey timing constraints. The 36 species have been assumed present in all locations where a TBDC associated vegetation type has been identified by either SVTM or WSP verified mapping, which is not considered a realistic representation of the location and extent of these species. Furthermore, the recently released *Remote assessment of biodiversity values* (DCCEEW 2025) is likely to be applicable to the project for large land holdings subject to land access restrictions and would provide further reduction in areas where species have been assumed present. As such, credit liability generated by areas of assumed species presence is highly likely to be an over-representation compared to the final credit liability of the project.

A summary of impacted threatened flora species is outlined in Table ES.5 and threatened fauna species credit species is outlined in Table ES.6. Confirmed loss refers to areas where the species has been recorded as present within the subject land during field verification survey. Alternatively, assumed loss is an approach to estimating species impact in areas that have not been subject to field verification, often due to land access restrictions or seasonal survey timing constraints. It conservatively assumes the maximum likelihood of impact to each species based on the extent of associated habitat present within the un-surveyed area. This is likely to be significantly reduced following field verification survey.

Table ES.5 Summary of residual direct impacts to threatened flora species credit species within the subject land

Scientific name	Common name	BC Act status[1]	EPBC Act status[2]	IBRA subregion			Confirmed loss of habitat (ha) or individuals	Assumed loss of habitat (ha) or individuals	Total impact habitat (ha) or individuals
				Inland Slopes	Murray Fans	Murrumbidgee			
Ammobium craspedioides[3]	Yass Daisy	V	V	✓	–	–	0.00	2.08	2.08
Amphibromus fluitans	River Swamp Wallaby-grass	V	V	–	✓	–	0.00	0.43	0.43
Austrostipa metatoris	–	V	V	–	✓	–	0.00	1.24	1.24
Austrostipa wakoolica	–	E	E	–	–	✓	0.00	29.11	29.11
Brachyscome muelleroides	Mueller Daisy	V	V	–	–	✓	0.00	1.04	1.04
Brachyscome papillosa	Mossgiel Daisy	V	V	–	–	✓	12.67	128.59	141.26
Caladenia arenaria	Sand-hill Spider Orchid	E	E	✓	–	–	0.00	0.30	0.30
Calotis moorei	Burr-daisy	E	E	–	–	✓	0.00	12.14	12.14

Scientific name	Common name	BC Act status[1]	EPBC Act status[2]	IBRA subregion			Confirmed loss of habitat (ha) or individuals	Assumed loss of habitat (ha) or individuals	Total impact habitat (ha) or individuals
				Inland Slopes	Murray Fans	Murrumbidgee			
Convolvulus tedmoorei	Bindweed	E	–	–	–	✓	0.00	28.92	28.92
Cullen parvum	Small Scurf-pea	E	–	✓	–	✓	0.00	25.49	25.49
Diuris tricolor	Pine Donkey Orchid	V	–	✓	–	–	0.00	0.30	0.30
Eleocharis obicis	Spike Rush	V	V	–	✓	✓	13.21	144.10	157.31
Eucalyptus leucoxylon subsp. pruinosa[3]	Yellow Gum	V	–	–	✓	–	30.30	5	5
Grevillea wilkinsonii	Tumut Grevillea	CE	CE	✓	–	–	0.00	0.10	0.10
Lepidium monoplocoides	Winged Peppercress	E	E	–	✓	✓	0.05	80.49	80.54
Leptorhynchos orientalis	Lanky Buttons	E	–	–	-	✓	0.00	43.70	43.70
Maireana cheelii	Chariot Wheels	V	V	–	✓	✓	4.24	152.60	156,84
Pilularia novae-hollandiae	Austral Pillwort	E	–	–	✓	✓	10.62	103.47	114.09
Prasophyllum petilum	Tarengo Leek Orchid	E	E	✓	–	–	0.00	1.98	1.98
Prasophyllum sp. Moama	–	CE	–	–	✓	–	0.00	9.88	9.88
Pterostylis despectans	Lowly Greenhood	CE	E	–	✓	–	0.00	9.88	9.88
Sclerolaena napiformis	Turnip Copperburr	E	E	–	–	✓	0.00	43.39	43.39
Solanum karsense	Menindee Nightshade	V	V	–	–	✓	0.00	0.24	0.24
Swainsona murrayana	Slender Darling-pea	V	V	–	–	✓	168.51	171.95	340.46

Scientific name	Common name	BC Act status[1]	EPBC Act status[2]	IBRA subregion			Confirmed loss of habitat (ha) or individuals	Assumed loss of habitat (ha) or individuals	Total impact habitat (ha) or individuals
				Inland Slopes	Murray Fans	Murrumbidgee			
Swainsona plagiotropis	Red Darling-pea	V	V	–	–	✓	0.00	45.67	45.67
Swainsona recta	Small Purple-pea	E	E	✓	–	–	0.00	2.08	2.08
Swainsona sericea	Silky Swainson-pea	V	–	✓	–	✓	0.00	47.39	47.39

(1) V = Vulnerable, E = Endangered, EP = Endangered Population, CE = Critically Endangered under the BC Act

(2) V = Vulnerable, E = Endangered, CE = Critically Endangered under the EPBC Act

(3) Species are a 'count' species under the BAM where the assumed loss of habitat (ha) is a representation of areas not subject to targeted flora surveys where suitable habitat for the species may occur. A representative one individual has been entered for each vegetation zone subject to impact where suitable habitat has been identified.

Table ES.6 Summary of residual direct impacts to threatened fauna species credit species within the subject land

Scientific name	Common name	BC Act status[1]	EPBC Act status[2]	IBRA subregion			Confirmed loss of habitat (ha) or individuals	Assumed loss of habitat (ha) or individuals	Total impact habitat (ha) or individuals
				Inland Slopes	Murray Fans	Murrumbidgee			
Aprasia parapulchella	Pink-tailed Worm-lizard	V	V	✓	–	–	0.00	0.62	0.62
Ardeotis australis	Australian Bustard	E	–	–	✓	✓	0.00	116.10	116.10
Burhinus grallarius	Bush Stone-curlew	E	–	✓	✓	✓	7.61	253.46	261.07
Callocephalon fimbriatum	Gang-gang Cockatoo	E	E	✓	–	–	0.00	0.06	0.06
Haliaeetus leucogaster	White-bellied Sea-Eagle	V	–	✓	✓	✓	0.00	29.75	29.75
Hamirostra melanosternon	Black-breasted Buzzard	V	–	–	✓	–	0.00	2.38	2.38
Hemiaspis damelii	Grey Snake	E	E	–	✓	✓	0.00	190.31	190.31
Hieraaetus morphnoides	Little Eagle	V	–	✓	✓	✓	0.00	42.80	42.80

Scientific name	Common name	BC Act status[1]	EPBC Act status[2]	IBRA subregion			Confirmed loss of habitat (ha) or individuals	Assumed loss of habitat (ha) or individuals	Total impact habitat (ha) or individuals
				Inland Slopes	Murray Fans	Murrumbidgee			
Litoria raniformis	Southern Bell Frog	E	V	–	✓	✓	10.25	0.00	10.25
Lophochroa leadbeateri	Pink Cockatoo	V	E	–	✓	✓	0.00	50.26	50.26
Lophoictinia isura	Square-tailed Kite	V	–	–	✓	✓	0.00	39.84	39.84
Myotis macropus	Southern Myotis	V	–	–	✓	✓	0.00	20.73	20.73
Ninox connivens	Barking Owl	V	–	✓	✓	✓	0.00	80.15	80.15
Pedionomus torquatus	Plains-wanderer	E	CE	–	–	✓	1.19	0.00	1.19
Petaurus norfolcensis – endangered population	Squirrel Glider in the Wagga Wagga LGA	V	–	✓	–	–	0.00	0.92	0.92
Phascolarctos cinereus	Koala	E	E	✓	✓	–	0.00	149.77	149.77
Polytelis swainsonii	Superb Parrot	V	V	✓	–	–	0.00	29.81	29.81
Tyto novaehollandiae	Masked Owl	V	–	✓	✓	✓	0.00	52.98	52.98

(1) V = Vulnerable, E = Endangered, EP = Endangered Population, CE = Critically Endangered under the BC Act

(2) M = Migratory, V = Vulnerable, E = Endangered, CE = Critically Endangered under the EPBC Act

Residual direct impacts to scattered trees

A total of 16 scattered trees were recorded within the subject land with 14 trees occurring within the Murray Fans IBRA subregion, one tree occurring within the Murrumbidgee IBRA subregion and one tree occurring in the Inland Slopes IBRA subregion. The residual direct impacts to scattered trees for each IBRA subregion is presented in Table ES.7 to Table ES.9.

Table ES.7 Summary of residual direct impacts to scattered trees in the Murray Fans IBRA subregion

Class	Species	DBH category	Contain hollows	Number of trees
13 - Black Box - Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)				
3	*Eucalyptus largiflorens*	Yes (estimated)	>50 cm DBH	5
3	*Eucalyptus largiflorens*	No (visual assessment)	>50 cm DBH	4
3	*Alectryon oleifolius*	Yes (visual assessment)	>50 cm DBH	2
3	*Alectryon oleifolius*	No (visual assessment)	>50 cm DBH	3
Total				**14**

Table ES.8 Summary of residual direct impacts to scattered trees in the Murrumbidgee IBRA subregion

Class	Species	DBH category	Contain hollows	Number of trees
58 - Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion				
3	*Casuarina pauper*	No (visual assessment)	>50 cm DBH	1
Total				**1**

Table ES.9 Summary of residual direct impacts to scattered trees in the Inland Slopes IBRA subregion

Class	Species	DBH category	Contain hollows	Number of trees
343 - Mugga Ironbark - Red Box - Red Stringybark - Western Grey Box grass/shrub woodland on metamorphic substrates in the Tarcutta - Gundagai region, NSW South Western Slopes Bioregion				
3	*Eucalyptus sideroxylon*	No (visual assessment)	>50 cm DBH	1
Total				**1**

Indirect impacts

Indirect impacts from bird strike and EMF criteria assessment

The project is likely to have an indirect operational impact to avifauna resulting from interactions and collision with electrical power infrastructure, however there is no specific assessment criteria under the BAM for this type of indirect impact. Therefore, for the purpose of this assessment, the vehicle strike prescribed impact assessment criteria were considered the most appropriate for assessment of bird strike and EMF associated with electrical power infrastructure.

Assessed species selection

Given uncertainty around these indirect operational impacts, in association with discussions with CPHR, additional biodiversity offsets (over and above the biodiversity offsets required by the BAM for direct impacts) have been calculated for species considered to be of high-risk of an indirect impact determined by the risk assessment in Appendix J.

The key species considered to be of high risk and proposed for additional offsets are:

Ecosystem credit species includes:

- *Botaurus poiciloptilus* (Australasian Bittern)
- *Grus rubicunda* (Brolga).

Species credit species are:

- *Haliaeetus leucogaster* (White-bellied Sea-Eagle)
- *Hieraaetus morphnoides* (Little Eagle)
- *Lophoictinia isura* (Square-tailed Kite).

These key species have been selected:

- as surrogate species to be able to calculate proportional impacts to threatened and non-threatened avifauna
- as they have all been recorded or assumed within the subject land
- as they have a greater likelihood of interaction with the transmission line infrastructure as outlined in risk assessment in Appendix J.

A summary of affected habitat for the Inland Slopes, Murray Fans and Murrumbidgee IBRA subregions is presented in Table ES.10 and Table ES.11.

Table ES.10 Indirect impacts to surrogate species credit species within the Murray Fans IBRA subregion

Scientific name	Common name	BC Act status[1]	EPBC Act status[2]	Disturbance area applicable to the species (full or partial impact) (ha)			Confirmed loss of habitat (ha)	Assumed loss of habitat (ha)	Total impact habitat (ha)	Indirect impact (10% of direct impact) (ha)
				Disturbance area A	Disturbance area B	Disturbance area HZ				
Haliaeetus leucogaster	White-bellied Sea-Eagle	V	–	15.83	11.82	2.10	0.00	29.75	29.75	2.98
Hieraaetus morphnoides	Little Eagle	V	–	20.90	18.30	2.67	0.00	41.88	41.88	4.19
Lophoictinia isura	Square-tailed Kite	V	–	19.77	16.82	2.34	0.00	38.92	38.92	3.89

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

(2) V = Vulnerable, E = Endangered, CE = Critically Endangered under the EPBC Act

Table ES.11 Indirect impacts to surrogate species credit species within the Murrumbidgee IBRA subregion

Scientific name	Common name	BC Act status[1]	EPBC Act status[2]	Disturbance area applicable to the species (full or partial impact) (ha)			Confirmed loss of habitat (ha)	Assumed loss of habitat (ha)	Total impact habitat (ha)	Indirect impact (10% of direct impact) (ha)
				Disturbance area A	Disturbance area B	Disturbance area HZ				
Haliaeetus leucogaster	White-bellied Sea-Eagle	V	–	0.92	0.00	0.00	0.00	0.92	0.92	0.09
Hieraaetus morphnoides	Little Eagle	V	–	0.92	0.00	0.00	0.00	0.92	0.92	0.09

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

(2) V = Vulnerable, E = Endangered, CE = Critically Endangered under the EPBC Act

Prescribed impacts

An assessment of prescribed biodiversity impacts has been prepared in accordance with section 8.2 of the BAM. Residual prescribed impacts that cannot be avoided or mitigated, would be addressed through retiring additional biodiversity credits. In general, the likelihood of any prescribed impacts occurring to a significant degree was considered to be negligible or low. The following prescribed impact categories fell into this negligible or low classification:

a impacts of development on the habitat of threatened species or ecological communities associated with karst, caves, crevices, cliffs and other geological features of significance, or rocks

b impacts of development on the habitat of threatened species or ecological communities associated with:

  i human made structures, or

  ii non-native vegetation

c impacts of development on habitat connectivity

d impacts of development on water bodies, water quality and hydrological processes that sustain threatened species and threatened ecological communities

e impacts of wind turbine strikes on protected animals

f the impacts of vehicle strikes on threatened species of animals or on animals that are part of a threatened ecological community.

In relation to (c), impacts of development on habitat connectivity, the assessment determined that the Squirrel Glider was likely to be subject to a loss of habitat connectivity in areas of the network augmentation works.

While it is acknowledged the project would impact on connectivity for this species, there are a number of examples of effective implementation of connectivity structures to facilitate movement of glider species. A study by Ball and Goldingay (2008) recorded a maximum glide distance of 25 metres, suggesting that the proposed 20-metre-wide connectivity corridors associated with the project should be functional for gliding species if trees of suitable height are present. Where suitable vegetation is not present, wooden poles can be utilised to replace trees (Ball and Goldingay, 2008).

Appendix K provides an assessment of the regional habitat connectivity and provides detailed information on proposed and recommended connectivity structures and other potential mitigation measures.

Mitigation measures outlined by this BDAR that apply to the Squirrel Glider also include the preparation of a Connectivity Strategy.

In order to address any uncertainties around the impacts to connectivity for this species in the landscape, additional prescribed impact credits are proposed.

Guiding the approach for prescribed impacts on connectivity for the Squirrel Glider are the following principles:

- areas of impact are calculated for the relevant subregions that have been adopted in this report for each of the selected species, and
- prescribed impacts to Squirrel Glider due to habitat connectivity impacts encompass areas at which Squirrel Glider habitat has been mapped.

Within the areas assessed for prescribed impacts for Squirrel Glider habitat connectivity, impact calculations have assumed an additional 10 per cent of impacted habitat within Disturbance Area A, Disturbance Area B and Disturbance Area HZ for this species to be impacted. This cautious assumption is considered to be proportional to the likely extent of impacts to the tree canopy connection. This is in addition to the credits generated for Squirrel Glider for the projects direct impacts.

Limiting the assessed impacts to 10 per cent of the available habitat in these locations is considered to be appropriately representative given the impacts to connectivity for Squirrel Glider are considered to be at a much lower level than actual habitat removal, when incorporating the recommended mitigation measures such as glider poles and rope ladders in association with understorey retention.

The proposed additional credit obligation for impacts to Squirrel Glider habitat connectivity are provided in Table ES.12 below. Impacts are to be provided for areas at which Squirrel Glider has been assumed present.

Table ES.12 Prescribed connectivity impacts to species credit species within the Inland Slopes IBRA

Scientific name	Common name	BC Act status[1]	EPBC Act status[2]	Disturbance area applicable to the species (full or partial impact) (ha)	Confirmed loss of habitat (ha)	Assumed loss of habitat (ha)	Total impact habitat (ha)	Prescribed impact (10% of direct impact) (ha)
Petaurus norfolcensis - endangered population	Squirrel Glider in the Wagga Wagga LGA	E	-	0.92	0.00	0.92	0.92	0.09

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

(2) V = Vulnerable, E = Endangered, CE = Critically Endangered under the EPBC Act

Serious and irreversible impacts

To evaluate the nature of an impact on a potential entity at risk of a serious and irreversible impact, the BDAR must contain details of the assessment of serious and irreversible impacts (SAIIs), in accordance with the assessment criteria set out in the BAM.

Two SAII threatened ecological communities and one species were recorded within the subject land, with a further seven species assumed present due to limitations in access. A summary of each of the entities that may be affected by the project and considered potentially at risk of a SAII are outlined in Table ES.13.

Table ES.13 Serious and irreversible impacts

Common name	Scientific name	Reason for inclusion in assessment	Notes
SAII Threatened ecological communities			
Buloke Woodland in the Riverina and Murray-Darling Depression Bioregions	*Allocasuarina luehmanii* Woodland in the Riverina and Murray-Darling Depression Bioregions	Included in current list of entities at risk of an SAII and is likely to be impacted by the proposal	Included due to known occurrence of the community.
White Box Yellow Box Blakely's Red Gum Woodland	White Box Yellow Box Blakely's Red Gum Woodland	Included in current list of entities at risk of an SAII and is likely to be impacted by the proposal	Included due to known occurrence of the community.
SAII Threatened Flora Species			
Mueller Daisy	*Brachyscome muelleroides*	Included in current list of entities at risk of an SAII and is likely to be impacted by the proposal	This species is included based on the presence of assumed habitat only.

Common name	Scientific name	Reason for inclusion in assessment	Notes
Burr-daisy	*Calotis moorei*	Included in current list of entities at risk of an SAII and is likely to be impacted by the proposal	This species is included based on the presence of assumed habitat only.
Sand-hill Spider Orchid	*Caladenia arenaria*	Included in current list of entities at risk of an SAII and is likely to be impacted by the proposal	This species is included based on the presence of assumed habitat only.
Bindweed	*Convolvulus tedmoorei*	Included in current list of entities at risk of an SAII and is likely to be impacted by the proposal	This species is included based on the presence of assumed habitat only.
Tumut Grevillea	*Grevillea wilkinsonii*	Included in current list of entities at risk of an SAII and is likely to be impacted by the proposal	This species is included based on the presence of assumed habitat only.
	Prasophyllum sp. Moama	Included in current list of entities at risk of an SAII and is likely to be impacted by the proposal	This species is included based on the presence of assumed habitat only.
Lowly Greenhood	*Pterostylis despectans*	Included in current list of entities at risk of an SAII and is likely to be impacted by the proposal	This species is included based on the presence of assumed habitat only.
SAII Threatened Fauna Species			
Plains-wanderer	*Pedionomous torquatus*	Included in current list of entities at risk of an SAII and is likely to be impacted by the proposal	Included due to the presence of a mapped important habitat area.

Groundwater dependent ecosystems

River-based vegetation communities dependent on groundwater were identified using the Atlas of Groundwater Dependent Ecosystems (GDEs) (Bureau of Meteorology (BoM), 2024). The subject land includes 17 crossed watercourses that have been identified as containing aquatic GDEs. Such watercourses are identified as moderate to high potential aquatic GDEs. Proposed construction and operational activities associated with the subject land pose a very low risk of changes to groundwater levels, alongside any changes to groundwater quality due to increased salinity arising from groundwater mounding or changes to recharge being considered low risk (*Technical paper 10 – Groundwater impact assessment* (WSP, 2025b). As such, no high priority aquatic GDEs were identified across the subject land. However, database searches identified five unique high priority terrestrial GDEs across the locality, which are predominately located between the Murray River at the NSW/Victorian border and Moulamein.

Aquatic biota and habitats

The subject land is expected to cross 22 named and 83 unnamed watercourses, which are located within Central Murray and Murrumbidgee catchments. Further, all 22 named and 29 unnamed watercourses contain key fish habitat and/or watercourses within the indicative distribution area for threatened species listed under the EPBC Act (Cth) or *Fisheries Management Act 1991* (FM Act) (NSW). Major rivers that occur within the subject land include Wakool River, Niemur River as well as a range of major creeks that are tributaries of such major rivers.

The ecosystem health rating for the Central Murray and Murrumbidgee catchments informed by desktop assessments and previous reports suggested poor watercourse conditions across the subject land. The biological theme of Fish was significantly degraded across both catchments, with invasive species occupying majority of the sampled biomass. Prevalent existing degradation includes channel simplification, lack of native vegetation surrounding some watercourses, and significant differences in flow variability where zero-flow events may occur.

Seven threatened aquatic species and one threatened aquatic ecological community listed under the FM Act and/or EPBC Act have been identified as either occurring or having the potential to occur in the subject land. These include:

- Lowland Murray River EEC (Aquatic Ecological Community in the Natural Drainage System of the Lower Murray River Catchment)
- Silver Perch (*Bidyanus Bidyanus*)
- Murray Hardhead (*Craterocephalus fluviatilis*)
- Murray Spiney Crayfish (*Euastacus armatus*)
- Flathead Galaxias (*Galaxias rostratus*)
- Trout Cod (*Maccullochella macquariensis*)
- Murray Cod (*Maccullochella peelii*)
- Macquarie Perch (*Macquaria australasica*).

Overall, the impacts of the project are expected to be moderate during the construction phase and are not anticipated to result in significant long-term impacts to the threatened species that may inhabit the project footprint, nor to the Lower Murray River Catchment EEC within the project footprint. However, supplementary surveys are recommended prior to construction to determine site-specific mitigation measures to further minimise and/or mitigate potential impacts.

Offsets would be required if a project is deemed to have significant environmental impacts. Compensation to offset fisheries resource or habitat losses would be considered only after it is demonstrated that the proposed loss is unavoidable.

During the detailed design and micro-siting process, potential impacts to key fish habitat would be minimised wherever practicable and where residual impacts are identified these would be quantified and offset in accordance with *Policy and guidelines for fish habitat conservation and management (Update 2013)* (DPI, 2013).

Cumulative impact assessment

Based on the *Cumulative Impact Assessment Guidelines for State Significant Projects* (DPE 2022), a combined Biodiversity Cumulative Impact Assessment (Appendix O) was completed to identify potential biodiversity impacts from relevant future projects, in addition to the current project.

The cumulative impact assessment concluded that the accumulating impacts of multiple projects, continuing agricultural activities, and development and maintenance of infrastructure is considered likely to result in continued loss of biodiversity within the region. Cumulative impacts are expected for native vegetation, threatened species and threatened ecological communities.

The cumulative vegetation removal impacts of future projects considered in the cumulative assessment amounted to an estimated 11,110.97 hectares of remnant vegetation removal. The cumulative species and ecosystem credit requirement equates to 555,237 and 270,067 credits respectively.

Relevant future projects, including this project, were concluded unlikely to impact groundwater during construction, operation or decommissioning due to the limited amount of subsurface disturbance activities required during the installation and decommissioning of project infrastructure. Therefore, the project is unlikely to contribute to cumulative impacts on GDEs.

The project would have minor impacts to connectivity; however, is unlikely to significantly contribute to cumulative impacts on wildlife connectivity and habitat corridors.

The project is located adjacent to protected lands, including Murray Valley National Park (including the Wetuppa Forest within the Noorong-Wetuppa area) and South West Woodland Nature Reserve, and is likely to have local prescribed impacts on these areas. These protected areas are not impacted, however, by any future relevant projects under consideration and as such cumulative impacts on protected lands were not anticipated.

Recommended mitigation measures

The environmental management approach has been developed to be consistent with the regulatory requirements, in accordance with Section 3.2 of the Biodiversity Assessment Method Stage 2 Manual, for management of biodiversity impacts, during the construction and operational phases of the project.

Mitigation measures would be implemented during construction to manage the potential impacts of the project on biodiversity values. These mitigation measures would be outlined in a Biodiversity management subplan (including a Connectivity Strategy) that would form part of the CEMP.

Upfront assessment of the project's impacts and commitments to mitigation and offsets have been incorporated into the project assessment. This approach includes a conservative assessment and upfront mitigation measures in accordance with Section 8.4 of the BAM.

Impacts to matters of biodiversity conservation significance would be avoided to the greatest extent practicable during finalisation of the design and construction methodology for the project. Micro siting of the transmission line infrastructure and associated construction sites and other areas of disturbance would occur to avoid and/or minimise impacts wherever practicable. Site features with the highest biodiversity conservation significance, in particular, recorded threatened species and their habitat, would be given the highest priority with the creation of Special Biodiversity Protection Zones to further minimise impacts on entities at risk of SAII or nationally threatened ecological communities.

Where native vegetation disturbance activities are required in areas that have not been previously subject to biodiversity survey, additional survey would be carried out prior to works occurring in any such areas and to inform design refinement. Additionally, this would potentially allow for impact reduction through field validation of conditions which have been assessed conservatively at this stage with assumed presence. These surveys would be carried out by a suitably qualified ecologist.

Opportunities to locate facilities associated with construction compounds and combined temporary worker accommodation facilities in areas of limited biodiversity value (e.g. cleared land or areas of native vegetation where an offset is not required) would be prioritised during finalisation of the design and construction methodology.

Existing access tracks would be used, where possible, to avoid the construction of new tracks. Where this is not possible, the design would seek to use previously cleared areas and minimise impacts to native vegetation.

Transmission line structures would be located and constructed to avoid and minimise impact to vegetated riparian zones wherever practicable.

A Connectivity Strategy would be developed during detailed design. The core objectives of the strategy would be to outline the final location of the proposed mitigation measures identified within the BDAR, including a series of 20-metre-wide connectivity corridors would be established near transmission line structure locations that occur in woodland vegetation. These connectivity corridors would involve native vegetation retention up to the 10 metre (330 kV line) or 20 metre (500 kV line). The inclusion of these corridors would also assist in further reducing clearing volumes during design refinement stage. Connectivity corridors would occur as a minimum at:

- key riparian crossings
- areas of the alignment joining proposed state forests or conservation reserve estate
- areas of existing dense woodland.

Exact locations and mapping of connectivity areas would be based on the Connectivity Strategy developed during detailed design.

Any biodiversity credit liabilities related to retained vegetation such as the connectivity corridors would be considered in final BAM calculations.

The primary design mitigation measures to be directed towards managing avifauna impacts are:

- minimising interaction of birds with the transmission lines which might otherwise result in injury or fatality; and
- minimising nesting on the transmission line structures, which might otherwise result in low-level EMF impacts to birds.

The industry-recognised method for electrical transmission to mitigate bird strike and EMF impacts includes developing the use of bird diverters as part of detailed design, including consideration of positioning and the diverter model. At a minimum, bird diverters would be used within one kilometre of wetland/riverine habitats to reduce collision risk for aerial fauna and allow safer passage within these areas.

Biodiversity Offsets Scheme requirements

The biodiversity offset strategy (BOS) for this project includes three primary options to fulfill credit obligations:

- creating Biodiversity Stewardship Agreements (BSAs) on local land, including Transgrid-owned or third-party private land
- purchasing and retiring biodiversity credits from the biodiversity credit register
- making contributions to the Biodiversity Conservation Fund (BCF).

Additional strategies include acquiring land to establish BSAs dedicated to the National Parks and Wildlife Service (NPWS), partnerships with the NSW Credit Supply Taskforce (CST) for sourcing credit liabilities, and funding biodiversity conservation actions. Transgrid may also seek to enter into a strategic offset delivery agreement (SODA) under section 6.2(2)(f) of the Biodiversity Conservation Regulation 2017 (BC Regulation).

Transgrid has previously established a series of BSAs across the region of the project for the delivery of its biodiversity offset obligations under EnergyConnect projects. These BSAs have generated significant surplus credits (46,635 ecosystem credits) that are “like for like” with the project’s liability. In addition, Transgrid has acquired a significant land holding (referred to as the “Concord property offset”) specifically for the established of offsets for this project. Cumulatively, these BSAs have demonstrated that the project is likely to have secured approximately 65 per cent of the project’s ecosystem credit liability prior to approval (Table 11.16).

Of the projects 35 per cent residual ecosystem credits yet to be sourced, the majority are widespread and/or associated with offset trading groups that have been previously sourced through BSAs by Transgrid for EnergyConnect projects.

Transgrid are also actively progressing a number of additional potential BSAs that have been identified to contain like for like biodiversity values to those residual ecosystem liabilities.

Where the establishment of BSAs would not generate sufficient credits to fulfill the credit obligation, purchasing and retiring biodiversity credits from the biodiversity credit register would be the next choice. The purchase and retirement of existing biodiversity credits is required to be undertaken based on like for like trading rules as outlined under the BC Regulation and as identified by the BAM calculator output for the project.

The third and last option considered is a payment into the BCF to fulfil the offset obligations that cannot be met through BSA establishment or by purchasing credits off the open market. This option may need to be considered for very rare species that are only known from few localities and are unlikely to be found on a BSA site or have credits available for purchase on the open market.

The project is expected to require 25,708 ecosystem credits and 83,699 species credits (being 51, 153 threatened flora species credits and 29,584 threatened fauna species credits) to offset its impacts. This comprises of:

- Murray Fans: 3,102 ecosystem credits and 19,805 species credits of which 4,362 credits are for threatened flora species and 12,481 credits are for threatened fauna species.
- Murrumbidgee: 22,493 ecosystem credits and 63, 243 species credits of which 46,527 credits are for threatened flora species and 16,716 credits are for threatened fauna species.
- Inland Slopes: 113 ecosystem credits and 651 species credits of which 264 credits are for threatened flora species and 387 credits are for threatened fauna species.

In addition to these credits:

- 14 ecosystem credits for impacts to scattered trees
- 273 proposed additional species credits for indirect impacts due to bird strike and EMF
- three proposed additional species credits for prescribed impacts to habitat connectivity.

Full details of attributes associated with each ecosystem credit including sensitivity to loss, sensitivity to gain class, biodiversity risk weighting, potential SAII, like for like options, credit trading groups and IBRA regions is provided in Appendix E.

Ecosystem credits

The ecosystem impacts that require an offset (as per BAM Subsection 9.2.2(2.)) are outlined below in Table ES.14.

Table ES.14 Summary of the total ecosystem credits required

Plant Community Type	Credits required
2 - River Red Gum-sedge dominated very tall open forest in frequently flooded forest wetland along major rivers and floodplains in south-western NSW	2
7 - River Red Gum - Warrego Grass - herbaceous riparian tall open forest wetland mainly in the Riverina Bioregion	65
10 - River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	195
11 - River Red Gum - Lignum very tall open forest or woodland wetland on floodplains of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	4
13 - Black Box - Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	1,556
15-Black Box open woodland wetland with chenopod understorey mainly on the outer floodplains in south-western NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	1,240
17-Lignum shrubland wetland of the semi-arid (warm) plains (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	375
19-Cypress Pine woodland of source-bordering dunes mainly on the Murray and Murrumbidgee River floodplains	45
20-Buloke - Moonah - Black Box open woodland on sandy rises of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	9

Plant Community Type	Credits required
23-Yarran tall open shrubland of the sandplains and plains of the semi-arid (warm) and arid climate zones	109
24-Canegrass swamp tall grassland wetland of drainage depressions, lakes and pans of the inland plains	126
26-Weeping Myall open woodland of the Riverina Bioregion and NSW South Western Slopes Bioregion	3,118
28-White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone	539
44-For-rich Speargrass - Windmill Grass - White Top grassland of the Riverina Bioregion	1,660
45-Plains Grass grassland on alluvial mainly clay soils in the Riverina Bioregion and NSW South Western Slopes Bioregion	451
46-Curly Windmill Grass - speargrass - wallaby grass grassland on alluvial clay and loam on the Hay Plain, Riverina Bioregion	2,778
47-Swamp grassland wetland of the Riverine Plain	9
58-Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion	12
70-White Cypress Pine woodland on sandy loams in central NSW wheatbelt	5
76 - Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	4
86-Yellow Gum tall woodland of the Murray River floodplain, Riverina Bioregion	3
157-Bladder Saltbush shrubland on alluvial plains in the semi-arid (warm) zone including Riverina Bioregion	2,686
159-Old Man Saltbush shrubland mainly of the semi-arid (warm) climate zone (south western NSW)	3
160-Nitre Goosefoot shrubland wetland on clays of the inland floodplains	377
163-Dillon Bush (Nitre Bush) shrubland of the semi-arid and arid zones	1,882
164-Cotton Bush open shrubland of the semi-arid (warm) zone	8,048
170-Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones	30
216-Black Roly Poly low open shrubland of the Riverina Bioregion and Murray Darling Depression Bioregion	257
237-Riverine Western Grey Box grassy woodland of the semi-arid (warm) climate zone	11
266 - White Box grassy woodland in the upper slopes subregion of the NSW South Western Slopes Bioregion	5
277-Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	92
319-Tumbledown Red Gum - White Cypress Pine hill woodland in the southern part of the NSW South Western Slopes Bioregion	11
343-Mugga Ironbark - Red Box - Red Stringybark - Western Grey Box grass/shrub woodland on metamorphic substrates in the Tarcutta - Gundagai region, NSW South Western Slopes Bioregion	1
Total	**25,708**

Threatened species credits

The threatened species impacts that require an offset (as per BAM Subsection 9.2.2(2.)) are outlined below in Table ES.15 and Table ES.16.

Table ES.15 Impacts that require an offset – threatened flora species credits

Scientific name	Common name	BC Act[1]	EPBC Act[2]	SAII	Area (ha)/ count	Credits required
Ammobium craspedioides[3]	Yass Daisy	V	V	Yes	4	8
Amphibromus fluitans	River Swamp Wallaby-grass	V	V	No	0.43	11
Austrostipa metatoris	–	V	V	No	1.24	26
Austrostipa wakoolica	–	E	E	No	29.11	595
Brachyscome muelleroides	Mueller Daisy	V	V	Yes	1.04	78
Brachyscome papillosa	Mossgiel Daisy	V	V	No	141.26	6,941
Caladenia arenaria	Sand-hill Spider Orchid	E	E	Yes	0.30	8
Calotis moorei	Burr-daisy	E	E	Yes	12.14	827
Convolvulus tedmoorei	Bindweed	E	-	Yes	28.92	2,013
Cullen parvum	Small Scurf-pea	E	-	No	25.49	1,205
Diuris tricolor	Pine Donkey Orchid	V	-	No	0.30	4
Eleocharis obicis	Spike Rush	V	V	No	157.31	6,705
Eucalyptus leucoxylon subsp. pruinosa[3]	Yellow Gum	V	-	No	5	10
Grevillea wilkinsonii	Tumut Grevillea	CE	CE	Yes	0.10	4
Lepidium monoplocoides	Winged Peppercress	E	E	No	80.54	2,373
Leptorhynchos orientalis	Lanky Buttons	E	-	No	43.70	1,352
Maireana cheelii	Chariot Wheels	V	V	No	156.84	6,960
Pilularia novae-hollandiae	Austral Pillwort	E	-	No	114.09	2,159
Prasophyllum petilum	Tarengo Leek Orchid	E	E	No	1.98	57
Prasophyllum sp. Moama	–	CE	-	Yes	9.88	741
Pterostylis despectans	Lowly Greenhood	CE	E	Yes	9.88	741
Sclerolaena napiformis	Turnip Copperburr	E	E	No	43.39	1,336
Solanum karsense	Menindee Nightshade	V	V	No	0.24	3
Swainsona murrayana	Slender Darling-pea	V	V	No	340.46	13,995
Swainsona plagiotropis	Red Darling-pea	V	V	No	45.67	1,448

Scientific name	Common name	BC Act[1]	EPBC Act[2]	SAII	Area (ha)/ count	Credits required
Swainsona recta	Small Purple-pea	E	E	No	2.08	60
Swainsona sericea	Silky Swainson-pea	V	-	No	47.39	1,493
Total						**51,257**

(1) V = Vulnerable, E = Endangered, EP = Endangered Population, CE = Critically Endangered under the BC Act

(2) V = Vulnerable, E = Endangered, CE = Critically Endangered under the EPBC Act

(3) Species are a 'count' species under the BAM where the assumed loss of habitat (ha) is a representation of areas not subject to targeted flora surveys where suitable habitat for the species may occur. A representative one individual has been entered for each vegetation zone subject to impact where suitable habitat has been identified.

Table ES.16 Impacts that require an offset – threatened fauna species credits

Scientific name	Common name	BC Act[1]	EPBC Act[2]	SAII	Area (ha)	Credits required
Aprasia parapulchella	Pink-tailed Worm-lizard	V	V	No	0.62	9
Ardeotis australis	Australian Bustard	E	-	No	116.10	5,795
Burhinus grallarius	Bush Stone-curlew	E	-	No	261.07	6,047
Callocephalon fimbriatum	Gang-gang Cockatoo	E	E	No	0.06	5
Haliaeetus leucogaster	White-bellied Sea-Eagle	V	-	No	29.75	944
Hamirostra melanosternon	Black-breasted Buzzard	V	-	No	2.38	49
Hemiaspis damelii	Grey Snake	E	E	No	190.31	6,577
Hieraaetus morphnoides	Little Eagle	V	-	No	42.80	1,078
Litoria raniformis	Southern Bell Frog	E	V	No	10.25	286
Lophochroa leadbeateri	Pink Cockatoo	V	E	No	50.26	1,800
Lophoictinia isura	Square-tailed Kite	V	-	No	39.84	1,021
Myotis macropus	Southern Myotis	V	-	No	20.73	333
Ninox connivens	Barking Owl	V	-	No	80.15	2,677
Pedionomus torquatus	Plains-wanderer	E	CE	Yes	1.19	70
Petaurus norfolcensis – endangered population	Squirrel Glider in the Wagga Wagga LGA	V	-	No	0.92	23
Phascolarctos cinereus	Koala	E	E	No	149.77	3,462
Polytelis swainsonii	Superb Parrot	V	V	No	29.81	704
Tyto novaehollandiae	Masked Owl	V	-	No	52.98	1,701
Total						**32,581**

(1) V = Vulnerable, E = Endangered, EP = Endangered Population, CE = Critically Endangered under the BC Act

(2) M = Migratory, V = Vulnerable, E = Endangered, CE = Critically Endangered under the EPBC Act

Scattered tree credits

A total of 14 ecosystem credits are required to offset the impact to 16 scattered trees with seven requiring hollow bearing tree credit offsets and seven credits with no hollow bearing trees. A summary is presented in Table ES.17 to Table ES.19.

Table ES.17 Ecosystem credit summary for impacts to scattered trees in the Murray Fans IBRA subregion

PCT	TEC	HBT Cr	No HBT Cr	Credits
13 - Black Box - Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Not a TEC	7	5	12
Total ecosystem credits		**7**	**5**	**12**

Table ES.18 Ecosystem credit summary for impacts to scattered trees in the Murrumbidgee IBRA subregion

PCT	TEC	HBT Cr	No HBT Cr	Credits
58-Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion	Not a TEC	0	1	1
Total ecosystem credits		**0**	**1**	**1**

Table ES.19 Ecosystem credit summary for impacts to scattered trees in the Inland Slopes IBRA subregion

PCT	TEC	HBT Cr	No HBT Cr	Credits
343-Mugga Ironbark - Red Box - Red Stringybark - Western Grey Box grass/shrub woodland on metamorphic substrates in the Tarcutta - Gundagai region, NSW South Western Slopes Bioregion	Not a TEC	0	1	1
Total ecosystem credits		**0**	**1**	**1**

Additional credit obligation for indirect impacts due to bird strike and EMF

The proposed additional credit obligation for impacts to threatened bird species through indirect impacts due to line strike and EMF are provided in Table ES.20. An additional 273 ecosystem credits are proposed to be provided to account for indirect impacts to threatened bird species through indirect impacts due to line strike and EMF.

Table ES.20 Summary of indirect impacts on threatened fauna species for combined subregions

Scientific name	Common name	Total impact to habitat (ha)	10% habitat impact (ha)	Credits per ha based on project BAM-C calculations	Proposed additional species credits
Haliaeetus leucogaster	White-bellied Sea-Eagle	29.75	2.98	37.5	112
Hieraaetus morphnoides	Little Eagle	42.82	4.28	19.5	83
Lophoictinia isura	Square-tailed Kite	39.84	3.98	19.5	78
Total proposed additional species credits for indirect impacts					**237**

Additional credit obligation for prescribed impacts to habitat connectivity

The proposed additional credit obligation for impacts to habitat connectivity are provided in Table ES.21. Additional credits are to be provided for areas at which species have been recorded via targeted surveys and where presence has been assumed.

Table ES.21 Summary of additional species credits for prescribed impacts to habitat connectivity

Scientific name	Common name	Total impact to habitat (ha)	10 % habitat impact (ha)	Credits per ha based on project BAM-C calculations	Proposed additional species credits
Petaurus norfolcensis – Endangered population	Squirrel Glider – Endangered population in the Wagga Wagga LGA	0.92	0.09	28	3
Total proposed additional species credits for indirect impacts					**3**

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Glossary

Affected species	A species that is likely to be affected through by direct and/or indirect impacts as a result of the project.
Assessment area	The assessment area includes a 500 m linear buffer of the subject land (200 m easement and access tracks) and a 1500 m buffer zone surrounding project infrastructure or areas that are not directly connected to the subject land as per Subsection 3.1.2 of the BAM.
Avoid	Measures taken by a proponent such as careful site selection or actions taken through the design, planning, construction and operational phases of the project to completely avoid impacts on biodiversity values, or certain areas of biodiversity.
Biodiversity	The biological diversity of life is commonly regarded as being made up of the following three components: — genetic diversity – the variety of genes (or units of heredity) in any population — species diversity – the variety of species — ecosystem diversity – the variety of communities or ecosystems.
Biodiversity Assessment Method (BAM)	*Biodiversity Assessment Method* (Department of Planning, Industry and Environment, 2020)
Biodiversity Assessment Method Calculator (BAM-C)	The web application that provides decision support to assessors and proponents by applying the BAM, and which calculates the number and class of biodiversity credits required to offset the impacts of a project or created at a biodiversity stewardship site.
Biodiversity credits	Ecosystem credits or species credits
Biodiversity Credit Report	The report produced by the (BAM-C) that sets out the number and class of biodiversity credits required to offset the remaining adverse impacts on biodiversity values at a development site, or on land to be biodiversity certified, or that sets out the number and class of biodiversity credits that are created at a biodiversity stewardship site.
Biodiversity offsets	Management actions that are undertaken to achieve a gain in biodiversity values on areas of land to compensate for losses to biodiversity values from the impacts of project.

Biodiversity risk weighting	The BAM uses a biodiversity risk weighting to evaluate the ecological risks of threatened entities from the Biodiversity Offsets Scheme (BOS). The biodiversity risk weighting comprises two parts: — sensitivity to loss considers the increased threat posed to an entity from offsetting the loss of habitat or population — sensitivity to gain considers the ability of a species to respond to improvements in habitat condition at a biodiversity stewardship site. The biodiversity risk weighting for determining the credit requirement for ecosystem credits is based on: — the sensitivity to loss for the listed TEC identified on the subject land, or if the vegetation is not a TEC, the sensitivity to loss for the PCT identified on the subject land (i.e. threat status of the TEC takes precedence to determine the sensitivity to loss, regardless of the estimated per cent cleared value for the PCT) — the highest sensitivity to gain ranking for the ecosystem credit species associated with that TEC or PCT. The BAM-C would apply the biodiversity risk weighting to each vegetation zone based on the survey data the assessor collected from the subject land in Stage 1 and the impact assessment outcomes determined by the assessor in Stage 2.
Biodiversity value	Are the following values: — vegetation integrity – being the degree to which the composition, structure and function of vegetation at a particular site and the surrounding landscape has been altered from a near natural state — habitat suitability – being the degree to which the habitat needs of threatened species are present at a particular site — biodiversity values, or biodiversity-related values, prescribed by the regulations under the BC Act.
BioNet Atlas	NSW DCCEEW database of flora and fauna records (formerly known as the NSW Wildlife Atlas). The Atlas contains records of plants, mammals, birds, reptiles, amphibians, some fungi, some invertebrates (such as insects and snails listed under the BC Act) and some fish.
BioNet Vegetation Classification	The master vegetation community-level classification for use in vegetation mapping programs and regulatory biodiversity impact assessment frameworks in NSW. The BioNet Vegetation Classification is published by NSW DCCEEW and available at www.environment.nsw.gov.au/research/Visclassification.htm.
Brake and winch site	A temporarily cleared area where plant and equipment are located to spool and winch conductors into place on transmission line structures. The locations of the brake and winch sites may or may not be within the nominated transmission line easement. These sites are only required for construction of the project and do not need to be maintained during operation.
Broad Condition State	Areas of the same PCT that are in relatively homogenous condition. Broad condition is used for stratifying areas of the same PCT into a vegetation zone for the purpose of determining the vegetation integrity score.

Candidate species	A species credit species that is likely to have suitable habitat on the subject land. Referred to as 'candidate species credit species' in the BAM-C and require further assessment in accordance with subsection 5.2.3 of the BAM.
Construction area	The area that would be used for the construction of the project.
Direct impact	Impacts on biodiversity values and threatened species habitat that relate to clearing native vegetation and impacts on biodiversity values prescribed by the BC Regulation. This includes impacts from activities related to the construction or operational phase of the project.
Dual credit species	In some circumstances the TBDC may identify a threatened species that requires assessment for ecosystem credits and species credits (referred to as dual credit species). For dual credit species, part of the habitat is assessed as a species credit (e.g. breeding habitat or land mapped on an important habitat map for a species). The remaining habitat components for the species are assessed as an ecosystem credit (e.g. foraging habitat). Dual credit species are generally either highly mobile species that rely on particular habitat components for breeding, such as maternity caves for bats, tree hollows for some large forest owls or cockatoos; or are species for which particular areas in the landscape are important for their survival, such as selected beaches for migratory shorebirds.
Ecosystem credit species	Ecosystem credit species are threatened species whose occurrence can generally be predicted by vegetation surrogates and/or landscape features, or that have a low probability of detection using targeted surveys.
Groundwater	Water found in the subsurface in the saturated zone below the water table or piezometric surface i.e. the water table marks the upper surface of groundwater systems.
Habitat	An area or areas occupied, or periodically or occasionally occupied, by a species or ecological community, including and biotic or abiotic component.
High Threat Weed	A vascular plant that, if not controlled, would invade and outcompete native plant species. Plants considered to be high threat weeds are listed on the high threat weeds list published in the BAM-C.
Hollow bearing tree (HBT)	A living or dead tree that has at least one hollow. A tree is considered to contain a hollow if: (a) the entrance can be seen; (b) the entrance width is at least 5 cm; (c) the hollow appears to have depth (i.e. you cannot see solid wood beyond the entrance); (d) the hollow is at least 1 m above the ground. Trees must be examined from all angles.
IBRA region	A bioregion identified under the Interim Biogeographic Regionalisation for Australia (IBRA) system, which divides Australia into bioregions on the basis of their dominant landscape-scale attributes.
IBRA subregion	A subregion of a bioregion identified under the IBRA system.

Indicative disturbance area	Refers to the indicative area that would be temporarily or permanently cleared during the construction of project comprising the following: — locations of all project infrastructure elements (including the proposed transmission line, transmission line easement, substation works (at the future Dinawan, existing Wagga 330 kV and future Gugaa 500 kV substations), telecommunication facilities, and other ancillary works) — locations for construction elements such as construction compounds and temporary worker accommodation facilities, access tracks (excluding public roads proposed to be used for access tracks), site access points, water supply points, laydown and staging areas, concrete batching plants, brake and winch sites and site offices. The area is identified based on realistic project component locations and areas however it is indicative at this stage. The final disturbance area would be confirmed during finalisation of the design and construction methodology and would be developed as part of the consideration of avoidance and impact minimisation. This indicative disturbance area includes areas required for operation and maintenance. Synonym of development site as defined in the BAM.
Indirect impact	An impact on biodiversity values that occurs when project related activities affect threatened species, threatened species habitat, or ecological communities in a manner other than direct impact.
Interconnector	An electricity interconnector is a connection that allows power to flow in both directions between regions in the National Electricity Market (NEM), in this case between NSW and Victoria, providing access to a larger number of electricity generators and greater ability to meet varying demand where and when it is needed most.
Landscape attributes	In relation to a development site or a biodiversity stewardship site, native vegetation cover, vegetation connectivity, patch size and the strategic location of a biodiversity stewardship site.
Locality	A 25 km radius surrounding the project in which threatened species database searches were conducted.
Local population	The population that occurs in the subject land. In cases where multiple populations occur in the subject land or a population occupies part of the subject land, impacts on each subpopulation must be assessed separately.
Minimise	A process applied throughout the development planning and design life cycle which seeks to reduce the residual impacts of the project on biodiversity values through effective mitigation.
Mitchell landscape	Landscapes with relatively homogeneous geomorphology, soils and broad vegetation types, mapped at a scale of 1:250,000.
Mitigation	Action to reduce the severity of an impact as per Section 8.4 of the BAM
Mitigation measure	Measures used to reduce, eliminate or compensate for adverse environmental effects.

Native vegetation	Means any of the following types of plants native to New South Wales: — trees (including any sapling or shrub or any scrub) — understorey plants — groundcover (being any type of herbaceous vegetation) — plants occurring in a wetland.
Patch size	An area of intact native vegetation that: — occurs on the subject land or biodiversity stewardship site, and — includes native vegetation that has a gap of less than 100 m from the next area of moderate to good condition native vegetation (or ≤30 m for non-woody ecosystems). Patch size may extend onto adjoining land that is not part of the subject land or biodiversity stewardship site.
Plant community type (PCT)	A NSW plant community type identified using the PCT classification system.
PCT classification system	The system of classifying native vegetation approved by the NSW Plant Community Type Control Panel and described in the BioNet Vegetation Classification.
Population	A group of organisms, all of the same species, occupying a particular area.
Prescribed Impact	Prescribed impacts identified in clause 6.1 of the BC Regulation. Prescribed impacts can be direct or indirect impacts.
Project footprint	Includes the entire indicative disturbance footprint and is consistent with subject land for the project.
Subject land (the)	The subject land is a conservative area, generally up to 200 metres wide, that has the potential to be directly affected by the construction and operation of the project. The subject land would include all proposed infrastructure elements (including the proposed transmission line corridor, substation site works and other ancillary works) as well as locations for proposed construction elements such as temporary worker accommodation facilities, construction compounds, access tracks and site access points, laydown and staging areas, concrete batching plants, brake and winch sites and site offices. The subject land has been developed to achieve a level of flexibility for future design refinement.
Project transmission line corridor (the)	A generally 200 m wide corridor along the length of the transmission line within which the transmission line, structures and easement would be located (sub set of the project footprint).
Project	VNI West (NSW) project encompassing both areas from Dinawan Substation to the Victorian border and the augmentation network from Network augmentation works component.
Sensitivity to gain/loss class	Sensitivity to gain/loss considers the ability of a species to respond to improvements in habitat condition at a biodiversity stewardship site or the increased threat posed to an entity from offsetting the loss of habitat or population. Sensitivity to gain/loss are two parts of the Biodiversity Risk Weighting.

Species credit species	Threatened species that are assessed in accordance with section 6.4 of the BAM. Species credit species are threatened species for which vegetation surrogates and/or landscape features cannot reliably predict the likelihood of their occurrence or components of their habitat. A targeted survey or an expert report is required to confirm the presence of these species on the subject land. Alternatively, a species may be assumed present within the subject land.
Stage 1: Biodiversity Assessment	Stage 1 of the BAM. It establishes a single consistent approach to assessing the biodiversity values on land subject to the project.
Stage 2: Impact Assessment	Stage 2 of the BAM. It provides for an impact assessment on biodiversity values on land subject to the project.
Surveyed land	Surveyed land throughout the duration of the project where there was no restricted access.
Threatened Biodiversity Data Collection (TBDC)	Part of the BioNet database, published by the NSW State Government and accessible from the BioNet website at www.bionet.nsw.gov.au.
Threatened ecological community (TEC)	Means a critically endangered ecological community, an endangered ecological community or a vulnerable ecological community listed in Schedule 2 of the BC Act or any additional ecological community listed under Part 13 of the EPBC Act as critically endangered, endangered or vulnerable.
Threatened species	Critically endangered, endangered or vulnerable threatened species as defined by Schedule 1 of the BC Act, or any additional threatened species listed under Part 13 of the EPBC Act as critically endangered, endangered or vulnerable.
Transgrid (or 'the proponent')	The manager and operator of the high voltage electricity transmission network in New South Wales and the Australian Capital Territory with connections to Victoria and Queensland. Transgrid manages the network that is the backbone of the NEM, which enables energy trading between Australia's three largest states along the east coast.
Transmission line alignment	The location of the transmission line structures along the middle of the transmission line easement.
Transmission line easement	The area surrounding and including the transmission lines that allows access, construction and maintenance work to take place. The easement grants a right of access and for construction, maintenance and operation of the transmission line and other operational assets. The easements for the new 500 kV transmission line between the NSW/Victorian border and the future Dinawan substation would typically be 70 m wide. However, transposition locations would require wider easements up to 110 m wide. The replacement of the 330 kV transmission line generally between Ivy Road (south of the existing Wagga 330 kV substation) and the future Gugaa 500 kV substation would occur within the existing 60 m wide easement.
Transmission line structure	A free standing steel tower structure to support the transmission line cables. Structures can consist of two types of supporting steel lattice structures being: a suspension structure and strain structure (also known as tension structure).
Transposition	Transposition is the periodic swapping of positions of the conductors of a transmission line to improve voltage balance.

Unsurveyed land	Unsurveyed land refers to land tenure where access was restricted throughout the duration of the project. Vegetation mapping on unsurveyed lands uses NSW State Vegetation Type Mapping (SVTM) (NSW DCCEEW 2022) and assumed presence for any threatened species polygons.
Vegetation class	A level of classification of vegetation communities defined in Keith (2004). There are 99 vegetation classes in NSW.
Vegetation formation	A broad level of vegetation classification as defined in Keith (2004). There are 16 vegetation formations and sub-formations in NSW.
Vegetation integrity	The condition of native vegetation assessed for each vegetation zone against the benchmark for the PCT.
Vegetation integrity score	The quantitative measure of vegetation condition.
Vegetation type	A NSW plant community type (PCT)
Vegetation zone	A relatively homogenous area of native vegetation that is the same PCT and broad condition state.
VNI West	An interconnector of about 450 km between the power grids of NSW and Victoria. Specifically, VNI West would connect EnergyConnect (NSW – Eastern section) project (at the new Dinawan substation in NSW) with the Western Renewables Link project (at Bulgana in Victoria) via a new substation near Kerang (in Victoria).
VNI West (NSW) or ('the project)	The NSW component of VNI West includes: — a new 500 kV transmission line connection between the NSW/Victorian border and Transgrid's Dinawan substation (currently under construction as part of the EnergyConnect (NSW – Eastern section) project) — replacement of a section of existing single circuit 330 kV transmission line to a double circuit 330 kV line generally between Ivydale Road (south of the existing Wagga 330 kV substation) and the future Gugaa 500 kV substation (subject to separate planning approval as part of the HumeLink project) — expansion of the future Dinawan 330 kV substation to include a new 500 kV switchyard and two new 330 kV bays — connection and transmission line diversion works at both the existing Wagga 330 kV substation and the future Gugaa 500 kV substation to connect the new transmission line infrastructure — ancillary activities to support construction and operation of the project

Acronyms and abbreviations

APZ	asset protection zone
BAM	Biodiversity Assessment Method
BAM-C	Biodiversity Assessment Method Calculator
BC Act	*Biodiversity Conservation Act 2016* (NSW)
BC Regulation	Biodiversity Conservation Regulation 2017 (NSW)
BDAR	Biodiversity Development Assessment Report
BOAMS	Biodiversity Offsets and Agreement Management System
BOS	Biodiversity Offsets Scheme
CEEC	critically endangered ecological community
DBH	diameter at breast height (1.4 m) over bark
DCCEEW	Department of Climate Change, Energy, the Environment and Water
EIS	Environmental Impact Statement
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cth)
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW)
EEC	endangered ecological community
HTW	high threat weed
IBRA	Interim Biogeographic Regionalisation for Australia
LLS Act	*Local Land Services Act 2013* (NSW)
MNES	Matters of national environmental significance (Commonwealth)
NPW Act	*National Parks and Wildlife Act 1974* (NSW)
NSW DCCEEW	NSW Department of Climate Change, Energy, the Environment and Water
NSW	New South Wales
PCT	plant community type
SAII	serious and irreversible impact
SEARs	Secretary's Environmental Assessment Requirements
SVTM	State Vegetation Type Mapping
TBDC	Threatened Biodiversity Data Collection
TEC	threatened ecological community
VEC	vulnerable ecological community

Declarations

i. Certification under clause 6.15 *Biodiversity Conservation Act 2016*

I certify that this report has been prepared based on the requirements of, and information provided under, the Biodiversity Assessment Method and clause 6.15 of the *Biodiversity Conservation Act 2016* (BC Act).

Signature: 

Date: 24 July 2025

BAM Assessor Accreditation no: BAAS19078

This BDAR has been prepared to meet the requirements of BAM. Appendix A provides an assessment of compliance with the minimum information requirements outlined in BAM Appendix K.

The BAM Biodiversity Credit Reports were finalised on the 23/07/2025 and are provided in Appendix E. The BAM-C case numbers are:

Murray Fans IBRA sub-region

- Ecosystem and Species Credits – 00053398/BAAS23009/24/00053401 Revision 6
- Scattered Trees – 00053398/BAAS18097/25/00056440 Revision 1.

Inland Slopes IBRA sub-region

- Ecosystem and Species Credits – 00047237/BAAS23009/24/00047238 Revision 7
- Scattered trees – 00047237/BAAS18097/25/00056459 Revision 1.

Murrumbidgee IBRA sub-region

- Ecosystem and Species Credits – 00041510/BAAS19078/25/00054312 Revisions 7 & 8
- Scattered Trees – 00041510/BAAS18097/25/00056448 Revision 0 & 1.

ii. Details and experience of author/s and contributors

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iii. Conflict of interest

I declare that I have considered the circumstances and there is no actual, perceived or potential conflict of interest:

This declaration has been made in the interests of full disclosure to the decision-maker. Full disclosure has also been provided to the client.

Signature: 

Date: 24 July 2025

BAM Assessor Accreditation no: BAAS19078

Stage 1: Biodiversity assessment

1 Introduction

This Section provides an overview and background to the NSW component of the Victoria NSW Interconnector West (VNI West) project, including a summary of the project and the purpose and structure of this technical paper.

1.1 Project context and overview

Transgrid and Transmission Company Victoria (TCV) are jointly developing a new electrical connection between NSW and Victoria called the Victoria to NSW Interconnector West project (VNI West). VNI West would form a second transmission link between NSW and Victoria to harness clean, low-cost electricity from Renewable Energy Zones (REZ) in both states and improve the reliability and security of electricity supply. VNI West is a priority project for the Australian Energy Market Operator (AEMO), and the Commonwealth and NSW and Victorian governments.

VNI West proposes the construction, operation and ongoing maintenance of a high voltage, 500 kilovolt (kV) double circuit overhead transmission line that would connect the high voltage electricity grids in NSW and Victoria. Specifically, VNI West would link the Western Renewables Link proposal at Bulgana in Victoria with the EnergyConnect (NSW – Eastern section) project (SSI-9172452) at the future Dinawan substation in NSW (currently in construction). The connection would be made via a new substation near Kerang in Victoria (refer to Figure 1.1).

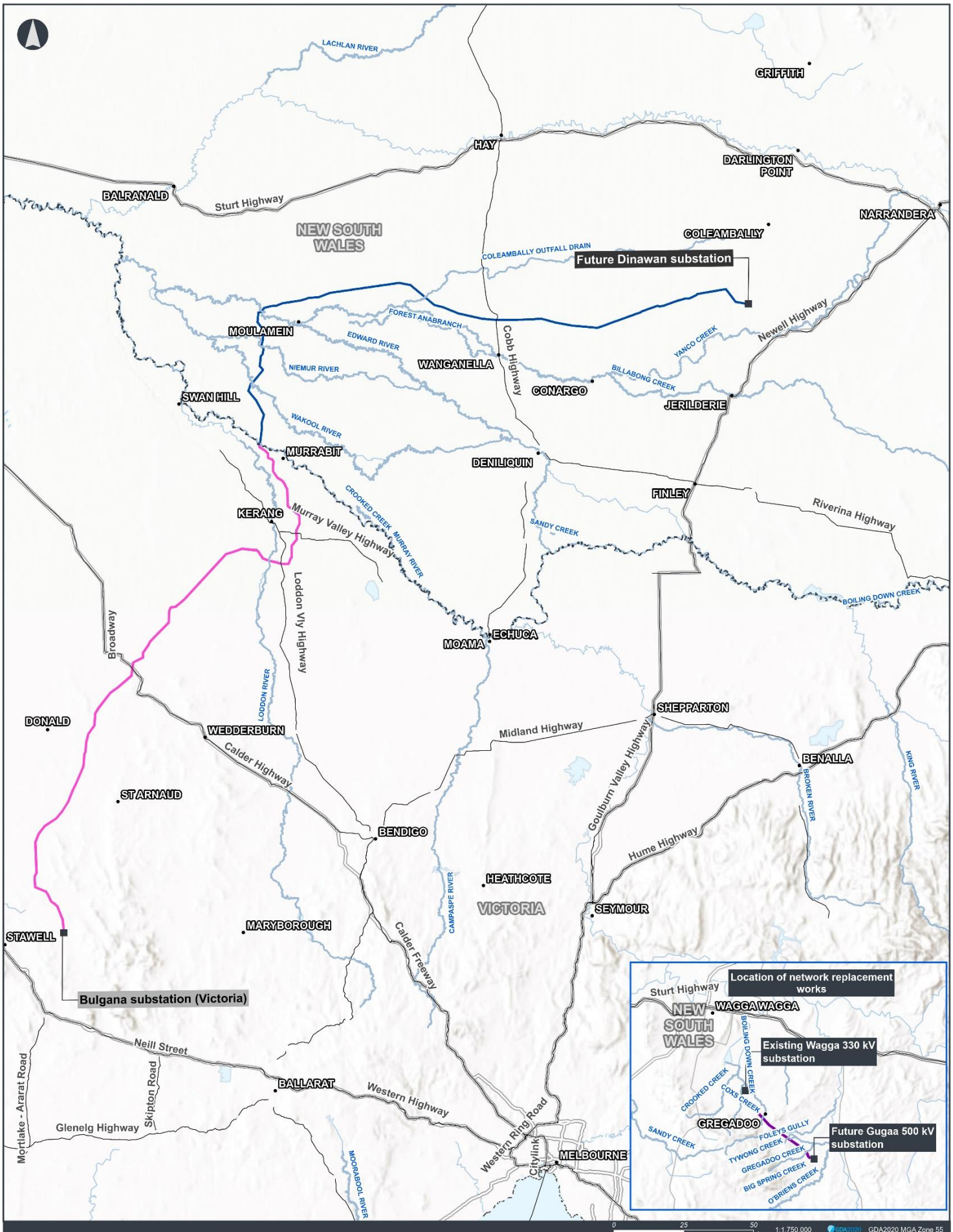
Transgrid (the proponent) is responsible for seeking the required planning approval and delivering the NSW component of VNI West (referred to as 'the project' or 'VNI West (NSW)') in the Riverina Region of NSW and would provide the 500 kV transmission line component of the connection for the VNI West project. The project would be located between the NSW/Victorian border near Murrabit in Victoria and the future Dinawan substation (the 330 kV component of which is currently being constructed under the EnergyConnect (NSW – Eastern section) project approval). The project would also include replacement of around nine kilometres of an existing single circuit 330 kV transmission line (Line 51) with a double circuit 330 kV transmission line generally between Ivydale Road (south of the existing Wagga 330 kV substation) and the future Gugaa 500 kV substation, Livingstone Gully Road (which is subject to separate planning approval as part of the HumeLink project (SSI-36656827)). The project would also include an expansion of the future Dinawan substation and substation connection works at both the existing Wagga 330 kV substation and the future Gugaa 500 kV substation, Livingstone Gully Road.

TCV, in association with the AEMO Victoria, is responsible for seeking the required planning approval and the delivery of the Victorian component of the VNI West project (VNI West (Victoria)), from the crossing point on the NSW/Victorian border to a connection with the Western Renewables Link near Bulgana, via a new proposed substation near Kerang. The Victorian component is subject to a separate planning and environmental approvals under the applicable Victorian State and Commonwealth jurisdictional requirements.

1.1.1 Project objectives

The primary objective of VNI West is to reduce the cost of providing secure electricity transmission between NSW and Victoria in the near term and facilitate the longer-term transition of the energy sector across the National Electricity Market (NEM) to low emission energy generation sources. More specifically, the project aims to:

- provide reliable and affordable electricity to customers
- improve energy security of the south western transmission network, enable greater sharing of energy between NSW and Victoria and help to unlock the potential capacity of proposed REZs in the region
- support the national transition to a lower carbon emission energy system by enabling more renewable energy generation to enter the market, supporting Australia's emissions reduction targets
- support the development of a greater mix of renewable energy in the NEM.



VNI West (NSW)

Figure 1.1
Overview of VNI West

U:\ProjectsAU\PS138xxx\PS138962_VNI_West_EIS_NSW\4_WIP\GIS\00_ArcGIS\Pro\03_EIS\Chapter_01\PS138962_EIS_Ch01_Figures.aprx | Author: MN | QA: SW

Data sources: NSW EPI, DELWP, WSP, EnergyConnect

1.2 The project

Transgrid is seeking approval under Part 5, Division 5.2 of the *Environmental Planning and Assessment Act 1979* (NSW) (the EP&A Act) to construct and operate the project. The project was declared as Critical State Significant Infrastructure (Critical SSI) under Section 5.13 of the EP&A Act on 19 June 2024.

The project was also declared a 'controlled action' on 4 September 2024 (EPBC Act 2024/09871) by the (Commonwealth) Department of Climate Change, Energy, the Environment and Water ((Commonwealth DCCEEW) and as such also requires a separate approval under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act). As a result of the need for Commonwealth approval, the project will be subject to the bilateral assessment process that has been established between the Australian and NSW governments.

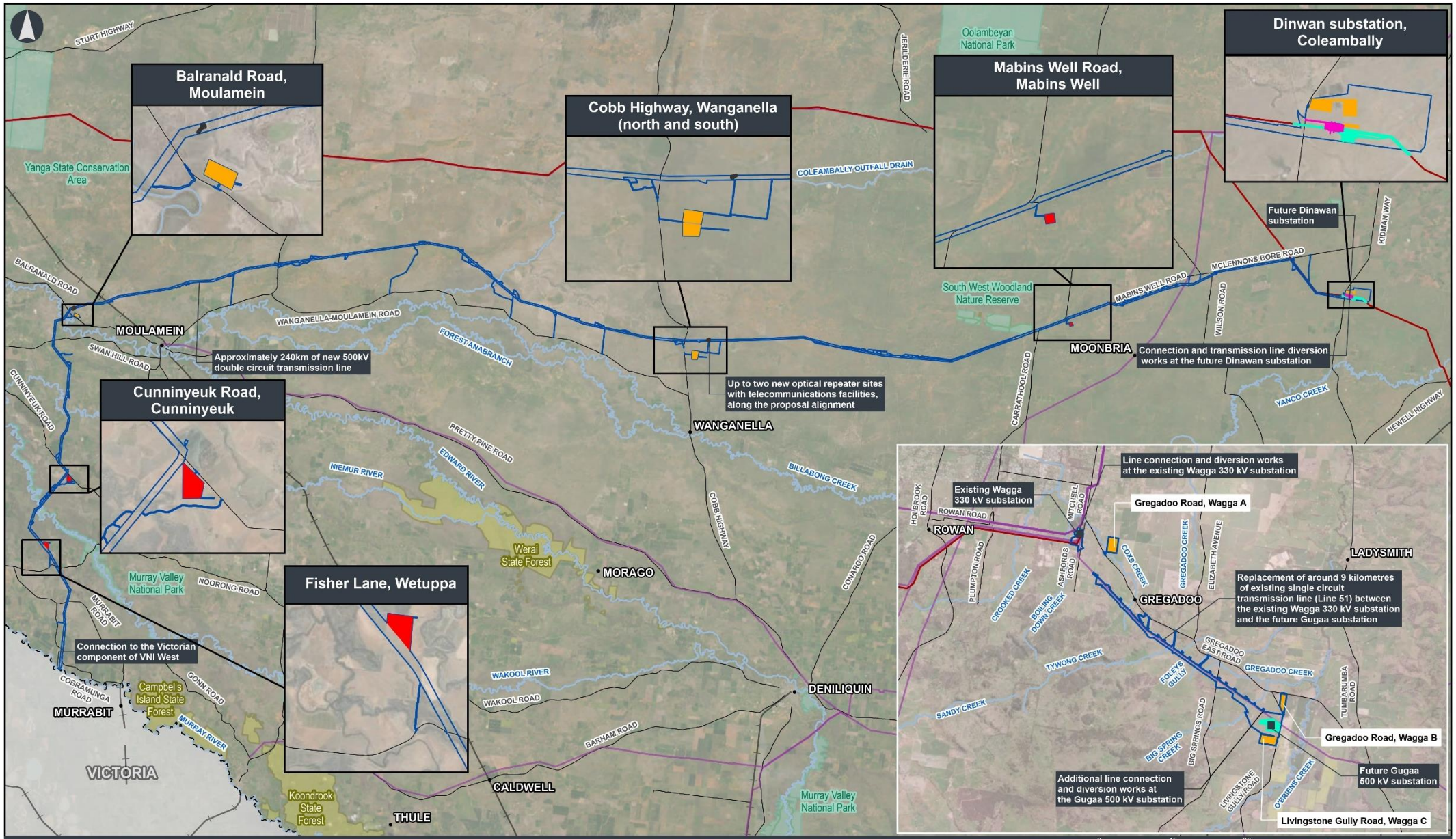
1.2.1 Key features of the project

The key elements of the project would be located within the project footprint and would include infrastructure such as the transmission lines and transmission line structures, the 500 kV expansion component of the future Dinawan substation and some additional ancillary features. The overall scope of the project includes the following key components:

- transmission line works comprising:
  - a new 500 kV double circuit overhead transmission line around 240 kilometres in length between the NSW/Victoria border near Murrabit, and the future Dinawan substation
  - replacement of around nine kilometres of an existing 330 kV single circuit overhead transmission line (Line 51), generally between Ivydale Road (south of the existing Wagga 330 kV substation) and the future Gugaa 500 kV substation, Livingstone Gully Road, with a new 330 kV double circuit overhead transmission line. The new transmission line structures for this section of the project would be up to around 56 metres in height
- substation works comprising:
  - connection and line diversion works at the future Dinawan substation to allow for connection of the proposed 500 kV switchyard
  - expansion of the future Dinawan substation to include a new 500 kV switchyard and two new 330 kV transformer bays
  - connection and line diversion work at the existing Wagga 330 kV substation and at the future Gugaa 500 kV substation, Livingstone Gully Road to allow for connection to the newly replaced Line 51
- ancillary activities comprising:
  - new and upgraded temporary and permanent access tracks
  - construction of utilities infrastructure and power supply
  - installation and operation of two telecommunication facilities (optical repeater sites) along the transmission line between the NSW/Victorian border and future Dinawan substation including connections to the local power supply
  - temporary facilities required for construction of the project including construction compounds, temporary worker accommodation facilities, laydown and staging areas, stockpiling areas, concrete batching plants, brake and winch sites, site offices, parking areas, and utilities supplies.

All components of the project would be located within the project footprint shown in Figure 1.2.

The project footprint is the area that has been assessed in this EIS as being directly affected by the construction, operation and maintenance of the project.



wsp

VNI West (NSW)

Figure 1.2
Overview of the VNI West (NSW) Project

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Data sources: NSW EPI, DELWP, WSP, EnergyConnect

The 500 kV transmission line between the NSW/Victorian border and the future Dinawan substation would be located within an easement approximately 70 metres wide except at two transposition locations (where the conductors of a transmission line swap positions to improve transmission voltage balance) requiring a wider 110 metre easement for around one kilometre in length.

The section of the transmission line to be replaced generally between Ivydale Road (south of the existing Wagga 330 kV substation) and the future Gugaa 500 kV substation, Livingstone Gully Road would be contained within the existing 60 metre easement. These easements would provide a legal right of access to construct, operate and maintain the transmission lines and other operational assets associated with these lines.

A detailed description of the project features and construction methods is further described in Chapter 3 (Project description) of the main EIS document.

1.2.2 Construction

1.2.2.1 Key construction work

Key construction work for the project would typically include (but not be limited to):

- pre-construction minor works which would include:
  - installation of mitigation measures, including but not limited to erosion and sediment controls, temporary exclusion fencing and monitoring equipment
  - property acquisition adjustment work including installation of property fencing, barricades and gates
- site establishment works, which may include (but not be limited to):
  - establishment of combined temporary worker accommodation facilities and construction compounds, including excavations, surface preparation, access roads and utility connections
  - vegetation clearing
  - road and intersection improvement works (where required)
  - establishment of access tracks and watercourse crossings
  - relocating, adjusting or protecting utilities
- construction of the proposed transmission lines, which would include (but not be limited to):
  - earthwork (including establishment of construction pads) and the construction of footings and foundations for each transmission line structure
  - erection of the new transmission line structures using crane(s) and/or helicopter(s), noting, where cranes are proposed, is assumed that the final height of the cranes would extend around 20 metres above the respective transmission line structure heights
  - stringing of the conductors and overhead earth wires and optical ground wire (utilising either ground-based and/or helicopter/drone stringing construction methods)
  - installation of earthing conductors
  - testing and commissioning of the transmission lines

- works to replace around nine kilometres of Line 51 generally between Ivydale Road (south of the existing Wagga 330 kV substation) and the future Gugaa 500 kV substation, Livingstone Gully Road, which would include (but not be limited to):
  - demolition of existing transmission line structures and footings and removal of waste materials
  - erection of the new transmission line structures
  - stringing of the conductors and overhead earth wires and optical ground wire
  - testing and commissioning of the new transmission lines
- expansion of the future Dinawan substation, which would include (but not be limited to):
  - civil construction works including earthworks
  - slab construction for the new 500 kV switchyard and 330 kV transformer bays
  - electrical fit out with new substation equipment
  - testing and commissioning of the new substation equipment
- utility service connections to telecommunication facilities (optical repeater sites) and construction compounds/temporary worker accommodation facilities, and adjustments of existing utilities that intersect the transmission line corridor (as required)
- connection and transmission line diversion works at the existing Wagga 330 kV substation and future Gugaa 500 kV substation, Livingstone Gully Road.

Prior to energisation of the infrastructure, a series of pre-commissioning activities would be conducted. This would include testing the new transmission lines and additional substation infrastructure.

A detailed description of construction work for the project is further outlined in Chapter 3 (Project description) of the main EIS document.

1.2.2.2 Construction program

Subject to NSW and Commonwealth planning approvals and potential construction staging, the project is expected to commence in late 2026 (site establishment works phase). Once construction has commenced, the project is estimated to take around two years to complete. Initial operation is anticipated to commence by early 2029, and at full capacity by late 2029. Site decommissioning and remediation would extend up to around six months beyond the initial commissioning (operational) phase, with estimated completion by the end of 2029.

The final construction program would be confirmed as part of the finalisation of the project development following approval of the project.

1.2.2.3 Indicative duration of transmission line construction activities

Construction at each transmission line structure would be intermittent and construction activities would not occur for the full duration at any one location. Figure 1.3 presents an indicative duration of construction activities associated with the transmission line structures. These durations could vary and breaks between activities may be shorter, which may lead to longer inactive periods in subsequent stages of construction at an individual transmission line structure. Duration of any particular construction activity, and respite periods, may vary for a number of reasons including (but not limited to), multiple work fronts, resource and engineering constraints, works sequencing, and location.

These activities would also have multiple work fronts, therefore (for example) foundation works or structure erection would be occurring in several locations, along the transmission line easement, at the same time.

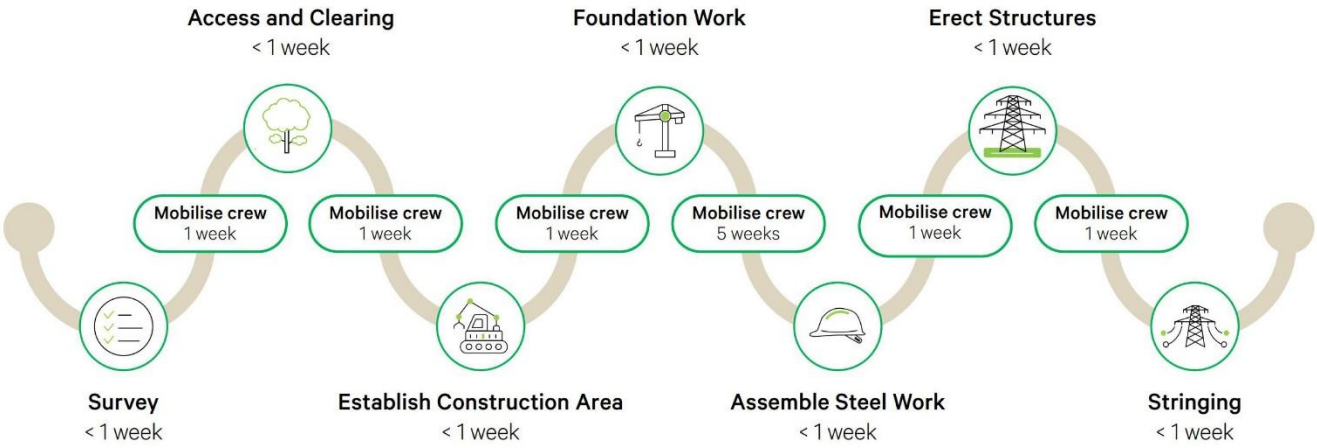


Figure 1.3 Indicative duration and sequence of construction activities for transmission line structures

1.2.3 Operation

Once operational, the new infrastructure would be inspected by field staff and contractors on a regular basis, with other operational activities occurring in the event of an emergency (as required). Key maintenance activities would include:

- regular inspection (ground and aerial) and maintenance of transmission lines and structures, including annual fly overs and routine ground inspections on an approximate six-yearly cycle
- vegetation clearing/trimming within the transmission line easement, and access along road/tracks, asset protection zones and defendable space
- inspection and maintenance of the future Dinawan substation including:
  - routine substation infrastructure inspection (such as transformers, electrical plant and equipment and fire detection systems) throughout the year
  - routine/planned substation maintenance of equipment, property and switchyard areas on a scheduled basis
  - ad hoc fault and emergency works for repair of any damaged infrastructure (for example through a weather event or other failure of infrastructure)
  - maintenance of asset protection zones and defendable space consisting of areas maintained to be cleared of all trees and vegetation which may affect the substation and telecommunication facilities during a bushfire in accordance with Transgrid's design and safety standards
- inspection and maintenance of other ancillary infrastructure including the telecommunication facilities and associated asset protection zones
- stormwater drainage maintenance.

It is expected that these activities would only require light vehicles and/or small to medium plant (depending on the work required).

1.2.4 Indicative disturbance area

The indicative disturbance area includes areas where vegetation would be impacted during the construction of the project. The indicative disturbance areas for the two locations include NSW/Victorian border to future Dinawan substation component and existing Wagga 330 kV substation to future Gugaa 500 kV substation component (network augmentation works). The indicative disturbance area is based on project components from the design as described in the EIS. Disturbance areas would be confirmed during finalisation of design and construction methodology and would be developed as part of the consideration of avoidance and impact minimisation.

The indicative disturbance area has the same meaning as 'development site' as defined in the BAM.

The indicative disturbance areas include the following categories:

- **Disturbance area A** – vegetation clearance is assumed for all areas where complete removal of vegetation is proposed, and the approach is outlined further below.
- **Disturbance area B (B4 and B10)** – assumed to have minimal ground disturbance. The partial vegetation clearing is restricted to clearance of vegetation with growth height potential of four metres or above for Disturbance area B4 and a growth height potential of 10 metres or above for Disturbance area B10. For the purposes of this assessment, areas of impact to vegetation with a growth height potential of 10 metres or above have been amalgamated into the B4 clearing zone, while vegetation with a growth height potential of ten metres or less have been identified as B10 and are represented as a vegetation retention zone.
- **Disturbance area HZ** – a hazard tree zone where there would be impacts to selected trees that are within the risk category height range 20 to 30 metre and have poor structural stability posing a risk of falling.

As part of the indicative disturbance model development process, spatial data has been reviewed to reduce clearing overlaps, gaps or zones that are too small and impractical for large plant equipment to access areas. These areas have been included as part of the impacted areas and included in the BAM-C. The vegetation clearance calculations entered into the BAM-C are considered a conservative approach and these indicative disturbance areas would be refined through detailed design and construction methodologies, and it is highly likely the impacts would be reduced further.

The indicative disturbance area for each component reflects the easement width as described in section 1.2.1.

Figure 1.4 show the disturbance areas for the project during construction and to Figure 1.5 to Figure 1.8 shows the vegetation management approach during operation.

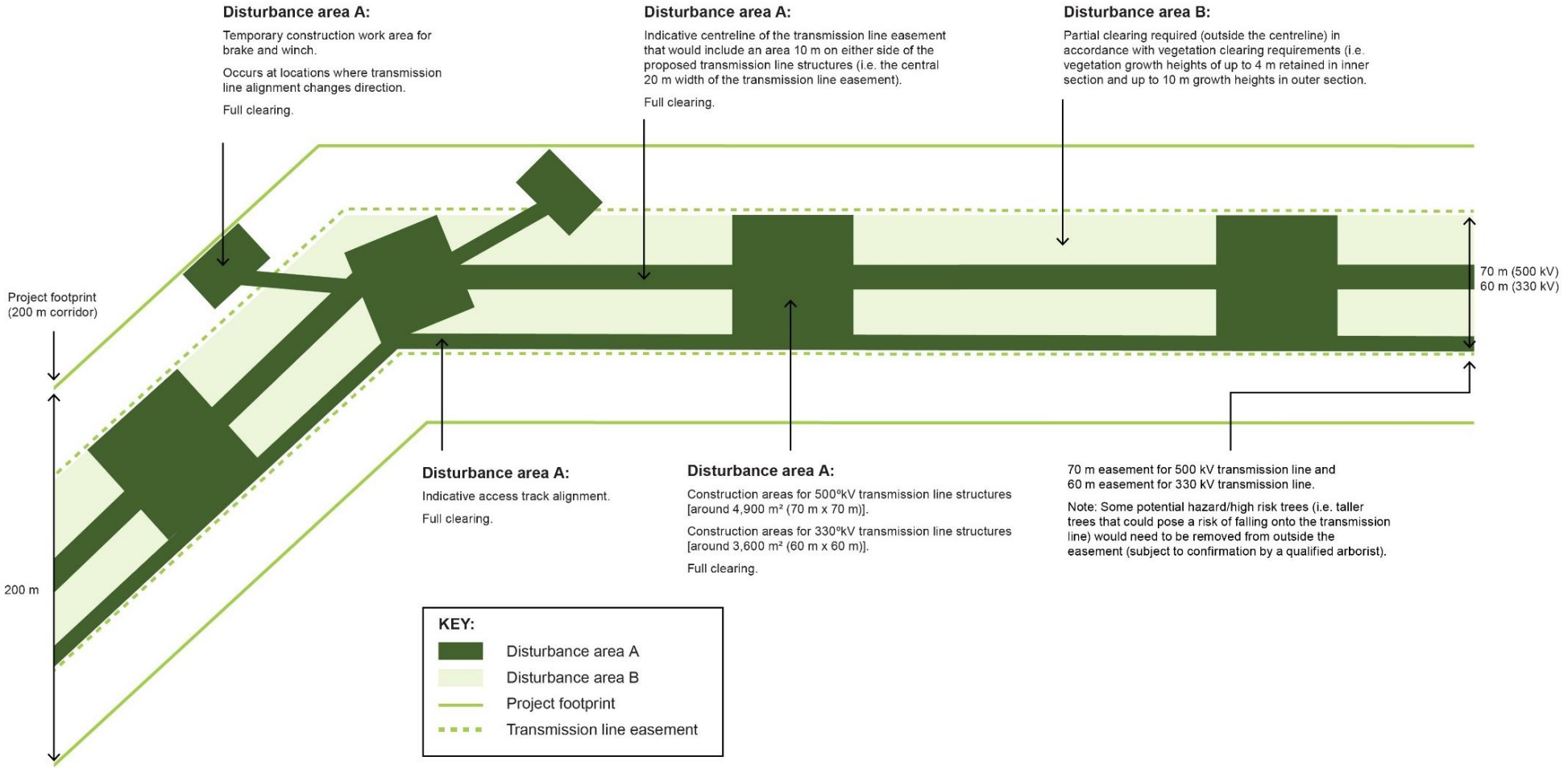


Figure 1.4 Indicative disturbance areas for the 330 kV and 500 kV line during construction

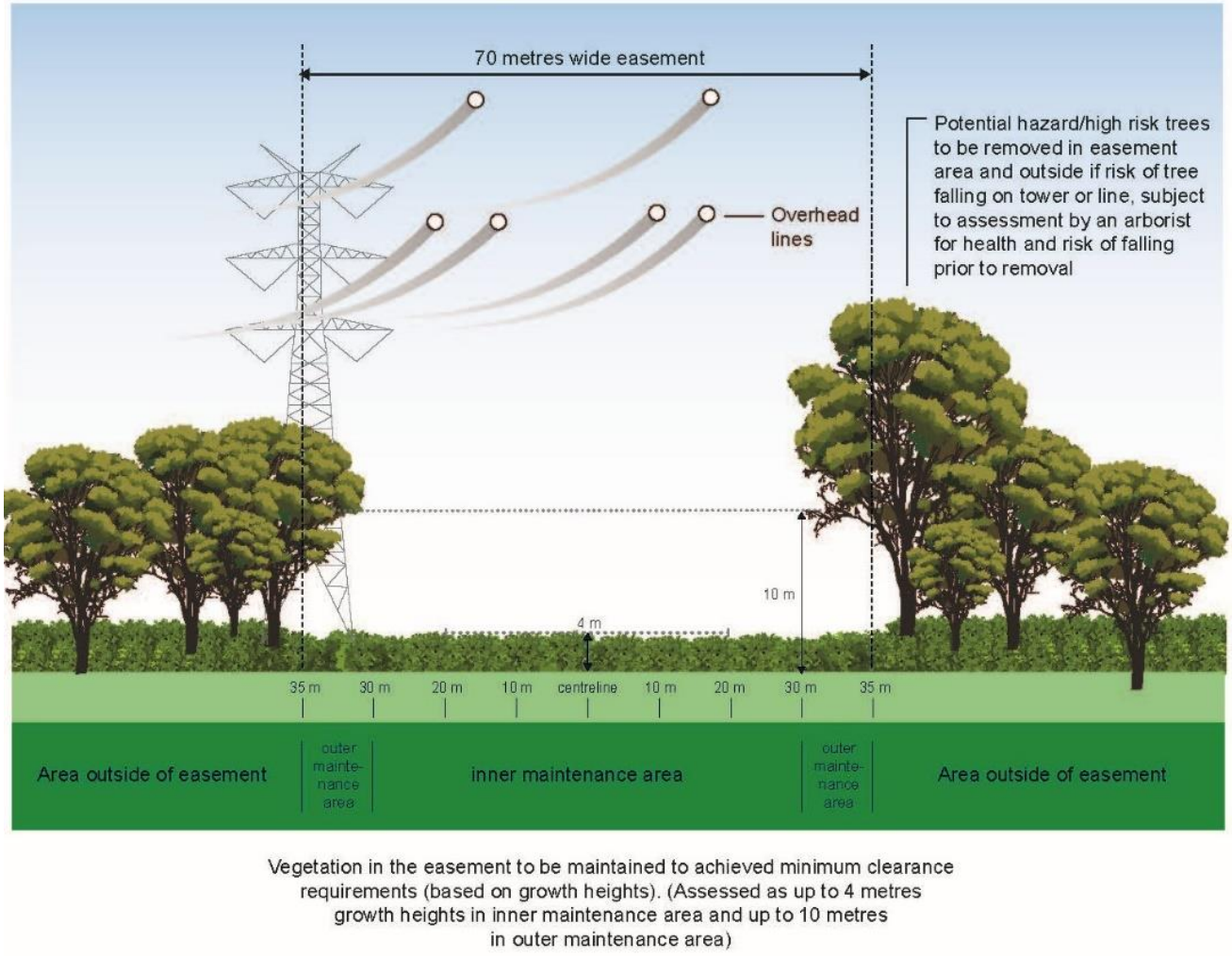


Figure 1.5 Illustration of the proposed clearing at mid-span for the 500 kV (NSW/Victoria to future Dinawan substation) line during operation

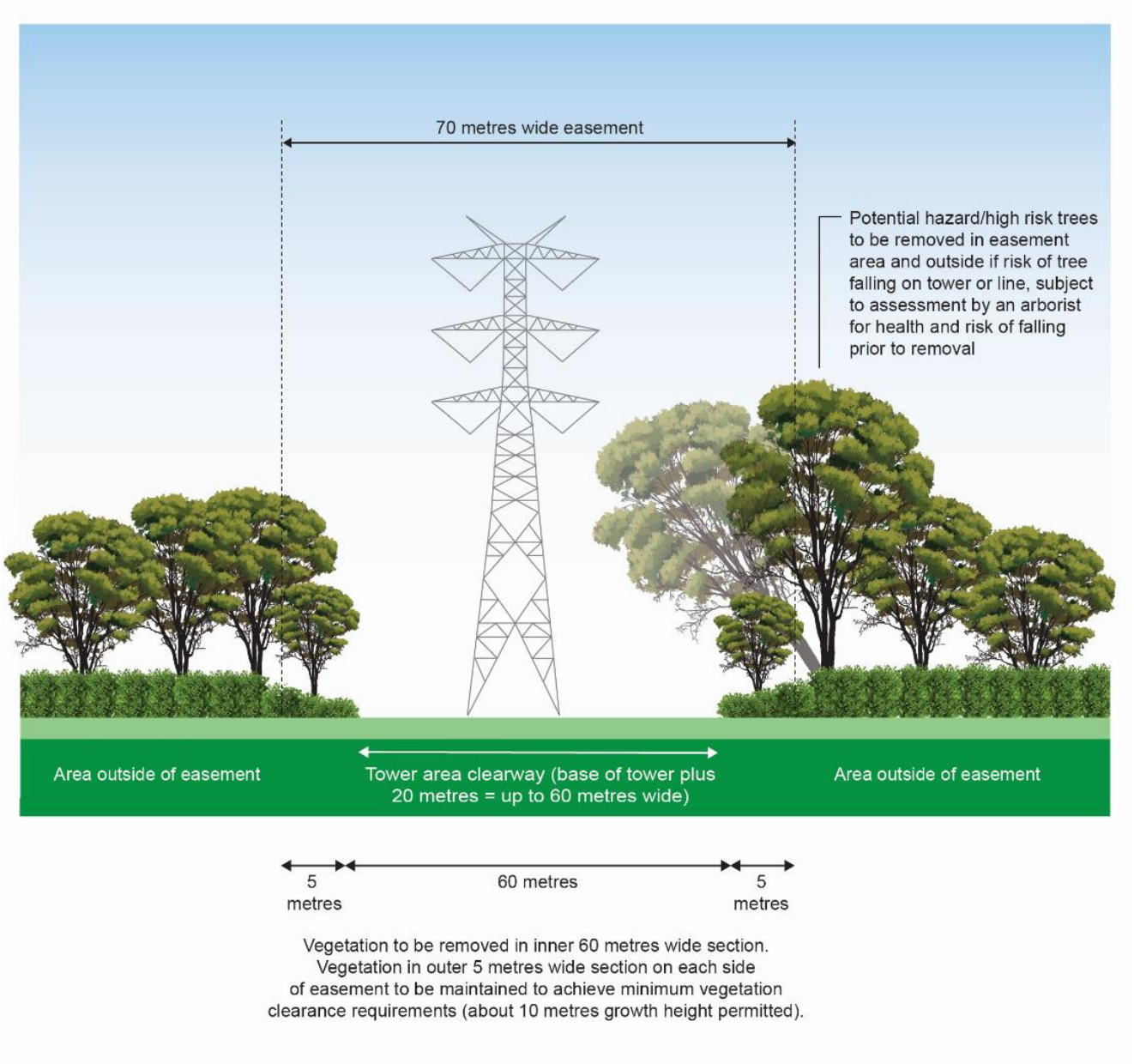


Figure 1.6 Illustration of the proposed clearing at a tower location for the 500 kV (NSW/Victoria to future Dinawan substation) line during operation

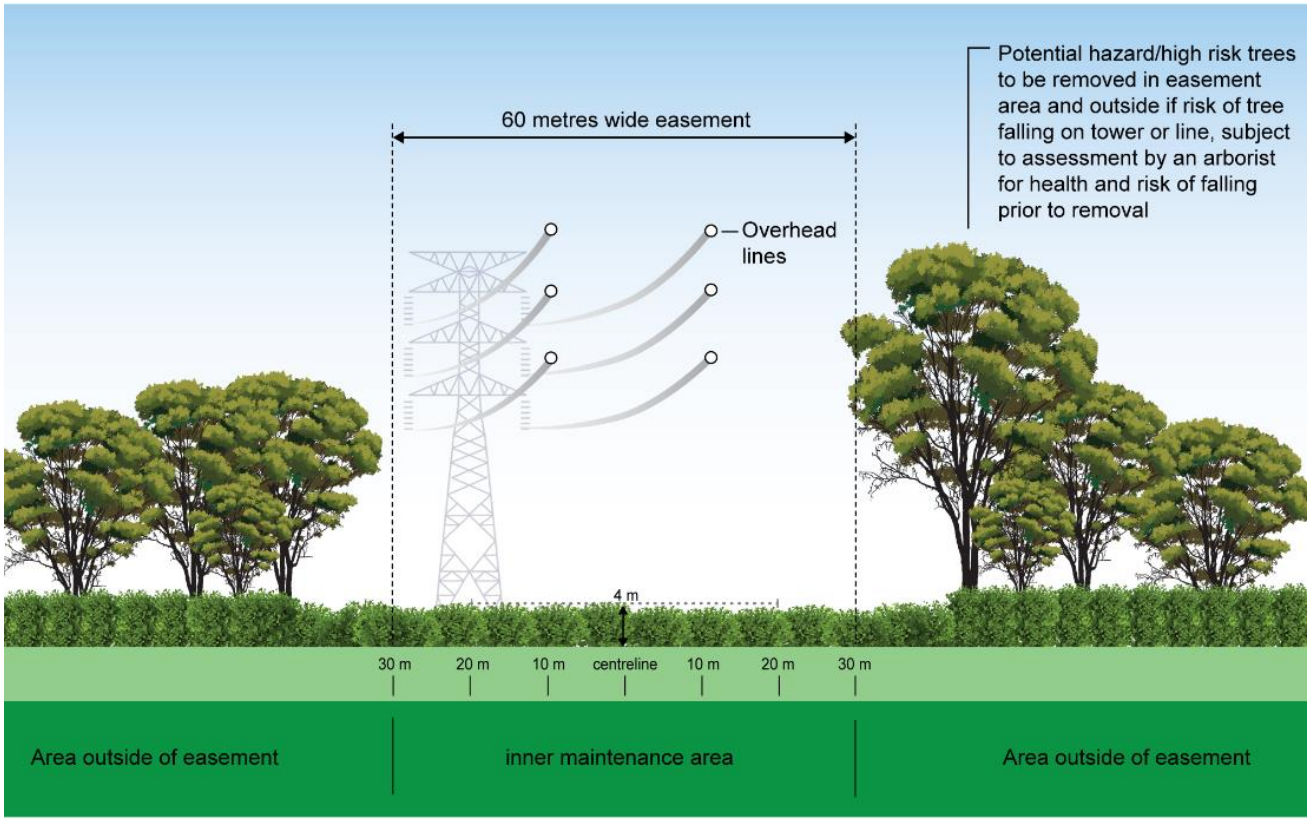


Figure 1.7 Illustration of the proposed clearing at mid-span for the network augmentation works (330 kV line) during operation

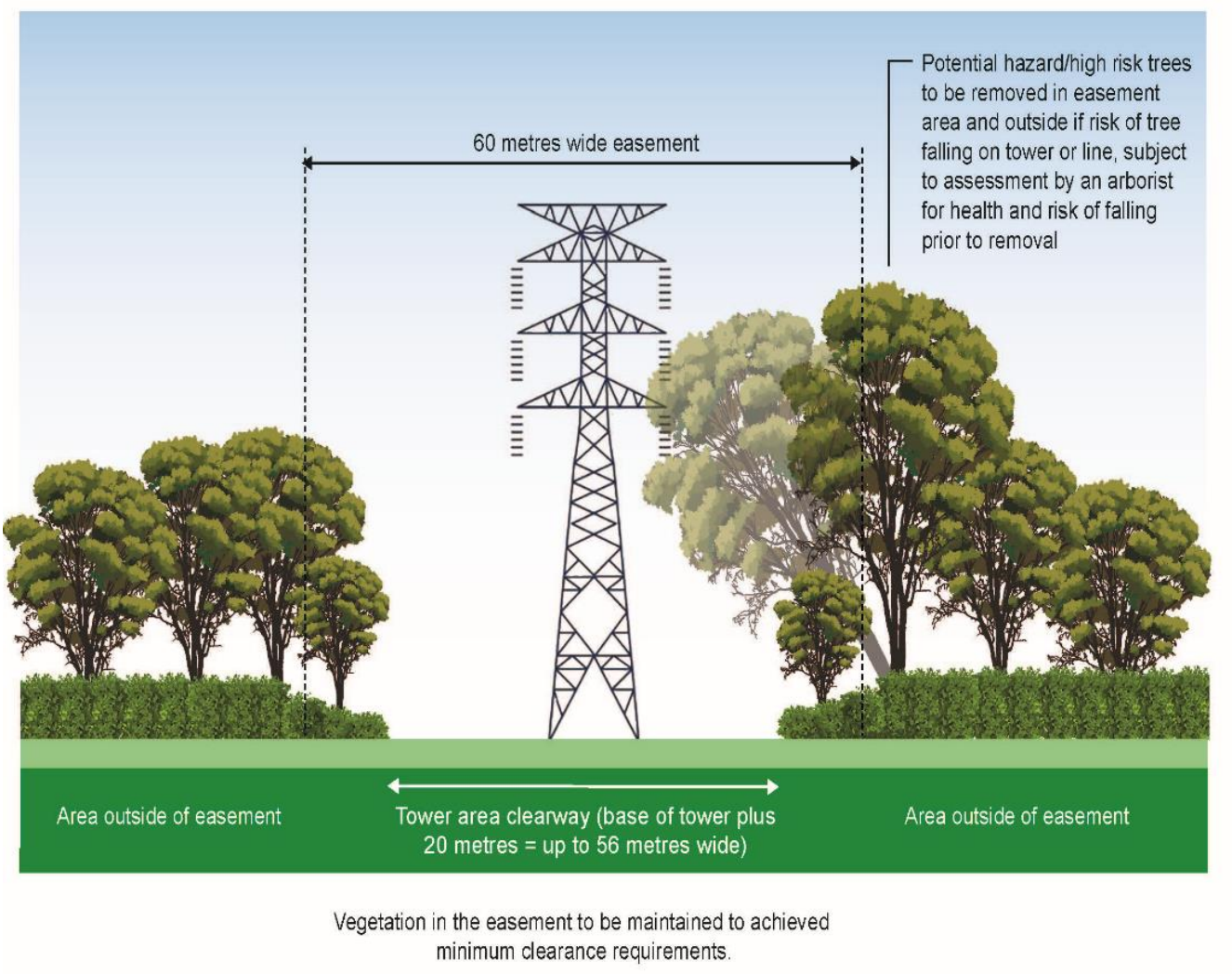


Figure 1.8 Illustration of the proposed clearing at a tower location for the network augmentation works (330 kV line) during operation

1.2.4.1 Disturbance Area A

Disturbance area A refers to the transmission line centreline (TLCL) and the area around transmission structures, brake and winch sites and new/upgraded access tracks.

Disturbance area A (TLCL) includes an area 10 metres on either side of the transmission centreline for the 500 kV line and an area 10 metres on either side of the transmission centreline for the 330 kV line between the proposed transmission line structures in which all vegetation (including trees) has been assumed to be removed during construction to ground level. Tree root balls would be removed in Disturbance Area A. This area would also be subject to ongoing maintenance during operation (i.e. removal to maintain vegetation clearance requirements) for operational and safety requirements (including bushfire).

Disturbance area A including the areas at and around the transmission line structures (including associated construction work areas), areas for brake and winch sites and new/upgraded access tracks in which vegetation would be removed during construction. The area also includes:

- the proposed Dinawan substation expansion
- two telecommunication facilities and power connections
- temporary worker accommodation facilities and construction compounds
- low voltage transmission line diversions.

Disturbance area A would include vegetation (including tree) removal and sub-surface impacts through construction activities such as grading, excavation, and full tree removal (i.e. root ball removal). The vegetation removal includes:

- construction benches for transmission line structures consisting of around 70 metres by 70 metres at each transmission line structure site for the NSW/Victorian border to Dinawan section and around 60 metres by 60 metres at each transmission line structure site for the network augmentation works section
- brake and winch sites consisting of around 100 metres by 70 metres where required
- work areas for the telecommunication facilities, proposed Dinawan 500 kV switchyard, and works within the vicinity of the network augmentation works
- access tracks for transmission line structure construction and access roads, which are currently 10 metres in width and likely to exceed project construction requirements.

Except in areas where only temporary disturbance is required (i.e. temporary access tracks and brake and winch sites), this area would also be subject to ongoing maintenance during operation (i.e. removal to ground level) for operational and safety requirements (including bushfire).

1.2.4.2 Disturbance Area B4

Disturbance area B4 refers to an area between transmission line structures where it is assumed vegetation removal would only be required to meet the vegetation clearance heights. Typically, during construction, this area occurs between 10 metres and 30 metres from the centreline between the proposed transmission line structures.

Where trees within this area would or have the potential to exceed vegetation clearance heights with growth heights greater than four metres, these trees would be removed and may result in temporary ground disturbance. There is potential for temporary minor changes to understorey composition in these areas due to the temporary ground disturbance activities. Retention of root bases or tree stumps of trees identified for removal would occur where practicable.

Additionally, where trees have the potential to exceed vegetation clearance heights with growth heights of greater than ten metres, between 30 metres and 35 metres from the centreline between the proposed transmission line structures have been amalgamated into the disturbance area B4. This only applies to the NSW/Victorian border to Dinawan substation component (for the 500 kV transmission line).

Transgrid sets vegetation clearance heights for operational and safety requirements, including bushfire risk management.

1.2.4.3 Disturbance area B10

Disturbance area B10 refers to an area between transmission line structures in which there is no assumed vegetation removal required to meet the vegetation clearance heights. Typically, this area occurs between 30 metres and 35 metres from the centreline between the proposed transmission line structures. This only applies to the NSW/Victorian border to Dinawan substation component (for the 500 kV transmission line).

Vegetation types where the maximum growth height does not exceed ten metres would not be impacted in this disturbance zone and calculations are representative of retained vegetation. As such, calculations for Disturbance area B10 where there is no predicted clearing have been excluded from impact totals throughout.

Transgrid sets vegetation clearance heights for operational and safety requirements, including bushfire risk management.

1.2.4.4 Disturbance area Hazard Tree Zone (HZ)

Disturbance area HZ is adjacent to disturbance area B4 or B10 (for the 500 kV transmission line) and disturbance area B4 (where there is no identified disturbance area B10 including for the 330 kV transmission line) and is known as a hazard tree zone. This area is outside the easement and may contain trees of a sufficient height which, if they were to fall, would strike the overhead conductors or the transmission line structures or come close enough to cause electrical flashover and infringe on the vegetation clearance requirement at maximum conductor sag.

These hazard trees pose a potential bushfire risk and also a risk to the asset. They require management/removal as part of the initial construction of the transmission line and during ongoing operation.

The impact would include partial vegetation clearing, restricted to the operational phase. Vegetation to be removed would have root balls retained, and where practicable, impacts would be restricted to pruning. Vegetation clearing has been identified as being limited to the maintenance of hazard/high-risk trees outside of the disturbance area B10 or B4 and within the adjacent 10 metres area where trees within vegetated areas exceed the defined height threshold of 20 metres.

1.2.5 Subject land

As outlined in the BAM, the subject land is the land subject to a development, activity, clearing, biodiversity certification or a biodiversity stewardship proposal. It excludes the assessment area which surrounds the subject land (i.e. the area of land in a buffer zone around the subject land).

The location of the subject land is shown in Figure 15.1 to Figure 15.3. The subject land contains all areas potentially impacted by construction and operation of the project. Specifically, the subject land incorporates Disturbance areas A, B and HZ (Figure 15.5).

The subject land occurs as two disjointed proposed transmission easements largely within the Riverina region of NSW with minor network augmentation works to occur in the NSW South western slopes to the south of Wagga Wagga. Three IBRA subregions, being the Murray Fans, Murrumbidgee and Inland Slopes IBRA subregions, have been identified to occur within the subject land. Vegetation associated with the subject land comprises a number of vegetation communities but is dominated by Black Box and River Red Gum woodlands in the west, chenopod and acacia shrublands in central and eastern portion, and by Box Gum Woodland in the minor network augmentation works near Wagga Wagga.

1.3 Purpose of this technical report

This Biodiversity Development Assessment Report (BDAR) accompanies the EIS and uses the NSW Biodiversity Assessment Method (BAM) (DPIE 2020) to assess the projects impacts on biodiversity. It addresses the project's Secretary's Environmental Assessment Requirements (SEARs) (refer to Section 1.3.1) and has been prepared in accordance with the *NSW Biodiversity Conservation Act 2016* (BC Act). The BDAR outlines the projects approach to avoiding and minimizing impacts on biodiversity and where unavoidable residual impacts remain the projects offset requirements in accordance with the BAM and NSW BOS.

1.3.1 Secretary's Environmental Assessment Requirements

The NSW Department of Planning, Housing and Infrastructure (DPHI) has provided the SEARs for the EIS. The requirements specific to this assessment and where these aspects are addressed in this technical report are outlined in Table 1.1 with the full SEARs provided in Appendix L.

Table 1.1 Secretary's Environmental Assessment Requirements – Biodiversity

Ref.	Secretary's environmental assessment requirements	Where addressed in the technical paper
Key issues – Biodiversity	An assessment of the biodiversity impacts of the project, in accordance with the *Biodiversity Conservation Act 2016 (NSW),* the Biodiversity Assessment Method (BAM) and documented in a Biodiversity Development Assessment Report (BDAR). The BDAR must:	Appendix A
	Be prepared using the approved BDAR template	This technical paper has followed the approved BDAR template published on 07 April 2022.

Ref.	Secretary's environmental assessment requirements	Where addressed in the technical paper
	Document the application of the avoid, minimise and offset framework including assessing all direct, indirect and prescribed impacts in accordance with the BAM	Refer to Chapters 7 to 13 of this BDAR.
	Assess any impacts to nearby conservation areas, including Murray Valley National Park (including the Wetuppa Forest within the Noorong-Wetuppa area) and South West Woodlands Nature Reserve	Nearby conservation areas, national parks and nature reserves are described in section 3.2.7.1. Indirect impacts are considered in section 9.3.7.
	Assess the impacts associated with all ancillary infrastructure, including the transport route road upgrades	The indicative disturbance area as assessed in this BDAR is described in section 1.2.4. Access track connections to the public road network and works associated with the construction of these new or upgraded access points have been included in the indicative disturbance area as assessed in this technical paper. In addition to these road works, a preliminary schedule of potential road and intersection improvements works beyond the project footprint have been identified in *Technical paper 8 – Traffic and transport impact assessment*. The finalisation of this schedule is subject to consultation with the relevant roads authority. Once confirmed, the final scope of road improvement and/or intersection works would be subject to the process outlined in Chapter 25 (Environmental management) of the EIS, including the need for additional environmental assessment.
	include an assessment for SAII in accordance with Section 9.1 of the BAM,	Chapter 10
	be finalised by an accredited assessor as BAM-compliant within 14 days of submission.	Refer to the certification page at the front of this BDAR.
	include an assessment for SAII in accordance with Section 9.1 of the BAM	Chapter 10
	An assessment of the likely direct and indirect impacts of the project on listed aquatic threatened species, populations or ecological communities, scheduled under the *Fisheries Management Act 1994*, and a description of the measures to minimise and rehabilitate impacts.	Appendix M Section 5.6
	A cumulative impact assessment of biodiversity values in the region from nearby developments.	Appendix O

Ref.	Secretary's environmental assessment requirements	Where addressed in the technical paper
	If an offset is required, details of the measures proposed to address the offset obligations.	Section 11.3
	Address the matters outlined in Attachment A of the SEARs	Appendix C

1.3.2 *Matters of National Environmental Significance*

As identified in section 1.2, the project is a controlled action and requires an additional approval under the EPBC Act. The project is a controlled action due to impacts on listed threatened species and ecological communities (EPBC section 18 and 18A) and would be assessed under the NSW Assessment Bilateral Agreement.

The NSW Assessment Bilateral Agreement supports certain actions that are considered SSI to be assessed and public exhibited by the NSW Government on behalf of the Commonwealth DCCEEW. As a requirement of the NSW Assessment Bilateral Agreement, the SEARs issued for the project set out the relevant Commonwealth requirements. As such, this BDAR also addresses these requirements, specifically:

- Section 5.6 summarises the assessment of EPBC listed threatened species and communities that may be impacted by the project
- Appendix C provides the detailed assessment against the EPBC assessment requirements appended to the SEARs and any additional EPBC considerations. A checklist against the EPBC requirements is provided in Appendix C.

1.4 Biodiversity Offsets Scheme trigger

Entry to the BOS is triggered by developments, projects and activities that meet certain thresholds for significant impacts on biodiversity, or on an opt-in basis.

For state significant development and state significant infrastructure projects, the BOS applies unless the Secretary of the Department of Planning, Housing and Infrastructure and the environment agency head determine that the project is not likely to have a significant impact.

In this case, the BOS applies to the project.

1.5 Excluded impacts

The excluded impacts (Section 6.8(3) of the BC Act) include areas identified as non-native vegetation where there is no native vegetation, and the areas can be assessed as Category 1 – exempt land (as defined in defined in Part 5A of the Local Land Services Act). If these areas provide habitat for threatened species, the impacts are considered under prescribed impacts, and this land may be assessed (as defined in section 6.1 of the Biodiversity Conservation Regulation 2017 (BC Regulation)). Prescribed impacts must therefore be assessed for Category 1 – exempt land.

The areas identified as non-native vegetation are found scattered across all three IRBA subregions including land historically cleared for cropping and grazing north of the Murray River, areas near the Edward River and Moulamein, Carrathool Road and areas impacted by the network augmentation works. Areas mapped as non-native vegetation or areas excluded in the development of this BDAR include:

- waterbodies including irrigation canals, farm dams, rivers, creeks and streams with no native vegetation and assessed under prescribed impacts
- roads – bitumen, gravel, dirt tracks, access tracks and driveways
- infrastructure – dwellings, outbuildings, any type of agricultural shed or stock yard areas
- cropped and improved pasture land considered Category 1 – exempt land and assessed under Prescribed Impacts.

The Native Vegetation Regulatory Map (NVR) determines areas of Category 1 – exempt land and Category 2 lands are assessed under these excluded impacts. Any areas identified as Category 1 – exempt land were mapped and field verified. If a grassland area is identified during the PCT identification surveys throughout 2024, the area was assessed using the '*Interim Grasslands and other Groundcover Assessment Method*' (OEH 2017). The survey method can be found in section 2.2.4. Areas determined to be Category 1 – exempt land were mapped and recorded and the field method can be found in section 4.1.2.1 with further discussion provided in Appendix B.

1.6 Information sources

The following information sources were used in the preparation of this BDAR:

- aerial photographic imagery (ESRI 2024)
- Areas of Outstanding Biodiversity Value Register (NSW Department of Climate Change, Energy, the Environment and Water 2024)
- Atlas of Groundwater Dependent Ecosystems (GDE) (Bureau of Meteorology 2024)
- Atlas of Living Australia – interactive map search (Atlas of Living Australia 2024)
- Biodiversity Assessment Method (BAM) Calculator (Credit Calculator). BAM-C Version 80 (Office of Environment and Heritage 2023)
- BioNet Atlas of NSW Wildlife (Department of Climate Change, Energy, the Environment and Water 2024)
- BioNet (NSW) Mitchell Landscapes – Version 3.1 (Department of Climate Change, Energy, the Environment and Water 2024)
- BioNet Vegetation Classification (Department of Climate Change, Energy, the Environment and Water 2024)
- Directory of Important Wetlands of Australia (Department of Climate Change, Energy, the Environment and Water 2024)
- EPBC Protected Matters Search Tool (Department of Climate Change, Energy, the Environment and Water 2024)
- NSW Department of Primary Industries (Fishing and Aquaculture) Threatened Aquatic Fauna Database (Department of Primary Industries and Regional Development 2024)
- NSW Interim Biogeographic Regionalisation of Australia (IBRA region and subregion) – Version 7.0) (Department of Climate Change, Energy, the Environment and Water 2024c)
- PlantNet Database (Royal Botanic Gardens and Domain Trust n.d.)
- Species Profiles and Threats Database (Department of Climate Change, Energy, the Environment and Water 2024f)
- Threatened Biodiversity Profile Search (Office of Environment and Heritage 2024)
- BAM Important Area Maps for threatened species (Department of Planning Industry and Environment, 2021)
- BAM and NSW survey guidelines, including:
  - NSW Survey Guidelines for threatened frogs (Department of Planning, Industry and Environment 2020b)
  - NSW Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (Working Draft) (Department of Environment and Conservation 2004)
  - 'Species credit' threatened bats and their habitats (State of NSW and Office of Environment and Heritage 2018)
  - Survey Guidelines for Australia's Threatened Birds (Department of the Environment, Water, Heritage and the Arts 2010b)

- Survey guidelines for Australia's Threatened Frogs (Department of the Environment, Water, Heritage and the Arts 2010c)
- Survey guidelines for Australia's Threatened Reptiles (Department of the Environment, Water, Heritage and the Arts 2011)
- Surveying threatened plants and their habitats; NSW guide for the Biodiversity Assessment Method (Department for Planning, Industry and Environment 2020c)
- Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (Working Draft) (Department of Environment and Conservation, 2004).
- Threatened Species Survey and Assessment Guidelines: field survey and methods for fauna. Amphibians (Department of Environment and Climate Change 2009).

The following vegetation mapping datasets were reviewed:

- NSW State Vegetation Type Map (SVTM) (Current Release C1.1.M1.1 (December 2022) (Department of Planning and Environment 2022a)
- NSW State Vegetation Type Map (Pre-Clearing) (Current Release C1.1.M1.1 (December 2022)) (Department of Planning and Environment 2022b)
- Vegetation Formations and Classes of NSW (version 3.03 – 200 m Raster) (NSWmap_v3_03_E_3848) (Keith and Simpson, 2010)
- State Forests NSW Forest Types – VIS_ID 4026 (ForestTypesFNSW_E_4026) (Forestry Commission of NSW, 1989)
- Western Regional Assessment API Vegetation Data VIS ID 1028 (WRA_API_VIS_1028) (Beckers and Binns, 2000).

The following geology and soil mapping datasets were reviewed:

- Soil and Land Resources of Central and Eastern NSW (Office of Environment and Heritage, 2018)
- Soil Landscapes of Central and Eastern NSW (Department of Planning, Industry and Environment, 2020c)
- Hydrogeological Landscapes of New South Wales and the Australian Capital Territory (Department of Planning and Environment 2023c)
- Australian Soil Classification (ASC) soil type map of NSW (Department of Planning, Industry and Environment, 2021a)
- Great Soil Group (GSG) Soil Type map of NSW (Department of Planning, Industry and Environment, 2021b)
- Land and Soil Capability Mapping for NSW (Department of Planning, Industry and Environment, 2021c)
- NSW Landuse 2007 (Department of Planning and Environment 2010).

2 Methods

2.1 Site context methods

This section describes the approach to identifying and assessing the landscape context in accordance with Section 3 of the BAM, and the requirements set out in Part 1 of the *BAM Operational Manual – Stage 1* (Department of Planning, Industry and Environment, 2020a). It provides information on a range of landscape features that occur on the subject land and in surrounding areas. The landscape features are used to inform the habitat suitability for threatened species and the potential movement of species across the landscape. This information is used in the landscape context component when entering data into the BAM-C. The BAM-C would be used to calculate the number and class of biodiversity credits required to offset the impacts from this project.

Section 3 of the BAM outlines the following methodology for creating the assessment area:

- a 500 metre buffer is to be applied along each side of the centre line of a linear-shaped proposal, and
- a 1500 metre buffer is to be applied elsewhere.

A hybrid method was adopted for the project where a 500 metre buffer was applied to the disturbance footprint for linear features, such as transmission easements and tracks, and a 1,500 metre buffer was applied to outer edge of the disturbance footprint for non-linear features, such as accommodation camps and substations.

2.1.1 Landscape features

Section 3 of the BAM sets out the requirement to assess landscape features and to establish the site context of the subject land in the surrounding landscape. The landscape features include:

- IBRA bioregions and IBRA subregions
- rivers, streams, estuaries and wetlands
- habitat connectivity
- karst, caves, crevices, cliffs, rocks and other geological features of significance
- areas of Outstanding Biodiversity Value
- NSW (Mitchell) landscape
- additional features that are required to be assessed according to any applicable SEARs
- soil hazard features.

Landscape features within the subject land were identified using regional vegetation mapping resources, aerial photographic interpretation and field survey. Details on the assessment of landscape features are provided in section 3.2.

2.1.2 Native vegetation cover

Determination of native vegetation cover within the assessment area was undertaken using regional vegetation mapping resources, aerial photograph interpretation, existing reports, knowledge of the subject land and field survey. Details of methods used to determine native vegetation cover are provided in section 4.1.

2.2 Native vegetation assessment methodology

2.2.1 Review of existing information

Mapping of native vegetation extent within the subject land is required under section 4.1 of the BAM with detailed requirements outlined in section 3.2 of the BAM Operational Manual.

In determining native vegetation extent within the subject land, the following method was employed:

- preliminary mapping of vegetation community boundaries was undertaken through analysis of existing vegetation mapping and aerial photograph interpretation
- vegetation mapping of the subject land started in the initial site surveys in 2023 and 2024 providing field validated assessment
- NSW SVTM (NSW DCCEEW 2022) provides spatial data on Plant Community Types which assists in desktop preparation prior to field verification. SVTM was spatially integrated where there was limited or no property access
- data on geology, dominant canopy species, native species richness, vegetation structure and condition were collected from areas accessed during field surveys to validate and refine this existing vegetation mapping to determine their associated PCT in accordance with the BioNet Vegetation Classification System (NSW DCCEEW 2024b)
- review and adoption of approved project vegetation mapping from EnergyConnect (NSW – Eastern Section) project (WSP, 2022). This data included previously mapped PCTs and relevant Vegetation Integrity (VI) plot data around the future Dinawan and the existing Wagga substations
- review of the vegetation mapping and VI Plots recorded in the HumeLink Project BDAR (Niche Environment and Heritage Pty Ltd, 2024) for the network augmentation works component of the project.

2.2.2 Mapping native vegetation extent

Mapping of native vegetation extent within the subject land was undertaken using regional vegetation mapping resources, aerial photograph interpretation, existing reports, knowledge of the subject land and field survey.

Preliminary mapping of vegetation community boundaries was undertaken through analysis of existing vegetation mapping and aerial photograph interpretation. Native vegetation extent within the subject land was determined through digitisation of areas of vegetation using the aerial photos provided on the ArcGIS online World Imagery map server and a review of the draft Native Vegetation Regulatory map for this region.

Vegetation within the subject land and locality has been mapped at the regional scale in the NSW SVTM release C1.1.M1. This mapping data provides a guide to the occurrence and distribution of PCTs, Vegetation Classes, and Vegetation Formations. The SVTM was used as an aid in mapping native vegetation extent within the subject land.

Existing BDARs were also used to guide the mapping of native vegetation where the subject land overlaps with these projects. The PCT mapping provided in EnergyConnect (NSW – Eastern section) project (WSP, 2022) and HumeLink (Niche Environment & Heritage 2024) were reviewed for consistent PCT identification.

Data on geology, dominant canopy species, native species richness, vegetation structure and condition were collected from areas able to be accessed during field surveys to validate and refine this existing vegetation mapping to determine their associated PCT in accordance with the BioNet Vegetation Classification System.

Where access was available, native vegetation extent was verified in the field. Where access was limited or not granted, native vegetation extent was determined on aerial photograph interpretation in conjunction with reference to the SVTM, with cross references made to ground-truthed areas of vegetation at similar landscape positions, geology and soil types.

Landscape features such as waterbodies, irrigation canals and access tracks were mapped based on aerial imagery for inaccessible land and known locations for accessible areas. Existing access tracks and roads have formed part of the project design based on aerial imagery and mapped areas and a 30-metre buffer applied. These areas are mapped with SVTM, and no targeted surveys were able to be undertaken within the survey period for threatened species. Assumed presence has been applied for areas mapped with SVTM and this is detailed in Chapter 5.

2.2.2.1 Native vegetation surveys

Native vegetation surveys were undertaken within the subject land during the following dates:

- 28 November 2023
- 20 January – 03 February 2024
- 05–06 February 2024
- 15 April – 18 April 2024
- 30 April – 07 May 2024
- 27–31 August 2024
- 01–17 September 2024
- 10–18 October 2024
- 08–24 October 2024
- 28–31 January 2025
- 16–21 February 2025
- 24–28 February 2025
- 08–14 April 2025.

The vegetation within the subject land was firstly assessed to a PCT level and then aligned to a vegetation zone which is defined in the BAM as ‘an area of native vegetation on the project site that is the same PCT and has the same broad condition state’.

A broad condition state infers that the vegetation has a similar tree cover, shrub cover, ground cover, weediness or combinations of these attributes which determine vegetation condition.

Broad condition state is used for stratifying areas of the same PCT into a vegetation zone for determining the vegetation integrity score. Six broad condition states used for this report which are outlined in Table 2.1.

Table 2.1 Native vegetation broad condition states

Broad condition state	Description
Moderate – good	Native vegetation is relatively intact with all structural layers present. Exotic weed cover is generally less than 30 per cent.
Thinned	Native vegetation where one or more structural components of the vegetation is entirely removed or severely reduced. Vegetation integrity scores are generally less than 60 and exotic cover is generally greater than 30 per cent.
Derived Tall Shrubland	Vegetation subject to historic clearing and grazing pressures where native over-storey species have been eliminated but a tall shrub layer, approximately 4m in height remains. Ground stratum vegetation varies but typically has high instance of weed incursion and a reduced native richness and cover compared to areas of intact vegetation. For this project, it includes PCTs that have changed to an alternative stable state because of land management practices since European settlement.
Derived	Native vegetation generally lacking a native over-storey. For this project, it includes PCTs that have changed to an alternative stable state because of land management practices since European settlement. Over-storey structural components of derived communities have either entirely been removed or are severely reduced (i.e. derived native grasslands with or without scattered paddock trees). Derived grassland was assigned to patches of vegetation where native perennial cover was greater than 50 per cent.
Derived – Low Conservation Value	Derived low conservation value includes areas of vegetation where previous land practices include pasture improvement or cropping and native species have recolonised with a VI score of <15.
Planted native vegetation	Areas of planted native vegetation where the species origin is outside of the project areas geographical range. This excludes native vegetation plantings with local providence that has been assigned a PCT. Planted native vegetation is considered under prescribed impacts.

2.2.3 Plot-based vegetation survey

The project footprint was a minimum 200-metre-wide corridor that focussed on the transmission line and includes temporary worker accommodation facilities, construction compound sites, brake and winch locations and access tracks where these are located outside the 200 metres wide corridor. Field validation (ground-truthing) of the SVTM within the project footprint was completed based on random meander surveys and vegetation integrity plots.

Field verification was undertaken to confirm the vegetation structure, dominant and characteristic species of each stratum, landscape position, native diversity, condition, presence of threatened ecological communities and other diagnostic features including soil type, soil colour and expected regularity and level of inundation. Field data was compared and analysed against the regional vegetation mapping key diagnostic species to confirm each vegetation type. Where a vegetation type did not strictly meet all characteristics of a single PCT, the PCT which best fit the vegetation on site was allocated with justification provided in sections 4.2.2 to 4.2.34.

There were 197 vegetation integrity plots completed from November 2023 to February 2025 that have been retained for assessment. The locations of vegetation integrity plots are shown in Figure 15.7 with BAM Vegetation Integrity Plot data provided in Appendix D. The survey aimed to meet or exceed the minimum number of plots required per vegetation zone area (refer to Section 4.3.4 of the BAM) (see Table 2.2).

Table 2.2 Minimum number of plots required per vegetation zone area

Vegetation zone area (ha)	Minimum number of plots
<2	1 plot
>2–5	2 plots
>5–20	3 plots
>20–50	4 plots
>50–100	5 plots
>100–250	6 plots
>250–1,000	7 plots; more plots may be needed if the condition of the vegetation is variable across the zone
>1,000	8 plots; more plots may be needed if the condition of the vegetation is variable across the zone

2.2.3.1 Use of vegetation integrity plots outside of the subject land

Section 4.2.1 of BAM states that the assessor must perform a plot-based vegetation survey of the subject land to identify the most suitable PCTs. Since the commencement of field surveys, changes have occurred to the project footprint to avoid and minimise impacts (including biodiversity). This has meant that a number of the vegetation integrity plots extend outside of the current project footprint presented in this BDAR. The vegetation integrity plots outside of the current project footprint were selected based on vegetation condition and in proximity to the current footprint. For the purposes of this BDAR, the project footprint is the area assessed for biodiversity values and the subject land is the area that would be impacted. Subject land can also be considered the indicative disturbance footprint.

A total 197 vegetation integrity plots have been retained for assessment. The vegetation integrity plots are illustrated in Figure 15.7.

Vegetation Integrity plots within one kilometre of the subject land were selected for this assessment. The results of these surveys are considered relevant, representative of the vegetation in the subject land, and make a significant contribution to the understanding of PCTs and vegetation integrity. This plot data provides valuable replicates and contains local data. Importantly, the vegetation zones where plot-based vegetation surveys were undertaken outside of the subject land are subject to the same land management regimes as the vegetation zones within the subject land (i.e. over 150+ years of agriculture).

2.2.3.2 Use of vegetation integrity plots from approved projects

The vegetation integrity plots from EnergyConnect (NSW – Eastern section) project BDAR (WSP, 2022) and Humelink Project BDAR (Niche Environment and Heritage Pty Ltd, 2024) was undertaken, and three plots were selected. Field validation confirmed the PCTs, and broad condition states and VI plots were adopted from these BDARs to ensure an accurate representation of the vegetation zone in the BAM Calculator. Further details are summarised in section 4.4.

2.2.3.3 Vegetation integrity plot – method

Vegetation integrity plots and successional vegetation mapping were undertaken in accordance with section 4.2 of the BAM to confirm PCTs and the likelihood of TECs. A schematic diagram illustrating the layout of each vegetation integrity plot is provided in Figure 2.1.

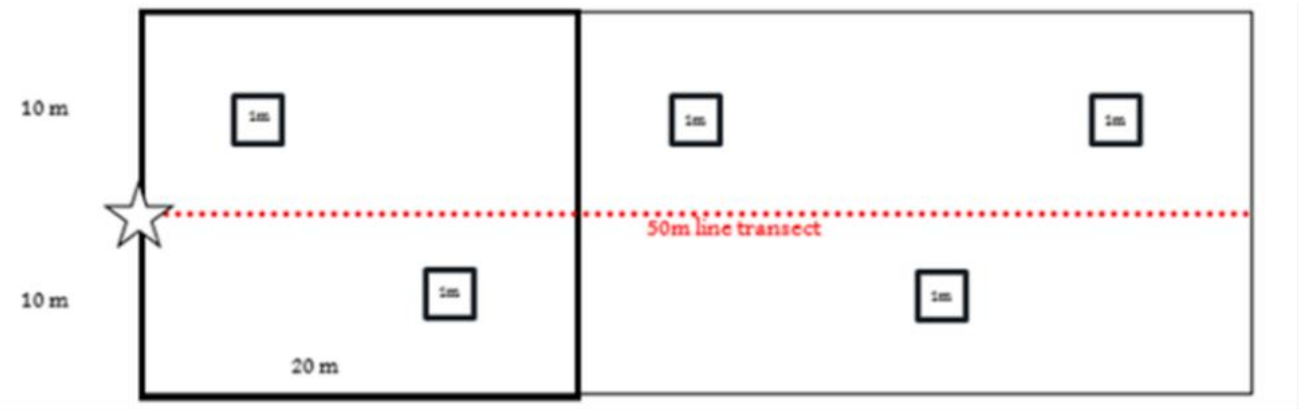


Figure 2.1 Vegetation integrity plot layout

The following site attributes were recorded at each vegetation integrity plot location:

- **Location:** (easting – northing grid type MGA 2020, Zones 54 and 55).
- **Vegetation structure and dominant species and vegetation condition:** Vegetation structure was recorded through estimates of percentage foliage cover, average height and height range for each vegetation layer.
- **Native and exotic species richness** (within a 400-metre squared quadrat): This consisted of recording all species by systematically walking through each 20-metre x 20 metre plot. The cover (percentage of area of quadrat covered) and abundance (individual stem counts) of each species was estimated. The growth form, stratum/layer and whether each species was native/exotic/high threat weed was also recorded.
- **Number of trees with hollows** (1,000 metre squared quadrat): This was the frequency of hollows within living and dead trees within each 50-metre x 20 metre plot. A hollow was only recorded if (a) the entrance could be seen: (b) the estimated entrance width was at least five centimetres across: (c) the hollow appeared to have depth: (d) the hollow was at least one metre above the ground and the (e) the centre of the tree was located within the sampled quadrat.
- **Number of large trees and stem size diversity** (1,000 metre squared quadrat): tree stem size diversity was calculated by measuring the diameter at breast height (DBH) (i.e. 1.3 metre from the ground) of all living trees (>5 centimetre DBH) within each 50-metre x 20 metre plot. For multi-stemmed living trees, only the largest stem was included in the count. Number of large trees was determined by comparing living tree stem DBH against the PCTs benchmarks.
- **Total length of fallen logs** (1,000 metre squared quadrat): This was the cumulative total of logs within each 50-metre x 20 metre plot with a diameter of at least 10 centimetres and a length of at least 0.5 metre.
- **Litter cover:** This comprised estimating the average percentage groundcover of litter (i.e. leaves, seeds, twigs, branchlets and branches with a diameter less than 10 centimetre which is detached from a living plant) from within five 1 metre x 1 metre sub-plots spaced evenly either side of the 50-metre central transect.
- **Evaluation of regeneration:** This was estimated as the presence/absence of overstorey species present at the site that was regenerating (i.e. saplings with a diameter at breast height less than or equal to five centimetres).

As outlined in BAM Section 4.3.3, vegetation integrity is a metric-based assessment used to measure the condition of native vegetation against a benchmark, based on survey data collected by the assessor. Within each vegetation zone in the subject land, a quantitative measure of the composition, structure and function attributes is obtained from the survey. The composition, structure and relevant function attributes for each vegetation zone are then assessed against the benchmark data for the relevant PCT. The benchmark data used in the BDAR were the Version 1.2 benchmarks as of March 13, 2024. The default benchmarks for PCTs held within the BAM-C were not modified. The plot survey data was used to determine the vegetation integrity scores for a vegetation zone. Equations 16–24 from Appendix H of the BAM (housed within the BAM-C) were used to determine the current vegetation integrity score for each vegetation zone.

2.2.4 Areas of non-native vegetation

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

Prescribed impacts for purposes of the biodiversity offsets scheme are listed under section 6.3 and 6.5 of the BC Act. Section 6.3 include the principles biodiversity offsets scheme, such as *avoid, minimise and offset hierarchy* and Section 6.5 determines serious and irreversible impacts on biodiversity values for the purposes of the biodiversity offsets scheme is to be made in accordance with principles prescribed by the regulations.

The LLS Act published maps (the draft native vegetation regulatory map, hereafter draft NVR map) show areas of the State to which Part 5A of the LLS Act applies, which are designated as category 1-exempt, category 2-regulated, category 2-sensitive, vulnerable regulated or excluded land.

Further discussion of Category-1 lands is provided in the next section, and the results of the assessment are summarised in section 4.1.2.1.

2.2.4.1 Category 1 land assessment

Field validation for Category 1 – exempt land identified by the draft NVR map was undertaken utilising both qualitative information (e.g. photographs, rapid data points) and quantitative information including the use of the Interim Grasslands and other Groundcover Assessment Method (Interim Grasslands method) (OEH 2017). The Interim Grasslands method is used to determine the conservation value of grassland vegetation based on the relative cover of perennial exotic vegetation and the native vegetation. The grassland assessment method applies to herbaceous groundcover (e.g. forbs, grasses, sedges, rushes, and some chenopods) less than one metre high. The grassland method does not apply in circumstances where the vegetation is woody or a wetland, disturbance such as flooding or fire has occurred within the last six months, or groundcover is less than 10 per cent.

Applying the grassland assessment includes the transect-intercept method, where an assessor undertakes a 100 metre transect in the subject land. If the vegetation is determined to be greater than 50 per cent perennial exotic vegetation, the area is considered low conservation value and considered to be Category 1 – exempt land. All Category 1 – exempt lands identified within the subject land are exempt from BAM assessment and are not considered further in this BDAR.

If the transect intercept method results determines applies groundcover is less than 50 per cent perennial exotic cover, the BAM is applied. The VI scores, determined using BAM plots, are related to conservation value category as follows:

- VI <15 = Low conservation value
- VI 15-60 = Moderate conservation value
- VI >60 = High conservation value.

The number of BAM plots required for each grassland category is based on the hectare size (see Table 2.2). The outcome of the Interim Grasslands method and associated BAM VI plots is provided in section 4.1.2.1.

2.2.5 Random meander surveys

Random meander surveys are a variation of the transect type survey and were completed in accordance with the technique described by (Cropper 1993), whereby the recorder walks in a random meander throughout the subject land recording dominant and key plant species (e.g. threatened species or noxious weeds), boundaries between various vegetation communities and condition of vegetation. The time spent in each vegetation community was generally proportional to the size of the community and its species richness. This survey technique was used to verify vegetation boundaries and stratification from the desktop analysis.

2.2.6 Scattered tree assessment

The streamlined assessment module 'scattered trees assessment' as outlined in Appendix B of the BAM has been utilised to assess the impact of clearing scattered trees. As outlined in the BAM, an assessment of the impact of clearing scattered trees can be made using this module where:

a. the impacts of clearing or development proposals are for vegetation that meets the definition of scattered trees, and

b. the scattered tree is not a threatened species itself, nor does it have any record of candidate species credit species (flora or fauna) incidentally using it, and

c. the impact is unlikely to be serious or irreversible.

Where only part of the subject land contains scattered trees, this module may be used to assess that part of a development or clearing proposal, and the standard BAM used to assess impacts on the remaining areas. The scattered tree module is used in this BDAR only to assess the part of the project that contains scattered trees.

The mapped scattered trees are not threatened species nor do the trees have any records of candidate species credit species (flora or fauna) incidentally using them.

Importantly, SAII species including Swift Parrot and Regent Honeyeater are excluded from the scattered tree assessments based on the absence of habitat constraints (i.e. the scattered trees are not in areas of mapped important habitat). As such, there is no impact to these SAII species credit species and the Scattered Tree module can be used.

Scattered trees are defined in the BAM as species listed in the tree growth form group that:

- have a per cent foliage cover that is less than 25 per cent of the benchmark for tree cover for the most likely plant community type and are on category 2 – regulated land and surrounded by category 1 – exempt land on the Native Vegetation Regulatory Map under the LLS Act, or
- have a DBH of greater than or equal to five centimetres and are located more than 50 metres away from any living tree that is greater than or equal to five centimetres DBH, and the land between the scattered trees is comprised of vegetation that are all ground cover species on the widely cultivated native species list, or exotic species or human-made surfaces or bare ground, or
- are three or fewer trees that have a DBH of greater than or equal to five centimetres and are within a distance of 50 metres of each other, that in turn, are greater than 50 metres away from the nearest living tree that is greater than or equal to five centimetres DBH, and the land between the scattered trees is comprised of vegetation that are all ground cover species on the widely cultivated native species list, or exotic species or human-made surfaces or bare ground.

Scattered trees were first identified by using the land categorisation mapping to locate areas of Category 1 land that contained isolated trees. These isolated trees conform to the presence of Category 2 – regulated land and surrounded by category 1 – exempt land on the Native Vegetation Regulatory Map (i.e. the tree is Category 2 land while the surrounding paddock is Category 1 land). This application of the Scattered Tree module includes mapping Scattered Tree module within Category 1 land that were not otherwise assigned to a vegetation zone.

Trees were only considered for inclusion in the Scattered Tree assessment if they had a DBH of ≥ 5 centimetres. The trees were mapped as Scattered Trees if they were individual trees or a group of three or fewer trees located more than 50 metres away from any living tree that is ≥ 5 centimetres DBH.

In undertaking the scattered tree assessment, the following information is required as outlined in Appendix B.2 of the BAM:

- a map that identifies the scattered trees proposed to be cleared
- identify the genus and species of each tree
- assign each tree or group of trees to be cleared into a class as per:
  - Class 1: trees that are less than 20 centimetres DBH and without hollows
  - Class 2: trees that are greater than or equal 20 centimetres DBH and less than the large tree benchmark for the most likely plant community type or trees that are less than 20 centimetres DBH that contain at least one hollow
  - Class 3: trees that are greater than or equal to the large tree benchmark for the most likely plant community type
- record any sightings (e.g. in hollows) or evidence (e.g. scats) of threatened species (flora or fauna) using the scattered trees.

2.2.6.1 Scattered tree limitations

Due to the scale of the project and the access limitations, scattered trees that could not be field verified to genus and species level were entered into the BAM-C as *Eucalyptus* sp. Aerial imagery was used to identify the scattered trees, and the trees were mapped remotely, the nearest or most likely PCT was selected based on landscape position, geology, soil type, adjacent vegetation that could be field verified.

In determining the offset requirement for scattered tree impacts, the BAM states that the assessor must visually assess every class 2 and class 3 scattered tree in the field to determine whether it is a hollow bearing tree. As this was not possible given the access limitations, the precautionary approach was adopted where any remotely mapped scattered tree was assessed as a Class 3 tree with hollows - and the offset requirement for scattered trees takes into account the highest values.

Scattered trees on land with restricted access could not be assessed for threatened species habitat (e.g. hollows, scats, nests etc.) therefore the assessment is based on available data and the characteristics of the candidate species returned from the BAM C for each scattered tree.

2.2.7 Planted native vegetation assessment

The streamlined assessment module 'Planted native vegetation' as outlined in Appendix D of the BAM has been utilised with reference to the *Streamlined assessment module planted native vegetation Biodiversity Assessment Method operation manual* to assess the impact of clearing planted native vegetation.

Where only part of the subject land contains planted native vegetation, this module may be used to assess that part of a development proposal, and the standard BAM used to assess impacts on the remaining areas. The planted native vegetation module is used in this BDAR only to assess the part of the project that contains planted native vegetation.

The planted native vegetation module was deemed appropriate to use for this vegetation following the decision-making key contained in BAM Appendix D, notably Step 5 (the native vegetation was planted for functional, aesthetic, horticultural or plantation forestry purposes (i.e. windbreaks in agricultural landscapes and roadside plantings)). BAM Appendix D.2 Assessment of planted native vegetation for threatened species habitat was therefore used to assess impacts to areas of planted native vegetation (Sections 4 and 5 of the BAM are not required to be applied).

The planted native vegetation module was deemed appropriate for the following reasons:

- the planted native vegetation occurs within an area that contains a mosaic of planted and remnant native vegetation. However, the plantings do not accurately represent adjacent PCTs and cannot be reasonably be assigned to a PCT known to occur in the same IBRA subregion
- the planted native vegetation was not planted for the purpose of environmental rehabilitation or restoration under an existing conservation obligation listed in BAM Section 11.9(2)
- these areas of planted native vegetation are either windbreaks planted at the edge of paddocks or are roadside tree plantings. The primary objective of the planting was not to replace or regenerate a plant community type or a threatened plant species population or its habitat
- the planted native vegetation does not contain individuals of a threatened species or other native species planted/translocated for the purpose of providing threatened species habitat. These areas of planted native vegetation are generally windbreaks planted at the edge of paddocks
- the planted native vegetation was not undertaken voluntarily for revegetation, environmental rehabilitation or restoration without a legal obligation to secure or provide for management of the native vegetation
- the native vegetation was planted for functional, aesthetic, horticultural or plantation forestry purposes (i.e. windbreaks in agricultural landscapes).

An example of a windbreak assessed using the planted native vegetation module is shown in Photo 2.1 and Photo 2.2.

According to BAM Appendix D.2 assessment of planted native vegetation for threatened species habitat, the assessor must assess the suitability of the planted native vegetation for use by threatened species and record any incidental sightings or evidence (e.g. scats, stick nests) of threatened species credit species (flora and fauna) using, inhabiting or being part of the planted native vegetation.



Photo 2.1 Aerial photo illustrating an area of wind break planting in the Inland Slopes IBRA subregion assessed using the planted native vegetation module



Photo 2.2 On ground view of the planted native vegetation shown in Photo 2.1

2.3 Assessing the habitat suitability for threatened species

In the BAM, threatened species are assessed as either ecosystem credit species, species credit species or a combination of the two (referred to as 'dual credit species'). The BAM defines these threatened species categories as follows:

- ecosystem credit species (predicted): are those threatened species where the likelihood of occurrence and/or elements of its habitat can be confidently predicted by vegetation surrogates and landscape features
- species credit species (candidate): are those threatened species that cannot be reliably predicted by habitat surrogates
- dual credit species are those threatened species where part of the habitat is assessed as an ecosystem credit (e.g. foraging habitat) and part as a species credit (e.g. breeding habitat). In this report, dual credit species would be included in both ecosystem and species credit assessment.

The BAM sets out six steps for assessing habitat suitability for threatened species (ecosystem credit species and species credit species), these are:

- ecosystem and species credit species (include dual species)
  - Step 1: Identify threatened species for assessment (BAM s. 5.2.1)
  - Step 2: Assess the habitat constraints and vagrant species on the subject land (BAM s. 5.2.2).
- species credits species only (includes dual species)
  - Step 3: Further assessment of candidate species credit species (BAM s. 5.2.3)
  - Step 4: Determine the presence of a candidate species credit species (BAM s. 5.2.4)
  - Step 5: Determine the area or count, and location of suitable habitat for a species credit species (a species polygon) (BAM s. 5.2.5)
  - Step 6: Determine the habitat condition within the species polygon for species credit species assessed by area (BAM s. 5.2.6).

2.3.1 Threatened species database searches

As part of Step 1, identifying threatened species for assessment, the BAM requires the accredited assessor to review additional information about threatened species to determine if any predicted or candidate species inclusions are required. This involved searches of the threatened species databases presented in Table 2.3.

Table 2.3 Threatened species database searches

Database	Search date	Area searches	Reference
PlantNet Database	March – October 2024	Locality search	Royal Botanic Gardens and Domain Trust
BioNet Atlas of NSW Wildlife	April 2025	The search was completed to 10 km for the following IBRA subregions: — Murrumbidgee — Murray Fans — Inland Slopes	Threatened Biodiversity Data Collection (TBDC) 2025
EPBC Protected Matters Search Tool	May 2025	10 km search around project corridor	NSW DCCEEW 2024c

Database	Search date	Area searches	Reference
Biodiversity Assessment Method (BAM) Calculator (Credit Calculator)	Final updates in BAM-C May 2025	The following IBRA subregions: — Murrumbidgee — Murray Fans — Inland Slopes	BAM-C Version 80 OEH 2023
NSW Department of Primary Industries (Fishing and Aquaculture) threatened Aquatic Fauna Database	January 2025	Local government areas: — Edward River LGA — Murray River LGA — Murrumbidgee LGA — Wagga Wagga LGA.	Department of Primary Industries and Regional Development, n.d.

2.3.2 *Literature review*

In addition to threatened species database searches, a range of relevant documents and literature related to threatened biodiversity was considered, including:

- NSW Sharing and Enabling Environmental Data (SEED) portal (NSW Government 2021)
- DAWE's Directory of Important Wetlands (Department of Agriculture Water and the Environment 2021).

A number of existing BDARs were reviewed to obtain existing information on biodiversity in the locality with specific focus on areas assessed in previous BDARs that overlap with the project. The reports reviewed included:

- EnergyConnect (NSW – Eastern section): comprises the construction and operation of new high voltage transmission lines between the existing Buronga and Wagga Wagga substations, a new substation (Dinawan), and upgrade and expansion of existing infrastructure. The proposed corridor is around one kilometre wide and 537 kilometres long and is located in western NSW (WSP, 2022).
- Yanco Delta is a 1.5 gigawatt (GW) wind farm and 800 MW battery project to be located in the South-West REZ in NSW with expected contract award in 2025. It is located at the eastern end of the NSW/Victoria border to Dinawan Substation section of the alignment, where the subject land intersects the project north of the township of Moonbria along Mabins Well Road (Virya Energy, 2022).
- Dinawan Wind Farm – East is a 1.5 GW wind farm to be located in the South West REZ in NSW with expected construction commencement in 2025. It is located at the eastern end of the NSW/Victoria border to Dinawan Substation section of the alignment, located halfway between the towns of Coleambally and Jerilderie where the subject land intersects the project along Mabins Well Road (Spark Renewables, 2024).
- Dinawan Solar Farm is a 800 MW solar and 300 MW battery project to be located in the South-West REZ in NSW with expected construction commencement in 2025. It is located at the very tip of the eastern end of the NSW/Victoria border to Dinawan Substation section of the alignment, and borders the Dinawan Wind Farm – East project, where it intersects the subject land at the site of the proposed Dinawan substation (Spark Renewables, 2023).
- HumeLink involves the construction of a substation east of Wagga Wagga as well as connections to existing substations at Wagga Wagga and Bannaby and a future substation in Gregadoo (i.e. Gugaa substation (Transgrid 2023). VNI West runs along the section of the Humelink alignment between the existing Wagga substation and the future Gugaa substation, nearby the township of Gregadoo.

2.3.3 Cumulative impact assessment

The cumulative impact assessment (Appendix O) has been prepared to consider biodiversity impacts and values from the project and additional surrounding projects (i.e. future relevant projects).

2.4 CPHR Consultation

Consultation with Conservation Programs, Heritage & Regulation (CPHR) has been undertaken for the project over 2024 and 2025 and summarised in Table 2.4. The correspondence can be found in Appendix B.

Table 2.4 CPHR Consultation

Meeting date	Purpose
15 February 2024	Project introduction and preliminary results based on initial assessment
20 February 2025	Project and BDAR update
30 April 2025	Project update of survey to date, discussion of vegetation clearing approach
5 June 2025	Project update of impacts

2.5 Threatened flora survey methods

2.5.1 Review of existing information

A review of publicly available information and databases (see Table 2.3) was completed to inform the flora threatened species desktop assessment. Habitat constraints, geographic limitations and microhabitats for candidate threatened flora (species credit) species as listed within the NSW Threatened Biodiversity Data Collection (TBDC) and the BAM-C was undertaken prior to survey. EPBC Act listed flora species identified in the Protected Matters Search Tool (PMST) were only were considered for Matters of National Environmental Significance (MNES) (see Appendix C), however were not further assessed in this BDAR.

2.5.2 Threatened flora desktop assessment

A total of 38 threatened flora species were identified in background searches and the flora species are listed in Table 2.5.

Table 2.5 Threatened flora species listed under the BC and EPBC Acts

Common name	Scientific name	BC Act status	EPBC Act status	Growth form
Ausfeld's Wattle	*Acacia ausfeldii*	V	–	Shrub
Yass Daisy	*Ammobium craspedioides*	V	V	Perennial herb
River Swamp Wallaby-grass, Floating Swamp Wallaby-grass	*Amphibromus fluitans*	V	V	Perennial grass
–	*Austrostipa metatoris*	V	V	Perennial grass
–	*Austrostipa wakoolica*	E	E	Perennial grass
Mueller Daisy	*Brachyscome muelleroides*	V	V	Annual herb
Mossgiel Daisy	*Brachyscome papillosa*	V	V	Perennial herb

Common name	Scientific name	BC Act status	EPBC Act status	Growth form
Sand-hill Spider Orchid	*Caladenia arenaria*	E	E	Perennial herb
Crimson Spider-orchid	*Caladenia concolor*	E	V	Herb
Moore's Burr-daisy	*Calotis moorei*	E	E	Perennial herb
Bindweed	*Convulvulus tedmoorei*	E	–	Perennial herb
Small Scurf-pea	*Cullen parvum*	E	–	Perennial herb
Pine Donkey Orchid	*Diuris tricolor*	V	–	Perennial herb
Spike rush	*Eleocharis obicis*	V	V	Perennial sedge
Yellow Gum	*Eucalyptus leucoxylon subsp. pruniosa*	V	–	Tree
–	*Euphrasia arguta*	CE	CE	Annual herb
Tumut Grevillea	*Grevillea wilkinsonii*	CE	CE	Shrub
Leafless Indigo	*Indigofera efoliata*	E	E	Subshrub
Spiny Peppercress	*Lepidium aschersonii*	V	V	Perennial herb
Winged Peppercress	*Lepidium monoplocoides*	E	E	Perennial forb
Lanky Buttons	*Leptorhynchos orientalis*	E	–	Annual herb
Chariot Wheels	*Maireana cheelii*	V	V	Perennial herb
Ridged Water-milfoil	*Myriophyllum porcatum*	–	V	Annual herb
Austral Pillwort	*Pilularia novae-hollandiae*	E	–	Fern
Tarengo Leek Orchid	*Prasophyllum petilum* (NSW listing)	E	–	Perennial herb
–	*Prasophyllum sp. Moama*	CE	–	Herb
–	*Prasophyllum* sp. Wybong (Federal listing)	–	E	Perennial herb
Lowly Greenhood	*Pterostylis despectans*	CE	E	Herb
Stiff Groundsel	*Senecio behrianus*	Extinct	E	Shrub
Woolly Ragwort	*Senecio garlandii*	V	–	Perennial herb
Large-fruit Fireweed	*Senecio macrocarpus*	–	V	Perennial herb
Turnip Copperburr	*Sclerolaena napiformis*	E	E	Subshrub
Menindee Nightshade	*Solanum karsense*	V	V	Perennial herb
Slender Darling-pea, Slender Swainson, Murray Swainson-pea	*Swainsona murrayana*	V	V	Perennial herb
Red Darling-pea, Red Swainson-pea	*Swainsona plagiotropis*	V	V	Perennial herb

Common name	Scientific name	BC Act status	EPBC Act status	Growth form
Yellow Swainson-pea	*Swainsona pyrophila*	V	V	Shrub
Small Purple-pea	*Swainsona recta*	E	E	Perennial forb
Silky Swainson-pea	*Swainsona sericea*	V	–	Perennial herb

2.5.3 Field surveys

Targeted surveys were undertaken for candidate flora species credit species (including EPBC Act listed species) within the subject land based on the survey requirements outlined in the *NSW surveying for threatened plants guidelines* (DPE 2020c).

Targeted threatened flora surveys were planned through the development of a detailed survey plan to determine the candidate species, survey timing and associated habitat recorded on site. The survey was designed to maximise the likelihood of detection of targeted threatened plant species by grouping those species considered likely to be reliably detected through survey according to optimal months of survey and their specific associated habitat. The field survey techniques were assigned to areas of associated habitat based on the number of associated candidate species, the likelihood of supporting candidate species and the condition and presence of associated microhabitats.

The following field survey techniques were used to undertake targeted seasonal surveys in general accordance with *Surveying threatened plants and their habitats; NSW guide for the Biodiversity Assessment Method* (DPE 2020c):

- two-phase grid-based systematic survey including finer-scale grid survey
- herbarium sampling and vouchering.

In addition to the above, regular opportunistic survey methods were applied to maximise the identification of threatened flora species including:

- trackside surveys
- opportunistic threatened flora observations
- rapid data point assessment and random meander of microhabitats.

These surveys were undertaken year-round and where out-of-season threatened flora habitat was identified, it was noted to undertake future surveys of those areas during the appropriate survey months. Further details of microhabitats for specific candidate species can be found in Chapter 5.

Detailed survey methodology is described below in sections 2.5.3.1–2.5.3.6 with the extent of targeted flora survey effort undertaken represented in section 5.3. Table 2.6 summarises the targeted threatened flora searches undertaken within the subject land between 2023 and 2025.

Table 2.6 Targeted threatened flora survey effort

Date	Survey undertaken	No. people	Time expended during survey[1]
18/09/2023	2-phase grid	4 people	7.5 hrs
19/09/2023	2-phase grid	4 people	7.5 hrs
20/09/2023	2-phase grid	4 people	7.5 hrs
21/09/2023	2-phase grid	4 people	7.5 hrs
22/09/2023	2-phase grid	4 people	7.5 hrs
23/09/2023	2-phase grid	4 people	7.5 hrs
28/11/2023	2-phase grid	2 people	2.5 hrs
	Opportunistic	2 people	0.5 hr
29/11/2023	Opportunistic	2 people	0.5 hr
30/11/2023	Opportunistic	2 people	0.5 hr
01/12/2023	Opportunistic	2 people	0.5 hr
30/01/2024	2-phase grid	3 people	2.5 hrs
01/02/2024	2-phase grid	3 people	2.5 hrs
02/02/2024	2-phase grid	3 people	2.5 hrs
03/02/2024	Opportunistic	2 people	1 hr
05/02/2024	Opportunistic	2 people	4 hrs
06/02/2024	Opportunistic	2 people	4 hrs
15/04/2024	Opportunistic	2 people	1 hr
27/08/2024	Opportunistic	3 people	5 hrs
28/08/2024	Opportunistic	1 person	2 hrs
29/08/2024	Opportunistic	2 people	1 hr
		2 people	1.5 hrs
30/08/2024	Opportunistic	2 people	1 hr
		2 people	3.5 hrs
31/08/2024	2-phase grid	2 people	2 hrs
	Opportunistic	2 people	1 hr
		2 people	3.5 hrs
01/09/2024	2-phase grid	1 person	1 hr
		2 people	3 hrs
	Transects	2 people	1 hr
02/09/2024	2-phase grid	2 people	8 hrs

Date	Survey undertaken	No. people	Time expended during survey[1]
03/09/2024	Transects	2 people	2 hrs
06/09/2024	2-phase grid	2 people	3.5 hrs
07/09/2024	2-phase grid	2 people	2 hrs
09/09/2024	Opportunistic	3 people	1 hr
	Transects	3 people	1 hr
10/09/2024	2-phase grid	2 people	4 hrs
		2 people	8 hrs
	Opportunistic	2 people	0.5 hr
11/09/2024	2-phase grid	2 people	8 hrs
		3 people	5 hrs
12/09/2024	2-phase grid	2 people	6 hrs
		3 people	7 hrs
		3 people	8 hrs
13/09/2024	2-phase grid	2 people	8 hrs
		3 people	8 hrs
14/09/2024	2-phase grid	2 people	8 hrs
		3 people	8 hrs
15/09/2024	2-phase grid	2 people	8 hrs
		3 people	8 hrs
16/09/2024	2-phase grid	2 people	8 hrs
		3 people	8 hrs
17/09/2024	2-phase grid	3 people	8 hrs
	Opportunistic	2 people	1 hr
09/10/2024	2-phase grid	2 people	8 hrs
10/10/2024	2-phase grid	2 people	8 hrs
11/10/2024	2-phase grid	3 people	8 hrs
12/10/2024	2-phase grid	2 people	8 hrs
13/10/2024	2-phase grid	2 people	8 hrs
14/10/2024	2-phase grid	2 people	8 hrs
15/10/2024	2-phase grid	2 people	6 hrs
16/10/2024	2-phase grid	2 people	4 hrs
	Transects	2 people	1 hr

Date	Survey undertaken	No. people	Time expended during survey[1]
17/10/2024	2-phase grid	2 people	4 hrs
18/10/2024	Opportunistic	2 people	1 hr
20/10/2024	Transects	2 people	3 hrs
21/10/2024	Opportunistic	1 person	2 hrs
22/10/2024	2-phase grid	1 person	3 hrs
	Opportunistic	2 people	1 hr
23/10/2024	2-phase grid	1 person	6 hrs
	Transects	3 people	1 hr
29/01/2025	Transects	2 people	1 hr
30/01/2025	2-phase grid	2 people	4 hrs
	Transects	2 people	1 hr
31/01/2025	2-phase grid	2 people	3 hrs
	Transects	2 people	1 hr

(1) Time per person

2.5.3.1 Two-phase grid-based systematic survey

The two-phase grid-based systematic survey methods has been developed for large areas of suitable potential threatened species habitat that generally exceed 50 hectares in area.

Phase-one

According to the *NSW surveying for threatened plants guidelines* (DPE 2020), the phase-one method involves establishing a grid spaced at 100 square metres that is nested within a one-square-kilometre grid. Surveys are then conducted at each survey location (100 metre grid intersect or greater if open woodland structure occurred), where a 40-metre diameter search area is undertaken (1256-square-metre circular area). If a target threatened species is located, finer-scale grid surveys (phase-two) is used to locate population extent, which allows a species polygon to be defined. This subsequent phase ensures a greater intensity of survey effort in locations where the target threatened species occurs (DPE 2020b).

Given the linear nature of the subject land, the first phase of the two-phase grid-based was adapted where the grid was set up in with a linear 100 metre survey line and the survey was completed for the 40-metre diameter area (covering 1,256-square-metre circular area) at each 100-metre survey location along the subject land. The grid was determined spatially and in circumstance where the subject land was non-linear, the guidelines were applied, and the 100-metre grid was used. Survey locations were pre-loaded onto a handheld GPS to enable a systematic approach to the survey effort.

Section 5.3 details threatened species surveyed using this survey method and timing of the survey. Refer to Figure 15.7 for survey tracks that demonstrates the use of this method and where it has been applied.

Finer-scale grid survey

If a target threatened species was located, a finer-scale grid survey (phase-two) was undertaken. This finer-scale grid further refined the population extent, allowing for more accurate species polygons to be defined. The extent of the area covered by the finer-scale grid was determined on site directly after locating a target species. The habitat type, vegetation type and condition, and landscape attributes surrounding the locations where the target species was first detected were considered. Parallel field traverses were undertaken at the appropriate distance apart based on growth form, as described by Table 1 in the *NSW surveying for threatened plants* guideline, to determine the extent of the population (DPE 2020). Timing and land access constraints also played a large role in the extent of the area covered by the finer-scale grid.

2.5.3.2 Herbarium sampling and vouchering

Threatened flora species located during surveys were tentatively identified in the field to enable finer-scale grid surveys to locate population extent and allows species polygons to be defined. Plant samples of each threatened species were collected and placed in a field plant press for further analysis and herbarium sampling to preserve key diagnostic material in order to confirm their identification at species level if further identification was required. Each sample was located with GPS coordinates and field notes were recorded including unique code, date of recording, genus and tentative species name, associated plant species, PCT, soils, landform, and any other relevant information to assist with herbarium vouchering. Collected plant samples were examined under a microscope before being processed and forwarded to the National Herbarium of NSW for positive verification. All plant samples were collected under NSW scientific licence number 100630. Correspondence with the National Herbarium is provided in Appendix F.

2.5.3.3 Trackside surveys

Trackside surveys include opportunistic threatened flora searches in table drains and roadsides which artificially pool water, mimicking conditions found in gilgais – known microhabitats of threatened species such as *Eleocharis obicis* and *Pillularia novae-hollandiae*. Trackside surveys are limited in nature but occur year round. These areas have been mapped based on the SVTM.

2.5.3.4 BioNet record checks

BioNet Atlas searches were undertaken as part of the desktop assessment (see Table 2.3) and survey planning. No threatened flora records were located within the subject land .

2.5.3.5 Opportunistic threatened flora surveys

Opportunistic sightings of threatened flora species were recorded during field surveys whilst completing other field surveys such as undertaking BAM vegetation integrity plots, vegetation type/condition validation etc. During these surveys, a hand-held GPS was used to record the locations of any threatened or important flora species that were opportunistically observed. If a threatened flora species were detected, parallel field traverses were undertaken at the appropriate distance apart based on growth form, as described by Table 1 in the *NSW surveying for threatened plants* guideline, to determine the extent of the population and the area was assessed during the optimal survey period for that particular species.

2.5.3.6 Additional microhabitat assessment

Additional microhabitat searches were undertaken as part of the flora surveys in 2024. Microhabitats provide suitable growing conditions for threatened flora in either wetter sheltered gilgais or scalds. The aim of the search was initially to record the presence and vegetation condition of these microhabitats. The assessment involved walking five to 10 metre transects to complete an initial search for threatened flora. The second part of the assessment noted the condition of the microhabitat which is outlined in below.

Gilgais

Gilgais are small, ephemeral surface depressions or micro-reliefs often forming due to the expansion and contraction of alluvial clay soils. Their ability to hold water for longer periods than surrounding soil morphologies creates seasonal microhabitat for semi-aquatic flora species (Photo 2.3). When a gilgai was identified in the field, a rapid data point was collected noting soil type, vegetation present, level of inundation or drying and water turbidity where water was recorded. Random meanders where also undertaken to determine the presence and extent of threatened flora species.



Photo 2.3 Example of an inundated gilgai within the subject land where *Pilularia novae-hollandiae* was recorded

Threatened flora species within the subject land associated with gilgais include:

- *Eleocharis obicis*
- *Pilularia novae-hollandiae.*

Other areas of potential habitat for these species were also assessed including farm dams and inundated table drains (e.g. road verges).

Scalds

Scalds are areas of soil where the topsoil has been eroded by wind and water erosion and is often exaggerated by overgrazing. Scalds are present where there is a slight depressions in the landscape compared to bordering vegetated soils and can be highly saline, creating hostile growing conditions for most species (Photo 2.4). When a scald was identified in the field, random meander surveys were undertaken to determine the presence and extent of threatened flora species.



Photo 2.4 Example of scalded soils within the subject land where *Maireana cheelii* was recorded

Threatened flora species within the subject land associated with gilgais include:

- *Lepidium monoplocoides*
- *Maireana cheelii.*

Sand Hills

Whilst the Hay Plain is predominantly flat, the influence of hydrology over time, particularly along river systems, has led to large sand deposits or 'source bordering dunes' forming a distinct component of the landscape (Photo 2.5). This change in topography, soil characteristics and hydrology has led to dunes providing microhabitat for some species. In particular, sandy flats of lower dunes and small sand hills associated with species such as *Callitris glaucophylla* and *Dodonaea viscosa* subsp. a*ngustissima* have been associated with the threatened flora species.

— *Calotis moorei.*

When a sand hill was identified in the field with these key distinguishing features, random meander surveys were undertaken to determine the presence and extent of *Calotis moorei*.



Photo 2.5 A low sand hill where suitable habitat for *Calotis moorei* was identified near the subject land. Similar species *Calotis* sp. *Zara* was recorded from this location

2.6 Threatened fauna survey methods

This section outlines the fauna survey effort completed for candidate species which were predicted to occur within the subject land based on the BAM-C, database searches and habitat assessments outlined in section 5.1.

2.6.1 Review of existing information

A review of publicly available information and databases (see Table 2.3) was completed to inform the flora threatened species desktop assessment. Habitat constraints, geographic limitations and microhabitats for candidate threatened fauna (species credit) species as listed within the NSW Threatened Biodiversity Data Collection (TBDC) was undertaken prior to survey. EPBC Act listed fauna species identified in the PMST only were considered for MNES (see Appendix C), however were not further assessed in this BDAR.

The BDARs and other biodiversity reports reviewed to understand existing information on biodiversity in the locality are listed in section 2.3.2.

2.6.2 Threatened fauna desktop assessment

A total of 81 threatened fauna species were identified in background searches with the potential to occur within the subject land. These species are outlined in Table 2.7.

Table 2.7 Threatened fauna species listed under the BC and EPBC Acts

Common name	Scientific name	BC Act status	EPBC Act status	Fauna type
Sloane's Froglet	*Crinia sloanei*	V	E	Amphibians
Booroolong Frog	*Litoria booroolongensis*	E	E	Amphibians
Southern Bell Frog	*Litoria raniformis*	E	V	Amphibians
Magpie Goose	*Anseranas semipalmata*	V	–	Avifauna
Regent Honeyeater	*Anthochaera phygia*	CE	CE	Avifauna
Brolga	*Antigone rubicunda*	V	–	Avifauna
Southern Whiteface	*Aphelocephala leucopsis*	V	V	Avifauna
Australian Bustard	*Ardeotis australis*	E	–	Avifauna
Dusky Woodswallow	*Artamus cyanopterus cyanopterus*	V	–	Avifauna
Australasian Bittern	*Botaurus poiciloptilus*	E	E	Avifauna
Bush Stone-curlew	*Burhinus grallarius*	E	–	Avifauna
Sharp-tailed Sandpiper	*Calidris acuminata*	–	V, M	Avifauna
Curlew Sandpiper	*Calidris ferruginea*	E	CE, M	Avifauna
Great Knot	*Calidris tentuirostris*	V	V, M	Avifauna
Gang-gang Cockatoo	*Callocephalon fimbriatum*	E	E	Avifauna
South-eastern Glossy Black-cockatoo	*Calyptorhynchus lathami lathami*	V	V	Avifauna
Pied Honeyeater	*Certhionyx variegatus*	V	–	Avifauna
Spotted Harrier	*Circus assimilis*	V	–	Avifauna
White-browed Treecreeper (Carrathool area population)	*Climacteris affinis* – endangered population	E	–	Avifauna
Brown Treecreeper (eastern subspecies)	*Climacteris picumnus victoriae*	V	V	Avifauna
Varied Sittella	*Daphoenositta chrysoptera*	V	–	Avifauna
White-fronted Chat	*Epthianura albifrons*	V	–	Avifauna

Common name	Scientific name	BC Act status	EPBC Act status	Fauna type
Grey Falcon	*Falco hypoleucos*	V	V	Avifauna
Black Falcon	*Falco subniger*	V	–	Avifauna
Lathams Snipe	*Gallinago hardwickii*	V	V, M	Avifauna
Painted Honeyeater	*Grantiella picta*	V	V	Avifauna
White-bellied Sea-eagle	*Haliaeetus leucogaster*	V	–	Avifauna
Black-breasted Buzzard	*Hamirostra melanosternon*	V	–	Avifauna
Little Eagle	*Hieraaetus morphnoides*	V	–	Avifauna
White-throated Needletail	*Hirundapus caudacutus*	V	V	Avifauna
Swift Parrot	*Lathamus discolor*	E	CE	Avifauna
Malleefowl	*Leipoa ocellata*	E	V	Avifauna
Black-tailed Godwit	*Limosa limosa*	V	E, M	Avifauna
Pink Cockatoo	*Lophochroa leadbeateri*	V	E	Avifauna
Square-tailed Kite	*Lophoictinia isura*	V	–	Avifauna
South-eastern Hooded Robin	*Melanodryas cucullata cucullata*	E	E	Avifauna
Black-chinned Honeyeater	*Melithreptus gularis gularis*	V	–	Avifauna
Blue-winged Parrot	*Neophema chrysostoma*	V	V	Avifauna
Turquoise Parrot	*Neophema pulchella*	V	–	Avifauna
Barking Owl	*Ninox connivens*	V	–	Avifauna
Blue-billed Duck	*Oxyura australis*	V	–	Avifauna
Gilberts Whistler	*Pachycephala inornata*	V	–	Avifauna
Purple-crowned Lorikeet	*Parvipsitta porphyrocephala*	V	–	Avifauna
Little Lorikeet	*Parvipsitta pusilla*	V	–	Avifauna
Plains-wanderer	*Pedionomus torquatus*	E	CE	Avifauna
Scarlet Robin	*Petroica boodang*	V	–	Avifauna
Flame Robin	*Petroica phoenicea*	V	–	Avifauna

Common name	Scientific name	BC Act status	EPBC Act status	Fauna type
Regent Parrot (eastern)	*Polytelis anthopeplus monarchoides*	E	V	Avifauna
Superb Parrot	*Polytelis swainsonii*	V	V	Avifauna
Grey-crowned Babbler	*Pomatostomus temporalis temporalis*	V	–	Avifauna
Redthroat	*Pyrrholaemus brunneus*	V	–	Avifauna
Speckled Warbler	*Pyrrholaemus sagittatus*	V	–	Avifauna
Australian Painted Snipe	*Rostratula australis*	E	E	Avifauna
Diamond Firetail	*Stagonopleura guttata*	V	V	Avifauna
Freckled Duck	*Stictonetta naevosa*	V	–	Avifauna
Common Greenshank	*Tringa nebularia*	E	E, M	Avifauna
Masked Owl	*Tyto novaehollandiae*	V	–	Avifauna
Eastern Pygmy-possum	*Cercartetus nanus*	V	–	Mammals
Large-eared Pied Bat	*Chalinolobus dwyeri*	V	E	Mammals
Little Pied Bat	*Chalinolobus picatus*	V	–	Mammals
Spotted-tailed Quoll	*Dasyurus maculatus*	V	E	Mammals
Eastern False Pipistrelle	*Falsistrellus tasmaniensis*	V	–	Mammals
Large Bent-winged Bat	*Miniopterus orianae oceanensis*	V	–	Mammals
Southern Myotis	*Myotis macropus*	V	–	Mammals
Corbens Long-eared Bat	*Nyctophilus corbeni*	V	V	Mammals
Yellow-bellied Glider	*Petaurus ausralis*	V	V	Mammals
Squirrel Glider	*Petaurus norfolcencis*	V	–	Mammals
Squirrel Glider in the Wagga Wagga LGA	*Petaurus norfolcensis* – endangered population	E	–	Mammals
Brush-tailed Rock-wallaby	*Petrogale penicillata*	E	V	Mammals
Brush-tailed Phascogale	*Phascogale tapoatafa*	V	–	Mammals

Common name	Scientific name	BC Act status	EPBC Act status	Fauna type
Koala	*Phascolarctos cinereus*	E	E	Mammals
Grey-headed Flying-fox	*Pteropus poliocephalus*	V	V	Mammals
Yellow-bellied Sheath-tailed Bat	*Saccolaimus flaviventris*	V	–	Mammals
Inland Forest Bat	*Vespadelus baverstocki*	V	–	Mammals
Pink-tailed Legless Lizard	*Aprasia parapulchella*	V	V	Reptiles
Striped Legless Lizard	*Delma impar*	V	V	Reptiles
Grey Snake	*Hemiaspis damelii*	E	E	Reptiles
Western Blue-tongued Lizard	*Tiliqua occipitalis*	V	–	Reptiles
Keys Matchstick Grasshopper	*Keyacris scurra*	E	E	Invertebrates
Golden Sun Moth	*Synemon plana*	V	V	Invertebrates

2.6.3 Field surveys

Targeted seasonal surveys and habitat assessments have been undertaken for threatened fauna species, species credit species and EPBC Act listed species, species with potential habitat within the subject land. Targeted threatened fauna surveys were undertaken in 2024 and 2025, with the survey periods outlined in Table 2.8.

Table 2.8 Threatened fauna survey periods

Date		Target species	Number of ecologists	Survey repetition
2024	29 Jan – 06 Feb	Southern Bell Frog, Southern Myotis	2	6
	19 Feb – 22 Feb	Southern Bell Frog, Barking Owl, Masked Owl, Brown Treecreeper, Southern Myotis, Koala	2	4
	03 Apr – 05 Apr	Squirrel Glider, Brush-tailed Phascogale (camera placement)	2	3
	15 Apr – 18 Apr	Squirrel Glider, Brush-tailed Phascogale	2	3
	07 May – 09 May	Squirrel Glider, Brush-tailed Phascogale (camera collection)	2	3
	19 Aug – 26 Aug	Sloane's Froglet, Bush Stone-Curlew, White-bellied Sea-eagle, Black-breasted Buzzard, Little Eagle, Pink Cockatoo, Square-tailed Kite, Barking Owl, Superb Parrot, Masked Owl, Brown Treecreeper, Koala	4	8

Date		Target species	Number of ecologists	Survey repetition
	01 Oct – 08 Oct	Australian Bustard, White-bellied Sea-eagle, Black-breasted Buzzard, Little Eagle, Pink Cockatoo, Square-tailed Kite, Superb Parrot, Brown Treecreeper, Squirrel Glider, Brush-tailed Phascogale, Pink-tailed Worm-lizard	4	8
	26 Nov	Plains-wanderer	4	1
2025	27 Jan – 31 Jan	Southern Bell Frog, Grey Snake	2	4
	03 Feb – 07 Feb	Koala and Grey Snake	2	4
	17 Feb – 21 Feb	Southern Myotis (anabat placement)	2	4
	24 Feb – 27 Feb	Plains-wanderer	6	3
	24 Feb – 27 Feb	Network augmentation works component habitat assessment Booroolong Frog, Gang-gang Cockatoo, South-eastern Glossy Black-Cockatoo, Striped Legless Lizard	2	4
	05 Apr –10 Apr	Bush Stone-curlew, Barking Owl, Masked Owl	2	6
	09 Apr –14 Apr	Bush Stone-curlew, Barking Owl, Masked Owl	2	6

Threatened fauna surveys completed within the subject land were carried out as described below and where applicable, in accordance with the methodology detailed in:

- NSW Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (Working Draft) (Department of Environment and Conservation 2004)
- *Survey Guidelines for Australia's Threatened Birds* (Department of the Environment, Water, Heritage and the Arts 2010b)
- Threatened Species Survey and Assessment Guidelines: field survey and methods for fauna. Amphibians (Department of Environment and Climate Change 2009)
- *Survey guidelines for Australia's threatened frogs* (Department of the Environment, Water, Heritage and the Arts 2010c)
- *Survey guidelines for Australia's threatened reptiles* (Department of the Environment, Water, Heritage and the Arts 2011)
- *'Species credit' threatened bats and their habitats* (State of NSW and EH 2018)
- *NSW Survey Guidelines for threatened frogs* (DPIE 2020b)
- *Threatened Species Profile Database* (Science 2024).
- Koala (Phascolarctos cinereus) Biodiversity Assessment Method Survey Guide (DPE 2022).

This section outlines the fauna survey effort that has currently been completed for candidate species based on the species likely to occur, as identified by the BAM-C.

2.6.3.1 Diurnal bird surveys

Formal diurnal bird surveys were completed within the subject land targeting the following species:

- Australian Bustard (*Ardeotis australis*)
- White-bellied Sea Eagle (*Haliaeetus leucogaster*)
- Black-breasted Buzzard (*Hamirostra melanosternon*)
- Little Eagle (*Hieraaetus morphnoides*)
- Pink Cockatoo (*Lophochroa leadbeateri*)
- Square-tailed Kite (*Lophoictinia isura*)
- Superb Parrot (*Polytelis swainsonii*)
- Brown Treecreeper (*Climacteris picumnus victoriae*).

The survey method for these species was selected through consultation with the *Survey Guidelines for Australia's Threatened Birds* (Department of the Environment, Water, Heritage and the Arts 2010b). The most appropriate method recommended by the guidelines to survey for the combined list of targeted species was the '20-minute search' method (Loyn 1986). This method consisted of ecologists working in pairs actively walking through the nominated survey site within an 80-metre radius of the survey point for a total of two hectares, over a period of 20 minutes.

All birds were identified to the species level, either through direct observation or identification of calls. Diurnal bird surveys were completed during different times of the day but generally occurred during morning hours or evening to coincide with the highest levels of bird activity. Birds were also recorded opportunistically during other on-site surveys.

Wherever threatened bird species were absent from the site, habitat assessments were conducted to determine the likelihood that the investigation area might support those species that are known to occur in the region.

Opportunistic observation was used to identify any large stick nests in the canopy of large trees, with these stick nests consequently becoming the focus of further observational periods for threatened bird species (e.g. Little Eagle, White-bellied Sea-eagle, Square-tailed Kite). Where no bird was observed using the nest, the surrounding area beneath was searched for distinguishing features including feathers and/or prey remains to determine the species occupying the stick nest.

Fifty-six formal diurnal bird surveys have been undertaken on the subject land throughout 2024. The location of diurnal bird survey sites is shown in Figure 15.7 with survey periods outlined in Table 2.8.

2.6.3.2 Nocturnal bird surveys

Formal nocturnal bird surveys were completed within the subject land targeting the following species:

- Bush Stone-curlew (*Burhinus grallarius*)
- Barking Owl (*Ninox connivens*)
- Masked Owl (*Tyto novaehollandiae*).

Habitat assessments carried out in associated PCTs, applying knowledge of known species habitat requirements, informed the decision of survey locations for nocturnal threatened nocturnal bird species. For Barking Owl (*Ninox connivens*) and Masked Owl (*Tyto novaehollandiae*), this included areas containing large trees with hollows of above 20 centimetres diameter occurring at least 4 m above ground. For Bush Stone-curlew (*Burhinus grallarius*), suitable habitat included areas of open forests and woodlands with a sparse grassy ground layer and fallen timber.

Targeted surveys for these species were then undertaken within appropriate habitat to survey for nocturnal threatened birds. The survey method for these species was selected through consultation with the *Survey Guidelines for Australia's Threatened Birds* (Department of the Environment, Water, Heritage and the Arts 2010b). These guidelines recommended the use of broadcast surveys (i.e. call playback) and spotlighting for nocturnal birds of prey. Call playback is also recommended as a survey method for Bush Stone-Curlew (Department of Environment and Conservation, 2006).

For each survey, an initial listening period of 10 to 15 minutes was undertaken. The calls of the target species were then broadcast at 20 per cent of natural volume for 15 seconds each, followed by at least 30 seconds' listening time. This broadcast/listening sequence was repeated for 15 minutes per species, with volume increased at each repeat until broadcast reached 200 per cent of natural volume.

Following call playback, spotlighting was undertaken within a one hectare circular plot of the survey point to search for any birds that had been attracted by the call broadcast but had not vocalised in response. Spotlighting included searching overhead for any owls that may be flying or circling above the canopy. Spotlighting was undertaken for at least 15 minutes at each site.

Forty-eight nocturnal targeted surveys were conducted over six consecutive nights in 2024, noting that heavy rain prevented safe access to some survey locations on the fifth and sixth nights. An additional 36 surveys were conducted in 2025 across two teams over six consecutive nights.

2.6.3.3 Plains-wanderer

Suitable habitat for the Plains-wanderer, according to the National Recovery Plan for the species, consists of sparse, treeless, species-rich, low-chenopod density lowland native grasslands (Commonwealth of Australia, 2016). The composition of habitat is approximately 50 per cent bare ground, 40 per cent herbs and grasses and 10 per cent fallen litter, with grass tussocks spaced around 10–20 centimetres apart. Most vegetation is less than five centimetres in height with some widely spaced plants up to 30 centimetres high present. These grasslands usually occur on hard, red-brown clay soils that do not support dense pasture growth under most conditions.

Suitable habitat was mapped according to the species' known habitat preferences with floristic structure, soil type and bare ground cover the most important determinants of habitat suitability (DPIE 2020). Areas of mapped important habitat were not targeted as presence is assumed for these areas; however, areas with similar floristic structures to these mapped habitats were identified throughout the subject land.

While Plains-wanderer forages diurnally, it is highly cryptic, does not flush readily like other grassland birds, and is difficult to detect unless almost stepped on. Detectability increases at night when the species is roosting and more easily observed under spotlights.

Surveys (November 2024 and February 2025) were undertaken per *Survey guidelines for Australia's threatened birds* in consultation with species expert David Parker from (CPHR). Surveys comprised grids of 10 transects, up to one kilometre long and each spaced 50 metres apart, in areas of suitable habitat with sub-optimal secondary habitat patches. Transects were traversed slowly by vehicle (less than 10 kilometres/hour), with two ecologists spotlighting from the vehicle looking for disturbed birds within 20 metres of the vehicle. Each grid survey took around two hours, and each grid was surveyed for two nights, as the likelihood of detecting the species is highest in the first two nights of survey if it is present.

2.6.3.4 Koala Spotlighting

Spotlighting for Koala was undertaken in suitable habitat throughout the subject land. Spotlighting surveys were undertaken in accordance with *Koala (Phascolarctos cinereus): Biodiversity Assessment Method Survey Guide* (DPE 2022) with two transects (each minimum 200 metres) spotlighted per five hectares habitat within the subject land. Transects were placed 100 metres apart to reduce the chance of overlap between observers and surveyed at a rate of 10 metres/minute. Each spotlighting site was surveyed for at least two consecutive nights in January and February 2025. Additional opportunistic spotlighting surveys for Koala were undertaken during nocturnal bird surveys and general fauna spotlighting (as described below).

2.6.3.5 Microchiropteran bat surveys

Formal microchiropteran bat surveys were completed within the subject land targeting the following species:

- Corben's Long-eared Bat (*Nyctophilus corbeni*)
- Southern Myotis (*Myotis Macropus*)
- Large Bent-winged Bat (*Miniopterus orianae oceanensis*)
- Large-eared Pied Bat (*Chalinolobus dwyeri*).

Ultrasonic Anabat bat detection (Titley Electronics) was used to record and identify the echolocation calls of micro bats foraging across a number of native vegetation communities in the subject land, targeting the following threatened Southern Myotis (*Myotis macropus*).

Passive monitoring of survey sites was achieved by setting Anabat bat detectors in areas of suitable habitat to record continuously overnight. Suitable habitat was identified using mapping of associated PCTs, location of records and known habitat requirements for the species (see Chapter 5). Anabats were placed to maximise the detection of threatened bats; this included a mixture of devices facing the river to detect bats foraging for insects over the water, and devices facing towards riparian woodland habitat to detect bats foraging adjacent to the river. Passive Anabat bat call analysis results can be found in Appendix G.

Although many microchiropteran bat species are detectable through use of Anabat call detection methodologies, the vocal differences between some species are too subtle to reliably differentiate between the various species occurring in a particular locality (e.g. Corben's Long-eared Bat). Therefore, harp trapping was also completed for capture and release of targeted microchiropteran threatened bat species. Site selection for the setting of harp traps included a number of rationales, such as targeting of those habitat areas where hollow-bearing trees provide potential roosting sites and where suitable flyways were detected. Habitat within 200 metres of permanent waterbodies three metres or wider was selected to target certain species (e.g., Southern Myotis), and sites with suitable tree hollows and crevices present were selected to detect other species (e.g., Corben's Long-eared Bat) (OEH 2018). Four 4m^2 double bank harp traps were set at survey locations for a four consecutive night period, with surveys conducted in calm and hot, warm, or mild weather conditions to increase the likelihood of bat activity (State of NSW and OEH 2018). Captured bats were identified to species level, sexed, measured and weighed. Bats were released immediately after processing during dark conditions.

Four consecutive nights of harp trapping totalling 16 trap nights and 49 trap nights of passive Anabat recording were undertaken across the subject land in 2024. The location of microchiropteran bat survey sites is shown in Figure 15.7 with survey periods outlined in Table 2.9.

Table 2.9 Harp and Anabat trap nights

Trap type	Trap number	Location	Trap nights	Dates
Harp trap	1	Edward River east	4	19/02/2024 – 22/02/2024
Harp trap	2	Edward River west	4	19/02/2024 – 22/02/2024
Harp trap	3	Wakool River east	4	19/02/2024 – 22/02/2024
Harp trap	4	Wakool River west	4	19/02/2024 – 22/02/2024
Anabat	2	Wakool River west	7	30/01/2024 – 6/02/2024
Anabat	1	Wakool River centre	7	30/01/2024 – 6/02/2024
Anabat	3	Wakool River east	7	30/01/2024 – 6/02/2024
Anabat	AB2	Wakool River west	4	19/02/2024
Anabat	AB3	Wakool River centre	4	19/02/2024

Trap type	Trap number	Location	Trap nights	Dates
Anabat	Mel 1	Wakool River east	4	19/02/2024
Anabat	AB1	Edward River west (far)	4	19/02/2024
Anabat	Mel 2	Edward River west	4	19/02/2024
Anabat	Mel 3	Edward River east	4	19/02/2024
Anabat	AB4	Edward River east (far)	4	19/02/2024
Anabat	–	PCT 15 – Ephemeral creek	4	17/02/2025 – 21/02/2025
Anabat	–	PCT 15 – Irrigation channel	4	17/02/2025 – 21/02/2025

2.6.3.6 Remote cameras

Remote motion sensing infra-red cameras were used as a survey method, in place of terrestrial and arboreal traps, due to increased potential for fauna to be attracted to baited traps with a high likelihood of the specimen being photographed (unharmed), as compared to the lesser successful and more dangerous traditional trapping methods. Each species recorded on each camera was identified (threatened and non-threatened) and if the target species could not be identified in the first instance, the imagery was viewed by the species expert. Remote camera traps were used to survey for the following targeted threatened species:

- Squirrel Glider (*Petaurus norfolcensis*)
- Brush-tailed Phascogale (*Phascogale tapoatafa*).

Suitable habitat was identified using mapping of associated PCTs, location of records and known habitat requirements for the species. Remote camera traps were set in trees (at minimum heights of 1.5–2 metres) in areas of suitable habitat with a suitable baited food source used to entice a range of target species within the appropriate microhabitat. Bait contained a mix of rolled oats, peanut butter, golden syrup and truffle oil and target trees were sprayed with a five to one:1 water to honey solution to attract nectivorous mammals. Baits were replaced after two weeks of camera trap deployment to ensure they remained attractive for the life of the survey.

Forty-four cameras were installed across 13 sites for a total of 3,349 trap nights across the subject land. Cameras were installed for a minimum of four weeks from early April to early May. A total of 16 cameras remained on site due to access restrictions, these cameras were collected in early September and October. In addition to the camera trapping, a site assessment of the project was undertaken by the species expert and the results of this can be found in Appendix I. No further trapping was undertaken for the project.

The location of remote camera survey sites is shown in Figure 15.7.

2.6.3.7 Squirrel Glider

In addition to the presence of suitable hollows as described above, the following characteristics were used to assess the suitability of habitats on site for Squirrel Glider (*Petaurus norfolcensis*):

- presence and abundance of *Acacia* species of more than two metres in height, and presence of other tall flowering shrubs such as *Callistemon* and *Banksia*
- the diversity and abundance of different *Eucalypt* species, as Squirrel Glider have a preference for mixed Eucalypt woodland with trees flowering at different times of year.

2.6.3.8 Opportunistic habitat assessment

Habitat Assessments were carried out opportunistically in areas where suitable habitat was observed. Opportunistic Habitat Assessments includes recording suitable threatened species habitat where encountered within the subject land. For example, stick nests for threatened raptors or tree hollows for threatened owls and mammals. This assessment approach provides survey flexibility to cover the extent of suitable habitat within the subject land.

2.6.3.9 Hollow-dependent threatened birds and small mammals habitat assessment

To assess the potential for hollow-dependent threatened bird/small mammal species to be present on site, all trees were assessed for the presence of hollows. Trees identified to contain hollows were recorded with the following information recorded:

- tree species and tree height
- hollow dimensions, and
- hollow height and position on tree.

Information was used to assess the suitability for various threatened hollow-dependent species is shown in Table 2.10.

Table 2.10 Important characteristics for threatened hollow-dependent species

Hollow size	Height above ground	Tree characteristics	Potential occupant
~ 5 cm	N/A	Eucalyptus, Acacia and other Mid-Storey flowering trees/shrubs.	Squirrel Glider or Phascogale.
> 5 cm	> 4 m or DBH > 30 cm	*E. blakelyi, E. melliodora, E. albens, E. camaldulensis, E. microcarpa, E. polyanthemos, E. mannifera, E. intertexta, E. bridgesiana*	Superb Parrot
> 7 cm	> 3 m	Eucalypts	Gang-gang cockatoo
> 15 cm	> 8 m	Eucalypts	South-eastern Glossy-black Cockatoo
> 20 cm	> 4 m	Any large tree.	Masked Owl, Barking Owl.

2.6.3.10 Herpetofauna active searches: amphibians

The *NSW Survey Guide for Threatened Frogs: a guide for the survey of threatened frogs and their habitats for the Biodiversity Assessment Method* (DPIE 2020) was used as the basis for the survey methodology conducted within the Subject Land. The prescribed methodology was followed to confidently determine the presence or absence of the species within the subject land and to map the extent of potential species habitat as a species polygon.

The amphibians species targeted during the Herpetofauna surveys include:

- Southern Bell Frog (*Litoria raniformis*)
- Sloane's Froglet (*Crinia sloanei*)
- Booroolong Frog (*Litoria booroolongensis*).

Habitat assessments for the three amphibians were undertaken as part of diurnal active searches to determine survey locations with optimal habitat conditions prior to commencement of nocturnal surveys.

Once the survey locations were determined, the nocturnal surveys recorded threatened and non-threatened amphibians. The survey results of the species recorded can be found in Appendix H. Nine nights of targeted Southern Bell Frog surveys have been undertaken across the subject land to date, with an additional 11 opportunistic active surveys undertaken. Two Sloane's Froglet surveys have been undertaken. A habitat assessment was completed for Booroolong Frog. The location of active herpetofauna searches is shown in Figure 15.7 with survey periods outlined in Table 2.8.

Southern Bell Frog

Nocturnal targeted surveys for Southern Bell Frog involved a combination of call playback and active searching/ spotlighting for eyeshine or observable movement. Surveys were undertaken within suitable habitat along the project footprint where it intersected with waterbodies such as rivers (Edward, Wakool, Murray), creeks (Yarrein), and irrigation channels (near permanent creeks and rivers), particularly waterbodies with permanent water, emergent aquatic vegetation, riparian woodlands and/or terrestrial refugia present. Watercourses that did not have permanent water were excluded from the 2025 survey program based on the survey effort in 2024 identifying a lack of suitable habitat.

Each targeted survey comprised the following:

- an initial five-minute listening period for calling male frogs with torches off
- a two-minute period of call playback, wherein alternating rounds of male Southern Bell Frog calls were broadcast via a Bluetooth speaker
- a further two-minute listening period for any call response
- active searches for 50 metres in suitable habitat along the waterbody.

This process was repeated for every 50 metres of suitable habitat or until Southern Bell Frog was located. Once Southern Bell Frog was recorded at a location, that survey site was considered to support a population of Southern Bell Frog and was subsequently excluded from further survey. Surveys were undertaken over four consecutive nights in January-February 2024 and January 2025 on warm nights with light to no breeze. While the 2024 survey period was outside the recommended window of October to January in NSW, surveys were undertaken in optimal conditions between October to February within one month of heavy rainfall (BOM 2024) per Commonwealth guidelines (DEWHA 2010c), the 2025 southern Bell frog survey were guided by the *NSW Survey Guidelines for threatened frogs* (DPIE 2020b) and were within the preferred survey period.

Several opportunistic active searches were undertaken for Southern Bell Frog in January and February 2024; these comprised spotlighting transects for a number of species along the Edward and Wakool Rivers and active searches around smaller waterbodies (e.g. irrigation channels, farm dams) supporting suitable habitat within the subject land. No call playback was undertaken as part of these searches.

Furthermore, following warm conditions and light showers in August 2024, several Southern Bell Frogs were observed on Nacurrie Road North and Balranald Road while ecologists travelled between nocturnal bird survey sites. Southern Bell Frog were subsequently opportunistically recorded during spotlighting transects in riparian habitat in the subject land on three consecutive nights.

Sloane's Froglet

Nocturnal targeted surveys for Sloane's Froglet involved a combination of call playback and active searches as recommended in the *NSW Survey Guide for Threatened Frogs: a guide for the survey of threatened frogs and their habitats for the Biodiversity Assessment Method* (Department of Planning, Industry and Environment 2020). Areas of suitable habitat were identified using a combination of associated PCT mapping, assessment of record locations and known specific habitat requirements, i.e. still or very slow sections of permanent and temporary streams as well as pools (e.g. farm dams) with vegetation located on the subject land.

Surveys were undertaken at a dry shallow depression in PCT 237 at Edward River. Each survey comprised 10 minutes of listening for calling froglets, five minutes of repeated call playback and listening for responses, followed by 15 minutes of active searching and continued listening for any calling froglets. Surveys were undertaken over two consecutive nights in August, though incidental listening was done for a further four nights as nocturnal bird surveys were undertaken at the same location.

2.6.3.11 Booroolong Frog habitat assessment

A habitat assessment for the Booroolong Frog was undertaken in February 2025. Booroolong Frog (*Litoria booroolongensis*) habitat consists of permanent rocky streams that only ever dry to pools. Habitat assessments for Booroolong Frog therefore involved the identification of any permanent water bodies on site and, where present, recording relevant features such as bank erosion, water turbidity, presence/absence of *Typha*, algae and native aquatic species, and presence of frog calls. Photographs were also taken. These characteristics were then used to assess the suitability of habitats on site for Booroolong Frog and is presented in Chapter 5.

2.6.3.12 Herpetofauna active searches: Grey Snake

Grey Snake (*Hemiaspis damelii*) was listed under the EPBC Act in October 2022, and in the BC Act in 2023. Due to this recent listing of the species, prescribed survey methodology has not yet been established in Commonwealth and NSW survey guidelines. A literature review was undertaken to determine the most comprehensive survey, with the methodology outlined in BioNet adapted from the work of Michael *et al*., 2023 – *"Finding Ngabi (*Hemiaspis damelii*): factors affecting the use of modified floodplain wetlands by an endangered snake selected as the most suitable."*

This methodology involved active spotlight surveys along shoreline transects and adjacent woodland after sunset in areas with a suitable prey population (frogs) and potential Grey Snake habitat, defined as cracking clay and woodland. Spotlighting involved the use of a head lamp or hand-held spotlight, scanning the ground for individuals along a transect. Transects are typically 250 metres long within "potential habitat", however for potential habitat less than 250 metres surveys were conducted for 30 minutes at a site which included searches of the shoreline up banks and in adjacent vegetation. Survey effort constituted 30 minutes of active searching, and where available ground cover such as logs, leaf litter and soil cracks were inspected.

Grey snake spotlighting and active searching surveys were conducted over a period of four consecutive nights in January 2025, and a further four consecutive nights in February 2025.

2.6.3.13 Striped Legless Lizard (Delma impar) and Pink-tailed Legless Lizard (*Aprasia parapulchella*)

Habitat assessments for threatened reptile species Striped Legless Lizard (*Delma impar*) and Pink-tailed Legless Lizard (*Aprasia parapulchella*) were carried out in February 2025. For Pink-tailed Legless Lizard (PTLL), this involved the identification of suitable habitat within PCT 319. Habitat includes areas within 50 m of well drained, rocky outcrops or scattered, partially buried rocks. Current or previously inhabited black ant and termite nests are also habitat for PTLL even in non-rocky areas.

Suitable habitat for Striped Legless Lizard typically includes grassland dominated by perennial, tussock-forming grasses such as Kangaroo Grass (*Themeda australis)*, spear-grasses (*Austrostipa* spp.), *Poa* tussocks and occasionally wallaby grasses (*Austrodanthonia* spp.).

Habitat deemed suitable for either species was mapped and is presented in Chapter 5.

2.6.3.14 Invertebrates

Habitat assessments for threatened invertebrates Golden Sun Moth (*Synemon plana*) and Keys Matchstick Grasshopper (*Keyacris scurra*) were carried out based on the following requirements:

- Keys Matchstick Grasshopper: typically found in native grasslands and grassy woodlands but can also be found in other vegetation types containing native grassland understorey (particularly with *Themeda triandra*) and known food plants (particularly within the Asteraceae family).
- Golden Sun Moth: occurs in grasslands dominated by Wallaby grass (*Rytidosperma*), Speargrass (*Austrostipa*) or Chilean needlegrass (*Nassella neesiana*), with bare ground between tussocks considered to be an important feature. Geographically limited to the south of the Mid-Western Highway.

Further assessment of suitable habitat for each species is provided in Chapter 5.

2.6.3.15 Opportunistic sightings

Opportunistic sightings of animals were recorded including birds, mammals, frogs, and reptiles throughout all survey periods. Opportunistic spotlighting was also carried out during nocturnal surveys. Evidence of animal activity, such as scats, diggings, scratch marks, nests/dreys, burrows etc., was noted. This provided indirect information on animal presence and activity. Incidental species sightings are found in Appendix H.

2.7 Aquatic habitat assessment methods

The following tasks were completed to inform the aquatic assessment:

- a desktop review and collation of publicly available data, including national and state databases and publicly available reports on the Murray-Darling Basin
- a review of applicable legislation and policy for assessing aquatic ecology, particularly the requirements set out in *Policy and Guidelines for Fish Habitat Conservation and Management (Update 2013)* (DPI, 2013) used to protect aquatic habitats
- an assessment of potential threatened species and ecological communities that may be present within the study area
- an assessment of potential impacts of the project on the aquatic sensitive receptors (including threatened aquatic species and communities and key fish habitat during both construction and operation)
- identification of project mitigation measures, during both construction and operation, to address any potential impacts of the project to aquatic ecology.

The assessment of aquatic habitats has been conducted in reference to both Commonwealth legislations and NSW legislation and policies. Such legislation includes the EPBC Act 1999, and *Fisheries Management Act 1994* (FM Act), specifically relating to the conservation of threatened species, populations and ecological communities as well as the conservation of biological diversity.

A search of publicly available databases was conducted to identify aquatic ecology values present within the subject land. The following publicly available databases were accessed in January 2025:

- Fisheries Spatial Data Portal (DPI, 2025)
- EPBC Act (Cth) protected matters search tool (DCCEEW, 2025)
- Atlas of Living Australia (Atlas of Living Australia, 2025)
- GDE atlas (Bureau of Meteorology (BOM), 2025) (only river base flow GDEs are included in this report).

The aquatic habitats within the subject land were assessed against relevant policies and guidelines for fish habitat conservation and management. Further, assessments were conducted on the likelihood of occurrence of threatened aquatic fauna species and significant aquatic habitats.

Further details of aquatic habitat assessment methodology is included in Appendix M.

2.8 Weather conditions

Weather conditions during targeted threatened fauna surveys can impact the likelihood of identifying certain threatened species on site (for example, frogs are more active during wet, rather than dry conditions). As a result, recording weather conditions can be an essential element of determining the presence of threatened fauna species on site. Table 2.11 outlines the environmental conditions experienced during targeted threatened fauna surveys on the subject land.

Table 2.11 Weather conditions during threatened fauna surveys

Survey undertaken (e.g. method/ targeted species)	Date	Survey period	Temperature min. & max. (°C)		Wind (km/h) & direction at 3 pm	Rainfall (mm) since 9 am	Other relevant conditions		
							Relative humidity %	Cloud cover %	Moon phase
Targeted Southern Bell Frog Survey									
Call Playback and Spotlighting	Previous month	N/A				106.6	N/A		
	30/01/2024	Summer	16.5*	35.4*	7 E*	0	28*	-	Waning gibbous 82% (moonrise 23:01)
	31/01/2024	Summer	13.2*	30.3*	20 SSW*	0	26*	-	Waning gibbous 74% (moonrise 23:23)
	01/02/2024	Summer	13.9*	33.4*	20 SW*	0	23*	0+	Not risen at time of survey
	02/02/2024	Summer	14.4*	31.3*	17 SSW*	0	28*	0+	Not risen at time of survey
	27/01/2025	Summer	20.0*	43.9*	28 NNW*	0*	15*	0+	Not risen at time of survey
	28/01/2025	Summer	17.7*	31.9*	24 SSW*	0*	22*	0+	Not risen at time of survey
	29/01/2025	Summer	12.2*	30.9*	20 SW*	0*	18*	0+	Not risen at time of survey
	30/01/2025	Summer	10.9*	30.4*	13 SE*	0*	20*	0+	Not risen at time of survey

Survey undertaken (e.g. method/ targeted species)	Date	Survey period	Temperature min. & max. (°C)		Wind (km/h) & direction at 3 pm	Rainfall (mm) since 9 am	Other relevant conditions		
							Relative humidity %	Cloud cover %	Moon phase
Targeted Bat Survey									
Anabat	30/01/2024	Summer	16.5*	35.4*	7 E*	0	28*	N/A	
	31/01/2024	Summer	13.2*	30.3*	20 SSW*	0	26*		
	01/02/2024	Summer	13.9*	33.4*	20 SW*	0	23*		
	02/02/2024	Summer	14.4*	31.3*	17 SSW*	0	28*		
	03/02/2024	Summer	12.8*	36.2*	13 NW*	0	19*		
	04/02/2024	Summer	17.0*	40.5*	28 NW*	0	14*		
	05/02/2024	Summer	22.7*	31.9*	22 WSW*	0	31*		
	06/02/2024	Summer	12.0*	27.4*	24 S*	0.8*	25*		
	19/02/2024	Summer	13.5*	33.7*	15 SSW*	0	19		
	20/02/2024	Summer	13.2*	34.7*	9 N*	0	19*		
	21/02/2024	Summer	18.0*	35.6*	22 NNE*	0	31*		
	22/02/2024	Summer	22.3*	41.6*	30 NW*	0	19		
	17/02/2025	Summer	8.3*	27.4*	9 ENE*	0	23		
Bat Trapping	19/02/2024	Summer	13.5*	33.7*	15 SSW*	0	19	N/A	
	20/02/2024	Summer	13.2*	34.7*	9 N*	0	19*		
	21/02/2024	Summer	18.0*	35.6*	22 NNE*	0	31*		
	22/02/2024	Summer	22.3*	41.6*	30 NW*	0	19*		
	23/02/2024	Summer	16.6*	26.2*	31 SW*	0	32*		
Remote camera survey									
Remote camera deployment	03/04/2024	Autumn	7.6*	20.4*	11 SSW*	0	51*	N/A	
	04/04/2024	Autumn	8.9*	22.5*	19 SSE*	0	37*		
	05/04/2024	Autumn	11.2^	21.5^	15 NNW*	0	68*		
	16/04/2024	Autumn	8.4*	24.4*	17 WSW*	0	38*		

Survey undertaken (e.g. method/ targeted species)	Date	Survey period	Temperature min. & max. (°C)		Wind (km/h) & direction at 3 pm	Rainfall (mm) since 9 am	Other relevant conditions		
							Relative humidity %	Cloud cover %	Moon phase
Nocturnal Bird Survey									
Call playback and spotlighting	21/08/2024	Winter	6.3^	16.9^	17 W^	0.2^	75^	70+	Waning gibbous 96% (moonrise 19:30)
	22/08/2024	Winter	6.8^	21.2^	13 WNW^	0.0^	49^	5+	Waning gibbous 90% (moonrise 20:43)
	23/08/2024	Winter	4.8^	23.6^	28 NNE^	0.0^	39^	95+	Waning gibbous 81% (moonrise 21:56)
	24/08/2024	Winter	12.4^	26.8^	17 W^	0.0^	18^	100+	Waning gibbous 72% (moonrise 23:11)
	25/08/2024	Winter	12.8^	23.5^	35 N^	0.0^	74^	70+	Not risen at time of survey
	26/08/2024	Winter	5.8^	19.0^	20 WNW^	11.8^	61^	10+	Not risen at time of survey
	05/04/2025	Autumn	9.3	21.4	17 WSW	0.0^	80	0+	52.9% (moonrise 2:20 pm)
	06/04/2025	Autumn	7.1	23.7	28 W	0.0^	58	0+	63.6% (moonrise 2:57 pm)
	07/04/2025	Autumn	9.4	21.9	17 S	0.0^	65	0+	73.5% (moonrise 3:27 pm)
	08/04/2025	Autumn	6.6	22.4	15 SSW	0.0^	64	0+	82.0% (moonrise 3:54 pm)
	09/04/2025	Autumn	5.5	23.9	13 NW	0.0^	64	0+	89.1% (moonrise 4:18 pm)
	10/04/2025	Autumn	9.6	29.0	9 WNW	0.0^	42	0+	94.4% (moonrise 4:41 pm)
	11/04/2025	Autumn	12.5	32.4	11 NNW	0.0^	46	0+	98.1% (moonrise 5:05 pm)
	12/04/2025	Autumn	11.7	33.5	0	0.0^	51	0+	99.8% (moonrise 5:29 pm)
	13/04/2025	Autumn	13.6	32.8	9 NE	0.0^	42	0+	Moon does not pass meridian.
	14/04/2025	Autumn	13.4	33.5	19 SW	0.0^	40	0+	99.6% (moonrise 6:26 pm)

Survey undertaken (e.g. method/ targeted species)	Date	Survey period	Temperature min. & max. (°C)		Wind (km/h) & direction at 3 pm	Rainfall (mm) since 9 am	Other relevant conditions		
							Relative humidity %	Cloud cover %	Moon phase
Targeted Sloane's Froglet survey									
Call playback and aural survey	21/08/2024	Winter	15.0+		4 W+	0	66+	85+	Not risen at time of survey
	22/08/2024	Winter	13.0+		Still+	0	73+	0	
Diurnal bird survey									
20 min 2 ha diurnal survey	19/08/2024	Winter	2.5*	20.2*	17 NNE*	0	48*	10+	N/A
	20/08/2024	Winter	8.3^	20.8^	26 NE^	0	66^	80+	
	21/08/2024	Winter	8.0*	19.7*	28 WNW*	1.8*	53*	70+	
	24/08/2024	Winter	12.4^	26.8^	17 W^	0	18^	100+	
	26/08/2024	Winter	5.8^	19.0^	20 WNW^	11.8^	61^	10+	
	01/10/2024	Spring	5.1^	23.5^	22 SE^	0	34^	5+	
	02/10/2024	Spring	4.5^	24.7^	11 NNE^	0	25^	0+	
	03/10/2024	Spring	9.7^	28.6^	22 NNE^	0	25^	0+	
	04/10/2024	Spring	15.6^	31.3^	39 NW^	0.2^	55^	70+	
	05/10/2024	Spring	7.5^	24.7^	30 WNW^	0.2^	29^	80+	
	06/10/2024	Spring	8.3^	25.1^	26 W^	0	35^	90+	
	07/10/2024	Spring	7.2*	26.0*	28 SW*	0	43*	10+	
	08/10/2024	Spring	3.0*	19.3*	20 S*	0	27*	5+	
Targeted Plains-wanderer survey									
Vehicle-based spotlighting	26/11/2024	Spring	19.7^	36.9^	24 NW^	13.0^	30^	90+	Not risen at time of survey
	25/02/2025	Summer	12.1^	37.8^	7 NNW^	0^	9^	0+	Not risen at time of survey
	26/02/2025	Summer	17.8^	39.5^	26 WSW^	0^	8^	0+	Not risen at time of survey
	27/02/2025	Summer	16.4^	38.6^	19 W^	0^	12^	20+	Not risen at time of survey

Survey undertaken (e.g. method/ targeted species)	Date	Survey period	Temperature min. & max. (°C)		Wind (km/h) & direction at 3 pm	Rainfall (mm) since 9 am	Other relevant conditions		
							Relative humidity %	Cloud cover %	Moon phase
Grey Snake and Koala survey									
Spotlighting	27/01/2025	Summer	20.0*	43.9*	28 NNW	0*	15*	0+	Not risen at time of survey
	28/01/2025	Summer	17.7*	31.9*	24 SSW	0*	22*	0+	Not risen at time of survey
	29/01/2025	Summer	12.2*	30.9*	20 SW	0*	18*	0+	Not risen at time of survey
	30/01/2025	Summer	10.9*	30.4*	13 SE	0*	20*	0+	Not risen at time of survey
	03/02/2025	Summer	22.8*	37.3*	19 N*	7.2*	28*	Cloudy	Waxing crescent 29% (moonset 23:12)
	04/02/2025	Summer	21.7*	39.9*	11 NW*	23.6*	25*	Clear	Waxing crescent 40% (moonset 23:43)
	05/02/2025	Summer	17.9*	34.0*	11 SE*	0.6*	40*	Clear	First quarter 51%(moonset 00:18)
	06/02/2025	Summer	17.2*	39.2*	11 NNW*	0*	27*	Clear	Waxing gibbous 63% (moonset 01:00)

(*) Weather Data: Swan Hill Aerodrome Station 077094

(^) Weather Data: Hay Airport Station 075019

(+) Weather data taken at time of survey

2.9 Limitations

2.9.1 Plant Community Type allocation and mapping

Plant communities are naturally variable. The boundaries between different PCTs in the subject land overlap considerably with a gradual transition from one community to another. Broad ecotones are present in many cases and sharp boundaries between PCTs, and vegetation zones rarely exist. However, to map PCTs and vegetation zones a choice must be made. A hard boundary must be drawn to separate PCTs and vegetation zones. The PCTs and vegetation zones presented in this BDAR have been mapped as best as possible based on patterns observed on aerial photography and verified by observations made during the field survey (where possible).

Vegetation within the subject land and locality has been mapped at the regional scale in the NSW State Vegetation Type Map (SVTM) release C1.1.M1. This mapping data provides a guide to the occurrence and distribution of Plant Community Types, Vegetation Classes, and Vegetation Formations. As with all maps, the SVTM is subject to error including:

- PCT attribution errors
- spatial errors or omissions (e.g., gaps and slithers or mapping linework inaccuracies)
- eastern NSW PCT classification topologies differ from central and western NSW classification topologies
- some PCTs mapped as part of earlier regional coverages have since been discontinued.

These limitations were considered when using the SVTM to aid in mapping native vegetation extent within the subject land.

2.9.2 Biodiversity surveys

No sampling technique can eliminate the possibility that a species is present within the subject land. For example, some species of plant may be present in the soil seed bank and some fauna species use habitats on a sporadic or seasonal basis and may not be present on-site during surveys. The conclusions in this report are based upon previous studies, data acquired for the subject land and the biodiversity field surveys and are, therefore, indicative of the environmental condition of the subject land at the time of preparing the report, including the presence or otherwise of species. Also, it should be recognised that site conditions, including the presence of threatened species, can change with time. Ecological conditions may be modified by changing natural forces or man-made influences. This report is based on conditions which existed at the time of survey.

In assessing the subject land from a limited number of samples there is the possibility that variations may occur between sample locations. The surveys that were undertaken provide a professional estimate of the scope of investigation required to provide a general profile of the biodiversity within the subject land. The data derived from the site investigation program and any later laboratory testing are extrapolated across the subject land to form an overview and scientific opinion is made about overall conditions and their likely behaviour with regard to the proposed development. Despite the work that has been undertaken within the subject land, the actual conditions on ground might differ from those inferred to exist, since no survey program, no matter how comprehensive, can reveal all ecological details and anomalies. The mapping of plant community types and species polygons is a subjective interpretation of on ground conditions at a particular location, made by trained personnel. The interpretation may be limited by the method of investigation and cannot always be definitive.

The extent and type of biodiversity surveys undertaken in preparation of this BDAR were limited by EIS timeframe. Evolving design of various project components and location in the landscape as biodiversity surveys were being undertaken resulted in surveys being undertaken outside of the final subject land or realignment of the two-phase grid (for threatened plant surveys) after survey had been undertaken. As such, some survey effort is located outside of the subject land but provides relevant local data.

2.9.3 Access restrictions

Some sections of the subject land were not accessible due to access restrictions. Where access was not available biodiversity values were extrapolated from desktop assessment using the SVTM. Due to the restricted access, areas where the SVTM was applied are subject to assumed benchmark condition (section 4.5.3).

Seasonal targeted threatened species surveys were also limited by access restrictions. The SVTM was used to identify PCTs and their extent within the unsurveyed area. All threatened entities associated with these PCTs were assumed present in theses areas.

As this is a highly conservative approach, impact calculations associated with threatened communities and entities represent the maximum possible impact and may be reduced following one of the following two methods:

1 Field verification survey following future access is granted onto unsurveyed lands

2 Application of the *Remote assessment of biodiversity values guidelines* (DCCEEW, 2025).

2.9.4 Reliance on data

This report is based on the assumption that threatened species data published in the TBDC, BioNet Atlas, BioNet Vegetation Information System, SPRAT database, and any other Government databases is correct and current.

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

2.9.5 Weather conditions

Weather conditions during scheduled survey periods limited the survey capacity, typically during periods where extreme weather is more common, such as the summer period. Heat-based survey effort limitations are more complex than a temperature-based stand down, as factors such as humidity and wind speed play a role in determining risk to field staff. Risks include, but are not limited to, bushfires and heat stress. Additionally, high heat or rainfall can limit access to site locations typically accessed via vehicle. Access to these sites via vehicles during periods of high heat or after long periods of rain are at high risk of starting grass fires or causing a permanent impact on the site's topsoil, respectively. Severe flooding in the Riverina occurred at various times, which also impacted the ability to complete surveys and resulted in some surveys being shortened and postponed.

Severe heat, heavy rainfall, dry winds and stormy conditions can reduce detectability of threatened species. Stormy or heavy rainfall periods resulted in delayed surveys for the Plains-wanderer from November 2024 to February 2025. However, the February 2025 survey provided suitable survey conditions. Targeted surveys in the summer period required additional planning to ensure detectability of species such as Southern Bell Frog.

Targeted flora surveys were planned in early September to optimise detectability for species with a limited survey period. These surveys also provided an opportunity to survey for multiple species and a second survey was completed in October to improve detection of threatened flora that are likely to respond to warmer spring conditions to flower and set seed.

3 Site context

Section 3 of the BAM sets out the requirement to assess landscape features and to establish the site context of the subject land in the surrounding landscape. This section of the BDAR identifies the range of landscape features that occur on the subject land or within the surrounding assessment area. These features may contain biodiversity values that are important for:

- establishing the context of the subject land in relation to the surrounding area
- identifying the likely habitat suitability on the subject land for threatened entities.

The Site Map is provided in Figure 15.1. The Site Map shows the boundary of the subject land, cadastre boundaries within the subject land and the landscape features identified below in section 3.2 of this BDAR.

3.1 Assessment area

As outlined in the BAM, the assessment area includes:

- the subject land and a 1,500-metre buffer surrounding the outside edge of the boundary of the subject land areas such as compound sites
- 500 metres along each side of the centre line of a linear-shaped project.

As this is a mixed linear-shaped and site-based project, a buffer of 500 metres along each side of the centre line of the project has been implemented to demarcate the assessment area and a 1,500-metre buffer placed around site features for this BDAR.

The Location Map (see Figure 15.2) shows the boundary of the subject land, the landscape features identified below in section 3.2 of this BDAR, and any other relevant detail such as local government area boundaries or other base data relevant at the scale of the map. The map illustrating the extent of the assessment area is provided in Figure 15.2 and Figure 15.3.

3.2 Landscape features

Landscape features identified within the subject land and assessment area are shown on Figure 15.1 Site Map and Figure 15.2 Location Map, respectively, with a more detailed assessment of landscape features provided on Figure 15.3. A discussion of relevant landscape features is provided below.

Field reconnaissance was used to confirm the extent and condition of landscape features on the subject land. This was particularly important for geological features of significance (e.g. karst, caves, crevices, cliffs, rocks) or the presence of non-native vegetation that is difficult to interpret from remote imagery (i.e. exotic paddocks). This ground-truthed information was used to adjust maps and per cent native vegetation cover estimates. Where access was limited, aerial imagery was used to supplement the field survey. Field reconnaissance for landscape features was undertaken during every survey session.

3.2.1 IBRA bioregions and IBRA subregions

The subject land occurs within two mapped IBRA bioregions and three IBRA subregions shown in Table 3.1.

This was determined using the Interim Biogeographic Regionalisation for Australia (IBRA), Version 7 (Regions) and Interim Biogeographic Regionalisation for Australia (IBRA), Version 7 (subregions) mapping.

An overview of the extent of each IBRA region and subregion in the assessment area is presented in Table 3.1 and Figure 15.3. The majority of the assessment area is in Murrumbidgee IBRA subregion followed by the Murray Fans IBRA subregion.

Table 3.1 IBRA bioregions and subregion

VNI Component	IBRA bioregion	IBRA subregion	Subject land (ha)	Assessment area (ha)
VNI West (Dinawan substation to NSW/Victorian border)	Riverina	Murrumbidgee	7203.09	60,917.26
		Murray Fans	1996.33	17,400.11
Network augmentation works	NSW South Western Slopes	Inland Slopes	536.50	5,264.10
	Total		**9,735.91**	**83,581.47**

3.2.1.1 Riverina IBRA bioregion

The Riverina IBRA bioregion lies in southwest New South Wales and extends into central-north Victoria. The Murray and Murrumbidgee Rivers and their major tributaries flow westward from the highlands across the Riverina Plain. The climate is dry and semi-arid with hot summers and cool winters, and most rain falls in winter. Vegetation of the region ranges from river red gums, along river channels, to saltbush on the plains (NSW Environment and Heritage, 2024).

The Murrumbidgee IBRA subregion comprises Quaternary alluvial sediments along with clay and sand, with source bordering dunes and lakes. Alluvial fans with distributary channels and floodplains, and undulating plains with depressions are the typical landforms of the subregion. Source bordering dunes are also common. Red brown earths, grey and brown clays are present and deep siliceous sands occur on dunes. Vegetation of the subregion includes River red gum (*Eucalyptus camaldulensis*) and River cooba (*Acacia stenophylla*) on channels, with Black box (*Eucalyptus largiflorens*), Lignum (*Muehlenbeckia florulenta*) and old man saltbush (*Atriplex nummularia*) present on floodplains. Myall (*Acacia* pendula) and old man saltbush with other saltbush and grasses were formerly widespread on back plains. White cypress pine (*Callitris columellaris*) occurs on dunes (Sahukar et al., 2003).

Quaternary alluvial sediments dominate the surface geology of the Murray Fans IBRA subregion and clay and sand with source bordering dunes, lakes and swamps also occur. Landforms consist of relatively confined alluvial fans constrained by sediments from northern Victorian rivers, the Murrumbidgee fan and the Cadell fault. Meandering channels, floodplains, source bordering dunes, overflow lakes and swamps are also present. Red-brown earths, grey and brown clays are typical, with deep siliceous sands on dunes. Extensive River Red Gum Forests with River Cooba occur on channels. Yellow Box (*Eucalyptus melliodora*) and Black Box with saltbush are present on high floodplains and terraces. White Cypress Pines occur on dunes, sandy levees and lunettes. Common Reed, Cumbungi (*Typha spp*) and grasses are present in swamps (Sahukar et al., 2003).

3.2.1.2 NSW South Western Slopes IBRA bioregion

The NSW South Western Slopes IBRA bioregion is an extensive area of foothills and isolated ranges comprising the lower inland slopes of the Great Dividing Range extending from north of Cowra through southern NSW into western Victoria. The bioregion includes parts of the Murray, Murrumbidgee, Lachlan and Macquarie River catchments. The climate is mainly sub-humid with hot summers and no dry season, with annual rainfall varying from 1,200 millimetres in the east to 400 millimetres in the west (NSW Environment and Heritage, 2023).

Characteristic landforms of the Inland Slopes IBRA subregion are steep, hilly and undulating ranges and granite basins, which are underlain by Ordovician to Devonian folded and faulted sedimentary sequences with inter-bedded volcanic rocks and large areas of intrusive granites. Typical soils include shallow stony soils on steep slopes, texture contrast soils grading from red subsoils on upper slopes to yellow subsoils on lower slopes. Vegetation of the subregion generally comprises open forests and woodlands. Red Stringybark (E*ucalyptus macrorhyncha*) grows on upper slopes with Black Cypress Pine (*Callitris endlicheri*), Kurrajong *(Brachychiton populneus*), Red Ironbark *(Eucalyptus sideroxylon*),

White Gum (*Eucalyptus dalrympleana*), White Box (*Eucalyptus albens*), Yellow Box (*Eucalyptus melliodora*) and Blakely's Red Gum (*Eucalyptus blakelyi*) on lower slopes. These assemblages merge west to yellow box, grey box and White cypress pine. Rough-barked apple occurs on flats with River oak on upper tributaries and River Red Gum on lower and larger streams (Sahukar et al., 2003).

3.2.2 Rivers, streams, estuaries and wetlands

Table 3.2 identifies the rivers, streams, estuaries and wetlands on, adjacent to, and downstream of, the subject land and within the assessment area (as defined by BAM).

These watercourses are illustrated in Figure 15.1, Figure 15.2 and Figure 15.3.

Table 3.2 Watercourses on, adjacent to, and downstream of the subject land within the assessment area

Strahler Order	Watercourse names
0	Mallan Branch Canal.
1	Moores Creek, Northern Branch Canal, Southern No 26 Channel, Southern No 26A Channel, Delta Creek, Carroonboon Creek
2	Carroonboon Creek, Magpie Creek, Delta Creek
3	Carroonboon Creek, Cunninyeuk Creek,
9	Coleambally Outfall Drain
10	Berrambong Creek, Bullockhide Creek, Dead Mans Creek, Edward River, Jaffrey Creek, Larry's Creek, Merran Creek, Murray River, Neimur River, Wakool River, Wyam Creek, Yarrein Creek.

3.2.3 Habitat connectivity

A variety of definitions have been proposed for 'habitat connectivity' (Merriam 1984; Taylor, Fahrig et al. 1993), and what they all imply is whether features, or patches, of interest are spatially connected to other, similar, features. It assesses whether plants or animals have the ability to move or migrate across the landscape, which is important for species ability to disperse and their population's ability to persist, and for ecosystem health in general. Connectivity can be subdivided into structural connectivity, or the quantification of the characteristics and spatial arrangements of elements of the landscape, and functional connectivity, or how an ecological process is influenced by the arrangement of elements of the landscape (Crooks & Sanjayan 2006).

A large part of the project occurs in a fragmented landscape due to past clearing and ongoing agricultural practices. The project is not likely to directly impact habitat connectivity at a regional scale, however, the project crosses several watercourses which pass through or near State Forests and conservation areas in the Murray Fans IBRA subregion. In these areas, further steps have been taken to minimise impacts where canopy connectivity would be affected. Further mitigation and consideration of indirect impacts (connectivity impacts resulting in potential bird strike) and prescribed impacts (vegetation connectivity impacts for species) are considered in Stage 2 of this BDAR. The nature of the potential impacts to connectivity primarily relate to aerial species such as birds and bats, through the interaction with the proposed transmission line structures and associated transmission lines. Research of transmission lines on smaller bats is scarce, but a decrease in bat activity close to transmission lines has been shown (Kahnonitch, Lubin et al. 2018). Transmission line-associated collision and electrocution has been proven to lead to high mortality rates of birds across the world, including in Italy and the United States affected (Rubolini, Gustin et al. 2005; Loss, Would et al. 2014). As expected, placement of transmission lines in migratory pathways (Kirby, Stattersfield et al. 2008) and in important habitat (Garrido and Fernández-Cruz 2003, Oppel, Ruffo et al. 2022) heightens bird mortality. As such, placement of transmission lines in movement corridors can decrease the habitat connectivity for aerial species.

The Murrumbidgee IBRA subregion covers the southern section of the Hay Plains with Shrublands, Grasslands, Myall and Sandhill Woodlands providing habitat connectivity for large mammals, reptiles, amphibians, birds of prey and woodland birds as well as geographically restricted plants. Many of these ecological communities are reduced and modified since European settlement due to clearing for agriculture, weed and pest animal infestation leading to many of these ecological communities to be listed under state and federal legislation.

The Inland Slopes IBRA subregion has been extensively cleared for agriculture and scattered with a mosaic of fragmented patches of woodland. The importance of these patches should not be generally disregarded. The threatened Squirrel Glider, for example, does not need continuous habitat and can thrive in remnant linear roadside reserves (van der Ree 2002). The long-term viability of these remnant habitat patches is likely to remain post-construction. In summary, the project is planned to occur in some likely movement corridors, where it may affect aerial species. However, the nature of the project means that it would be highly permeable and is highly unlikely to result in any substantial impacts to local or regional connectivity for aerial or terrestrial species. Special consideration where Squirrel Gliders are thought to occur in needed to ensure impacts are mitigated and managed.

Impacts to habitat connectivity are assessed within this BDAR as required in section 9.3 and 9.3.7.

3.2.4 Karst, caves, crevices, cliffs, rocks or other geological features of significance

Within the Riverina IBRA bioregion, the subject land occurs on the Hay Plains which is renowned for being one of the flattest locations in the world. There are no hills visible from the site apart from a couple of small rises within the subject land. The subject land does not contain any karst, caves, crevices, cliffs, rocky areas or geological features of significance apart from the distribution of different soil types, some of which encourage the production of gilgais and others deep cracks that may be suitable as refuges for reptiles and amphibians.

Within the NSW South Western Slopes IBRA bioregion, the subject land occurs on low hills, some of which have granite outcrops. These outcrops provide potential habitat for threatened reptile species. Rocky habitats have been shown on Figure 15.3.

3.2.5 Areas of outstanding biodiversity value

There are no areas of outstanding biodiversity value, as identified under the BC Act, within the subject land or assessment area.

3.2.6 NSW (Mitchell) landscape

The Mitchell landscapes that occur in the three IBRA subregions are listed in Table 3.3 and detailed below with visual representation on Figure 15.2 and Figure 15.3.

Table 3.3 Summary of NSW (Mitchell) landscapes within the subject land

NSW (Mitchell) landscapes	Subject land (ha)
VNI West (Dinawan substation to NSW/Victorian border)	
Murray Fans	**2,470.81**
Mallee Cliffs Sandplains	60.33
Murray Channels and Floodplains	2,264.55
Murray Depression Plains	43.09
Murray Scalded Plains	84.11
Murray Source-bordering Dunes	18.73

NSW (Mitchell) landscapes	Subject land (ha)
Murrumbidgee	**5,939.49**
Murray Channels and Floodplains	1132.27
Murrumbidgee Channels and Floodplains	1486.81
Murrumbidgee Depression Plains	295.91
Murrumbidgee Scalded Plains	2953.31
Murrumbidgee Source-bordering Dunes	71.19
Network augmentation works	
Inland Slopes	**356.73**
Coffin Rock Granite Hills	69.85
Murrumbidgee - Tarcutta Channels and Floodplains	201.29
Wonga Hills and Ranges	85.59
Total	**8,767.02**

3.2.6.1 Mitchell landscapes within the Murray Fans IBRA subregion

The Inland Slopes Mitchell Landscapes include Coffin Rock Granite Hills, Murrumbidgee – Tarcutta Channels and Floodplains and the Wonga Hills and Ranges. The Coffin Rock Granite Hills has a general elevation of 300 to 440 metres and comprises rolling to steep rocky hills with broad crests on granite. Typical soils are coarse gritty red and brown texture-contrast soils on crests and slopes merging to yellow harsh texture-contrast or gradational soils on flats. Vegetation comprises woodlands of Tumbledown Red gum (*Eucalyptus dealbata*), Red Ironbark (*Eucalyptus sideroxylon*), Red Stringybark (*Eucalyptus macrorhyncha*), White Gum (*Eucalyptus rossii*), Blakely's Red Gum (*Eucalyptus blakelyii*) and White Cypress Pine (*Callitris glaucophylla*) with Kangaroo Grass (*Themeda triandra*) and Plains Grass (*Austrostipa aristiglumis*) (Department of Environment and Climate Change 2002).

The Murrumbidgee - Tarcutta Channels and Floodplains landscape consists of channels, floodplains and terraces of Murrumbidgee tributaries on Quaternary alluvium, with general elevation 200 to 400 metres and local relief 25 metres. Typical soils are undifferentiated organic sand and loam on the floodplain, brown gradational loam and yellow texture-contrast soils on higher terraces. Vegetation is characterised by River Red Gum (*Eucalyptus camaldulensis*) gallery woodland on banks, Yellow Box (*Eucalyptus melliodora*) and Grey Box (*Eucalyptus microcarpa*) open woodland on floodplain and terraces (Department of Environment and Climate Change 2002).

The Wonga Hills and Ranges landscape consists of rolling hills, low rises and ridges on Ordovician siltstone, slate, quartzite and phyllite, with general elevation 250 to 370 metres, and local relief of 50 metres. Stony, thin red and brown texture-contrast soils merge to yellow harsh texture-contrast soils on valley floors. There is high salinity in the subsoil and some brackish flows in small creeks. Typical vegetation is woodlands of Tumbledown Red Gum (*Eucalyptus dealbata*), Red Stringybark (*Eucalyptus macrorhyncha*) and Grey Box (*Eucalyptus microcarpa*) on slopes, Yellow Box (*Eucalyptus melliodora*), White Box (*Eucalyptus albens*) and occasional Blakely's Red Gum (*Eucalyptus blakelyii*) on flats with Kangaroo Grass (*Themeda triandra*) and Plains Grass (*Austrostipa aristiglumis*) (Department of Environment and Climate Change 2002).

3.2.6.2 Mitchell landscapes within the Murray Fans IBRA subregion

Murray Fans Mitchelle landscapes includes Mallee Cliffs Sandplains, Murray Channels and Floodplains, Murray Depression Plains, Murray Scalded Plains and Murray Source-bordering Dunes. The Mallee Cliffs Sandplains comprises extensive, slightly undulating Quaternary aeolian sandplains with east-west trending dunes, often with blowouts, partly scalded broad swales and small depressions. The soils consist of solonised brown soils, calcareous loamy sand, and texture-contrast soils on the plain, red and brown sands on dunes, and non-cracking grey or brown clays in depressions. The vegetation includes Rosewood (*Alectryon oleifolius*), White Cypress Pine (*Callitris glaucophylla*), Sugarwood (*Myoporum platycarpum*), Belah (*Casuarina cristata*), dense clumps of Black Bluebush (*Maireana pyramidata*), or Pearl Bluebush (*Maireana sedifolia*), with variable Speargrass (*Austrostipa variabilis*), Bottlewashers (*Enneapogon* sp.) and Copperburr (*Sclerolaena* sp.) on plains. Scattered Rosewood (*Alectryon oleifolius*), Belah (*Casuarina cristata*), Mallee patches (*Eucalyptus* sp.), with isolated Porcupine Grass (*Triodia irritans*), White Cypress Pine (*Callitris glaucophylla*), Narrow-leaf Hopbush (*Dodonaea attenuata*), Punty Bush (*Senna eremophila*) and grasses on dunes. Annual Saltbush (*Atriplex* sp.), Canegrass (*Eragrostis australasica*), Lignum (*Muehlenbeckia cunninghamii*) and Nitre Goosefoot (*Chenopodium nitrariaceum*) in depressions usually fringed by Black Box (*Eucalyptus largiflorens*) (Department of Environment and Climate Change 2002).

The Murray Channels and Floodplains landscape is characterised by active channels and seasonally inundated floodplains of the Murray streams in Quaternary alluvium with associated billabongs, swamps, channels, levees and source bordering dunes, with relief to 10 metres. The landforms include scalded alluvial flats, broad elevated floodplains and associated relict channels and isolated sandy rises. Channel banks of grey and brown clays are covered by River red gum (*Eucalyptus camaldulensis*), Black Box (*Eucalyptus largiflorens*), and River Cooba (*Acacia stenophylla*). River Red Gum around billabongs with dense Lignum (*Muehlenbeckia cunninghamii*), Common Reed (*Phragmites australis*) and Cumbungi (*Typha orientalis*). Flats of silty or cracking grey clays, rimmed with Black Box (*Eucalyptus largiflorens*), Lignum (*Muehlenbeckia cunninghamii*), and Canegrass (*Eragrostis australasica*). Highest flooded terrace with brown clays or red-brown texture-contrast soils carry Yellow Box (*Eucalyptus melliodora*). Dunes and sandplains of deep sandy brown soils or texture-contrast soils, locally calcareous, with Belah (*Casuarina cristata*), White Cypress Pine (*Callitris glaucophylla*), Mallee (*Eucalyptus* sp.), Rosewood (*Alectryon oleifolius*), Needlewood (*Hakea leucoptera*) and marginal clumps of Black Box (*Eucalyptus largiflorens*), Belah (*Casuarina cristata*), Prickly Wattle (*Acacia victoriae*) over Bluebush (*Maireana* sp.) and grasses (Department of Environment and Climate Change 2002).

The typical landforms of Murray Depression Plains landscape are Quaternary alluvial plains with numerous circular depressions interpreted as high floodplains or low terraces beyond the reach of average floodwaters. Grey and brown cracking and non-cracking clays occur, often with gilgai on the plains. Sandy rises and levees trace ancestral streams and stand above the general plain, with relief one to three metres. Sands and red or brown texture-contrast soils occur on the higher ground. The landscape is mostly cleared, cropped or grazed. Native vegetation comprises isolated Black Box (*Eucalyptus largiflorens*), patches of Myall (*Acacia pendula*) and Prickly Wattle (*Acacia victoriae*) with annual saltbushes (*Atriplex* sp.) and grasses. Scattered White Cypress Pine (*Callitris glaucophylla*), Rosewood (*Alectryon oleifolius*), Belah (*Casuarina cristata*), Wilga (*Geijera parviflora*), Narrow-leaf Hopbush (*Dodonaea attenuata*) and grasses on sands. Bladder saltbush (*Atriplex vesicaria*), annual saltbush, burrs and grasses on scalded levees (Department of Environment and Climate Change 2002).

The Murray Scalded Plains landscape is mostly cleared, cropped or grazed. The geology consists of Quaternary alluvial plains with extensive scalding interpreted as relic floodplains, terraces or part of the Cadell tilt block. Soils include red brown texture-contrast soils with extensive scalds, prior stream channels of deep coarse sands with sandy levees, and grey, brown and red cracking clays in depressions. Vegetation was formerly open woodland and grasslands of White Cypress Pine (*Callitris glaucophylla*), Grey Box (*Eucalyptus microcarpa*), Bull Oak (*Allocasuarina luehmannii*), and Myall (*Acacia pendula*) with annual grasses and herbs (Department of Environment and Climate Change 2002).

Murray Source-bordering Dunes comprise sandy rises of relief (three to 12 metres) adjacent to river channels or prior streambeds, with deep red and brown sands and loams. The landscape is often heavily grazed and subject to wind erosion. Typical native vegetation includes White Cypress Pine (*Callitris glaucophylla*), Needlewood (*Hakea leucoptera*), Hooked Needlewood (*Hakea tephrosperma*), Wilga (*Geijera parviflora*), Bull Oak (*Allocasuarina luehmannii*), Emu Bush (*Eremophila longifolia*), Miljee (*Acacia oswaldii*), Yarran (*Acacia homalophylla*), Native Quince (*Petalostigma pubescens*), and Narrow Leaf Hopbush (*Dodonaea attenuata*) with sparse grasses (Department of Environment and Climate Change 2002).

3.2.6.3 Mitchell landscapes within the Murrumbidgee IBRA subregion

Characteristic landforms of the Murrumbidgee Channels and Floodplains comprise Quaternary alluvium on seasonally inundated floodplains, active and inactive channels, billabongs, levees and swamps of the Murrumbidgee River and its effluent streams, and also include scalded alluvial flats, broad elevated floodplains and associated relict channels, and isolated sandy rises. Soils are grey and brown clay with occasional areas of low sandy rise. The vegetation consists of open forest of River Red Gum (*Eucalyptus camaldulensis*), River Cooba (*Acacia stenophylla*), Cooba (*Acacia salicina*), Lignum (*Muehlenbeckia cunninghamii*), Nitre Goosefoot (*Chenopodium nitrariaceum*) with numerous grasses along the channels and floodplain. On more distal floodplains and back plains, vegetation is Black box woodland with Lignum (*Muehlenbeckia cunninghamii*), Nitre Goosefoot (*Chenopodium nitrariaceum*), Thorny Saltbush (*Rhagodia spinescens*), Old Man Saltbush (*Atriplex nummularia*) and annual saltbushes (*Atriplex* sp.). Cumbungi (*Typha orientalis*), Common Reed (*Phragmites australis*) and Nardoo (*Marsilea drummondii*) grow in isolated depressions (Department of Environment and Climate Change 2002).

Murrumbidgee Depression Plains comprise Quaternary alluvial plains with numerous circular depressions interpreted as high floodplains or low terraces beyond the reach of average floodwaters, with relief to 10m. Soils are grey to brown clays and clay loams with linear patterns of sandy prior streams. Vegetation is now extensive grasslands of white-top, windmill grass, sand broom, and spear grasses, heavily grazed and invaded by exotic species. It was reported to have originally been Myall (*Acacia pendula*), Old Man Saltbush (*Atriplex nummularia*) and Bladder Saltbush (*Atriplex vesicaria*). Sandy ridges of prior streams support patches of White Cypress Pine (*Callitris glaucophylla*), with Needlewood (*Hakea leucoptera*), Western Pittosporum (*Pittosporum phylliraeoides*) and Spear Grasses (*Austrostipa* spp.) (Department of Environment and Climate Change 2002).

The Murrumbidgee Scalded Plains landscape is characterised by Quaternary alluvial plains with extensive scalding interpreted as relic floodplains or terraces. Soils include grey, brown and red cracking clays, red brown texture-contrast soils with scalds. Levees traces are evident, with relief generally less than one metre, and up to 5 metres on associated pans, swamps and lunettes. Vegetation consists of low shrublands and grasslands of Bladder Saltbush (*Atriplex vesicaria*), other annual Saltbushes (*Atriplex* sp.), numerous Burrs (*Sclerolaena* sp.), Cottonbush (*Maireana aphylla*), Bush Minuria (*Minuria cunninghamii*), White-top Grass (*Austrodanthonia caespitosa*), Windmill Grass (*Chloris truncata*), and Hill Wallaby Grass (*Austrodanthonia eriantha*) (Department of Environment and Climate Change 2002).

Murrumbidgee Source-bordering Dunes comprise sandy rises adjacent to river channels and along prior streambeds, deep red and brown sands and loams, with relief of three to 12 metres. The landscape is often heavily grazed and subject to wind erosion. Typical vegetation is White Cypress Pine (*Callitris glaucophylla*), (*Hakea leucoptera*), Hooked Needlewood (*Hakea tephrosperma*), Wilga (*Geijera parviflora*), Bull Oak (*Allocasuarina luehmannii*), Emu Bush (*Eremophila longifolia*), Miljee (*Acacia oswaldii*), Yarran (*Acacia melvillei*), Native Quince (*Petalostigma pubescens*), Thorny saltbush (*Rhagodia spinescens*), Western pittosporum (*Pittosporum phylliraeoides*), Belah (*Casuarina cristata*), some Bimble box (*Eucalyptus populnea*), Narrow-leaf hopbush (*Dodonaea attenuata*), with sparse grasses. Black bluebush (*Maireana pyramidata*) occurs in the shrub layer in western areas (Department of Environment and Climate Change 2002).

3.2.7 *Additional landscape features identified in SEARs*

This subsection only applies when there are SEARs for the development. The SEARs for this project can be found in Appendix L. The SEARS (Application Number: SSI-72887208) requested an assessment of the impact of the project on conservation areas, including the Murray Valley National Park (including the Wetuppa Forest within the Noorong-Wetuppa area) and South West Woodlands Nature Reserve, parcels of which are located immediately adjacent to sections of the project. These features are described below and the impact assessed in section 9.3 of this BDAR.

3.2.7.1 Impacts to conservation areas and nature reserves

The Murray Valley National Park (including the Wetuppa Forest within the Noorong-Wetuppa area), located within the Riverina bioregion, covers an area of approximately 40,000 hectares and comprises a series of land parcels located on the floodplains of the Murray and Edward rivers. The National Park, alongside the Murray Valley Regional Park, protect part of the largest continuous tract of river red gum forest in the world (OEH, 2014) and host over 60 threatened animal species and over 40 threatened plant species. Whilst the project does not overlap directly with the National Park, it passes in between and is immediately adjacent to two parcels of National Park land where the project crosses the Wakool River.

The South West Woodland Nature Reserve, located within the NSW South Western Slopes, Riverina and Murray-Darling Depression bioregions, covers an area of approximately 13,000 hectares and preserves habitat for a number of threatened animal species, plant species and ecological communities. The project is immediately adjacent to one parcel of land within the Nature Reserve which is situated in the Steam Plains precinct, approximately one kilometre west of Carrathool Road.

National park and Nature Reserves have been identified on Figure 15.2 and Figure 15.3.

3.3 Native vegetation cover

Table 3.4 summarises the extent of native vegetation cover within the assessment area. Figure 15.4 shows native vegetation cover within the assessment area.

Table 3.4 Native vegetation cover in the assessment area

Item	Inland Slopes	Murrumbidgee	Murray Fans	Total
Assessment area (ha)	5,264.10	60,917.26	17,400.11	83,581.47
Total area of native vegetation cover (ha)	397.37	59,012.20	10,606.27	70,015.84
Percentage of native vegetation cover (%)	8	97	61	84
Class (0–10, >10–30, >30–70 or >70%)	0–10	>70	30–70	>70

4 Native vegetation, threatened ecological communities and vegetation integrity

4.1 Native vegetation extent

Mapping of native vegetation extent within the subject land is required under section 4.1 of the BAM with detailed requirements outlined in section 3.2 of the BAM Operational Manual – Stage 1.

4.1.1 Changes to the mapped native vegetation extent

The extent of native vegetation in the subject land was determined through digitisation of areas of vegetation using the aerial photos provided on the Arc GIS online World Imagery map server. In most cases, the mapped boundaries of native vegetation do not differ from the boundaries present in the SVTM, excluding several areas of native vegetation that have been mapped as Category 1 – exempt land which is explained below in section 4.1.2 and typically include cropping land with pivot irrigation, dryland cropping, improved pasture or areas that were historically cropped which are regenerating with native chenopods and native grasses. The mapped extent of native vegetation cover within the subject land was consequently adjusted to match on ground conditions observes at the time of survey.

Native vegetation extent within the subject land is illustrated in Figure 15.4 with areas of exempt land shown on Figure 15.6.

4.1.2 Areas that are not native vegetation

The subject land contains areas that are not native vegetation. These areas have been allocated to PCT 0 for the purposes of mapping. These areas are illustrated in Figure 15.6 and Figure 15.8. Areas that were considered to be not native vegetation were:

- Category 1 land (Photo 4.1 and Photo 4.2)
- pre-existing infrastructure (Photo 4.3)
- miscellaneous ecosystems (e.g. dams) (Photo 4.4). These areas cannot be assigned to a PCT due to a lack of native vegetation.



Photo 4.1 Example of Category 1 lands in an area actively subject to cropping



Photo 4.2 Example of Category 1 lands in an area actively subject to cropping



Photo 4.3 A large irrigation channel which has been classed as a Pre-existing infrastructure



Photo 4.4 A farm dam which has been classed as a waterbody

4.1.2.1 Category 1 – Exempt land

This section summarises the method and results of native vegetation regulatory mapping of proposed Category 1 – exempt land within the subject land.

In accordance with section 6.8 (3) of the BC Act, the BAM excludes the assessment of impacts on category 1-exempt land (within the meaning of Part 5A of the LLS Act, other than any impacts prescribed by the regulations under section 6.3.

The LLS Act defines 'category 1-exempt land' as areas of the State to which Part 5A of the LLS Act applies, which are designated as category 1 – exempt land on the 'native vegetation regulatory map', prepared and published under the LLS Act. A native vegetation regulatory map (NVR) is being developed by CPHR which has been published in draft form.

4.1.2.2 Background to Category 1 – Exempt land

Under the NSW Land Management Framework, the categorisation of land determines the native vegetation management options available to landholders. Rural land in NSW is categorised into three main categories:

- Category 1 – exempt land is land where native vegetation can be cleared without approval from Local Land Services.
- Category 2 – land is divided into:
  - Category 2 – regulated land is Category 2 land that is not Vulnerable or Sensitive regulated land. You may need authorisation from Local Land Services to clear native vegetation from rural zoned land in this category.
  - Category 2 – vulnerable regulated land is land where clearing of native vegetation may not be permitted under the Land Management (Native Vegetation) Code 2018, and a limited range of allowable activities are permitted.
  - Category 2 – sensitive regulated land is land where clearing is not permitted under the Land Management Code (Native Vegetation) Code 2018, and a limited range of allowable activities is permitted.
- Excluded land – is land where the Land Management (Native Vegetation) Code 2018 and allowable activities do not apply.

4.1.2.3 Land category criteria

Each land category is determined by various criteria as outlined in the LLS Act. Category 1 – exempt land is defined in section 60H of the LLS Act as the below:

1 Land is to be designated as Category 1 – exempt land if the Environment Agency Head reasonably believes that:

a the land was cleared of native vegetation as at 1 January 1990, or

b the land was lawfully cleared of native vegetation between 1 January 1990 and the commencement of this Part.

2 Land is to be designated as Category 1 – exempt land if the Environment Agency Head reasonably believes that:

a the land contains low conservation value grasslands, or

b the land contains native vegetation that was identified as regrowth in a property vegetation plan referred to in section 9 (2) (b) of the Native Vegetation Act 2003, or

c the land is of a kind prescribed by the regulations as Category 1 – exempt land.

3 Land is to be designated as Category 1 – exempt land if the land is biodiversity certified under Part 8 of the BC Act or under any Act repealed by that Act.

4 However:

a land described in subsection (1) or (2) is not to be designated as Category 1 – exempt land if section 60I (2) requires the land to be designated as Category 2 – regulated land, and

b land described in subsection (1) (a) is not to be designated as Category 1 – exempt land if the land was unlawfully cleared of native vegetation after 1 January 1990, and

c land described in subsection (2) (a) is not to be designated as Category 1 – exempt land if the land was unlawfully cleared of native vegetation after 1 January 1990.

5 The regulations may make provision for the purposes of determining whether grasslands are low conservation value grasslands for the purposes of this Division.

4.1.2.4 Determination of the category of mapped land

The matters relating to determination of mapped category of land are outlined in 60J of the LLS Act. Section 60J of the LLS Act is reproduced below:

1 This section makes provision relating to the mapping of land under this Division as category 1-exempt land or Category 2 – Regulated land

2 Native vegetation that comprises grasslands or other non-woody vegetation is taken to have been cleared if the native vegetation was significantly disturbed or modified. The regulations may make provision for the purposes of determining whether native vegetation has been significantly disturbed or modified for the purposes of this Division

3 Determinations may be made by the Environment Agency Head that land was unlawfully cleared of native vegetation only if compliance or enforcement action of a kind prescribed by regulations was taken in relation to the clearing

4 Determinations may be made by the Environment Agency Head that land was cleared of native vegetation as at 1 January 1990 or between that date and the commencement of this Part only on the basis of the best available aerial photographs or satellite imagery before and after the relevant date, and any evidence provided by the landholder under section 60K (8)

5 Determinations made (or taken on appeal to have been made) by the Environment Agency Head as to whether land was or was not unlawfully cleared of native vegetation does not affect any decision made with respect to compliance or enforcement action taken under this or any other Act in relation to the clearing.

4.1.2.5 Biodiversity assessment method requirements

In accordance with section 6.8(3) of the BC Act, when applying the Biodiversity Assessment Method (BAM) the assessor is to exclude the assessment of impacts of any clearing of native vegetation and loss of habitat on Category 1 – exempt land (within the meaning of Part 5A of the LLS Act), other than any impacts prescribed by the regulations under section 6.3.

All other rural lands that do not meet the definition of Category 1 – exempt land form part of the assessment area subject to the BAM.

4.1.2.6 Assessment of Category 1 Exempt land

The LLS Act publishes maps (the NVR map) that show areas of the State to which Part 5A of the LLS Act applies, which are designated as Category 1 – exempt land. A draft NVR map has been prepared for the locality, and this was reviewed and used as the base of the land classification done for this BDAR.

The areas identified as Category 1 – exempt land using the NVR were field verified (section 2.2.4.1) and separated into the following categories:

- Exotic vegetation or cropped land assessed as Category 1 exempt-land
- Grassland areas that may have been historically cropped, however native species recolonised and <50 per cent perennial exotic grasses has categorised these areas as derived low conservation value with a VI score of <15 applying the interim grassland assessment module. These areas have been re-assigned as category-2 land.
- Low Conservation Value Chenopod shrubland that has been historically cropped but natural regeneration has increased cover and abundance of Chenopods, native grasses and annual forbs with a higher percentage cover of exotic annual grasses and therefore poorer condition than the chenopod shrublands determined to be moderate-good. These areas have been re-assigned as category-2 land.

This on ground verification and comparison to the draft NVR map resulted in an increase in the area of category-2 land. All category-1 lands identified within the subject land are exempt from BAM assessment and are not considered further in this BDAR.

WSP has developed a desktop land characterisation methodology that builds on advice and consultation with CPHR and previous land categorisation assessments and with reference to the Native vegetation regulatory map (NVR): method statement (OEH 2017).

In defining the area of Category 1 – exempt land, an initial analysis of the following spatial datasets would be undertaken:

- Land use: NSW Land Use 2017 v1.2, published June 2020
- NSW Native Vegetation Extent 5m raster v1.2 dataset
- State-wide Landcover and Tree Survey (SLATS) clearing for NSW
- NVR: Transitional Native Vegetation Regulatory Map
- Zoning: EPI LEP LZN Land Zoning, current at 23 April 2021
- State Vegetation Type Map (SVTM)
- aerial photos (to determine areas that were/are obviously under cultivation or improved pasture or otherwise disturbed)
- information and records, including current and historical photographs of the subject land and current and historical high resolution
- in areas of conflicting data, or potential derived native grasslands characteristic of a CEEC, a site-based verification undertaken to confirm Category 1 or precautionary approach adopted and Category 2 assigned.

Each of these datasets were used to determine whether native vegetation has been significantly disturbed or modified (and therefore cleared) in accordance with 60J of the LLS Act.

The steps in identifying Category 1 – exempt land include the following:

1. Adoption published draft Native Vegetation Regulatory Map, incorporating the mapping of Category 1 – Exempt land.
2. The land use classification was subsequently overlayed with the Transitional Native Vegetation Regulatory Map, version 3.0, published 26 March 2021 and any areas of the subject land mapped as Category 2 lands were excluded. This is followed by the exclusion of areas of extant remnant vegetation as published within the Woody vegetation: NSW Woody Vegetation Extent 2015, (State Government of NSW, 2015), NSW Native Vegetation Extent 5 metre raster v1.2 dataset, State-wide Landcover and Tree Survey (SLATS) clearing for NSW and areas of SVTM mapped native derived grassland potentially corresponding with a Critically Endangered Ecological Community (CEEC) would be included within the Category 2 lands.
3. Additional analysis of historical aerial imagery is used to further classify areas as cleared/highly disturbed, resulting from significant disturbance associated with cultivation and/or improved pasture.
4. In areas of conflicting data with areas accessible for field verification, or potential derived native grasslands, a site-based verification undertaken to confirm ‘Low conservation grasslands’ in accordance with the Interim Grasslands and other Groundcover Assessment Method (IGGAM).

The outcome of native vegetation regulatory mapping category 1-exempt land is illustrated in Figure 15.6. The results of the Interim Grasslands method intersect transections is provided in Table 4.1. Examples of native vegetation within areas identified to be Category 1-exempt lands are provided in Photo 4.5 to Photo 4.54.

Table 4.1 Outcome of Interim Grasslands Method transects

Site ID	Location			Transect results (percent)			Outcome	Associated BAM VI Plot:
	Zone	Easting	Northing	Native	Exotic (perennial)	Exotic (annual)		
VNI_GrasslandDR01	55	268707	6126358	35.8	0	64.2	**Native -** Transect <50 per cent perennial exotic cover. Vegetation considered to be native and assigned to PCT 20 - Derived LCV.	VNI_DR103 Refer to Photo 4.5 for site photo and Photo 4.6 for plot location.
VNI_GrasslandDR02	55	266033	6126889	14.43	0	85.57	**Native -** Transect <50 per cent perennial exotic cover. Vegetation considered to be native and assigned to PCT 23 – Derived LCV.	VNI_DR105 Refer to Photo 4.7 for site photo and Photo 4.8 for plot location.
VNIGrassland_NM01	54	356493	6118684	43	0	57	**Native** - Transect <50 per cent perennial exotic cover. Vegetation considered to be native and assigned to PCT 13 – Derived LCV.	VNI_NM01 Refer to Photo 4.9 for site photo and Photo 4.10 for plot location.
VNIGrassland_NM02	54	762261	6095978	0	0	100	**Exotic** - Transect <50 per cent perennial exotic cover. However, no native vegetation was recorded. Vegetation considered to be non-native and assigned to PCT 0.	Not required. Refer to Photo 4.11 for site photo and Photo 4.12 for plot location.
VNIGrasslandH258-01	54	768592	6091993	57	0	43	**Native** - Transect <50 per cent perennial exotic cover. Vegetation considered to be native and assigned to PCT 15 – Derived LCV.	VNI_GL01 Refer to Photo 4.13 for site photo and Photo 4.14 for plot location.

Site ID	Location			Transect results (percent)			Outcome	Associated BAM VI Plot:
	Zone	Easting	Northing	Native	Exotic (perennial)	Exotic (annual)		
VNIGrasslandH258-02	54	758220	6091819	7	0	93	**Native** - Transect <50 per cent perennial exotic cover. Vegetation considered to be native and assigned to PCT 15 – Derived LCV.	VNI_GL02 Refer to Photo 4.15 for site photo and Photo 4.16 for plot location.
VNIGrasslandH258-03	54	757719	6090591	31	0	69	**Native** - Transect <50 per cent perennial exotic cover. Vegetation considered to be native and assigned to PCT 15 – Derived LCV.	VNI_GL03 Refer to Photo 4.17 for site photo and Photo 4.18 for plot location.
VNIGrasslandH258-04	54	757779	6090942	30	0	70	**Native** - Transect <50 per cent perennial exotic cover. Vegetation considered to be native and assigned to PCT 15 – Derived LCV.	VNI_GL04 Refer to Photo 4.19 for site photo and Photo 4.20 for plot location.
VNIGrassH360_01	55	266517	6126782	24	0	76	**Native** - Transect <50 per cent perennial exotic cover. Vegetation considered to be native and assigned to PCT 23 – Derived LCV.	VNI_GL05 Refer to Photo 4.21 for site photo and Photo 4.22 for plot location.
VNIGrassH360_02	55	265671	6126949	26	0	74	**Native** - Transect <50 per cent perennial exotic cover. Vegetation considered to be native and assigned to PCT 23 – Derived LCV.	VNI_GL06 Refer to Photo 4.23 for plot location.
VNI_grassland01	55	364852	6120581	25	0	75	**Native** - Transect <50 per cent perennial exotic cover. Vegetation considered to be native and assigned to PCT 28 – Derived LCV.	VNI_DR55 Refer to Photo 4.24 for site photo and Photo 4.25 for plot location.

Site ID	Location			Transect results (percent)			Outcome	Associated BAM VI Plot:
	Zone	Easting	Northing	Native	Exotic (perennial)	Exotic (annual)		
VNI_grassland02	55	348152	6115195	30	0	70	**Native** - Transect <50 per cent perennial exotic cover. Vegetation considered to be native and assigned to PCT 28 – Derived LCV.	VNI_DR58 Refer to Photo 4.26 for site photo and Photo 4.27 for plot location.
VNI_grassland03	55	293008	6114667	46	0	53	**Native** - Transect <50 per cent perennial exotic cover. Vegetation considered to be native and assigned to PCT 28 – Derived LCV.	VNI_OZ01 Refer to Photo 4.28 for site photo and Photo 4.29 for plot location.
VNI_grassland04	55	268296	6126420	5	0	96	**Native** - Transect <50 per cent perennial exotic cover. Vegetation considered to be native and assigned to PCT 20 – Derived LCV.	VNI_DR67 Refer to Photo 4.30 for site photo and Photo 4.31 for plot location.
Grasslands_VNI05	54	762835	6096097	23	0	77	**Native** - Transect <50 per cent perennial exotic cover. Vegetation considered to be native and assigned to PCT 13 – Derived LCV.	VNI_MP05 Refer to Photo 4.32 for site photo and Photo 4.33 for plot location.
NM_09	54	760481	6093920	10.11	0	89.89	**Native** - Transect <50 per cent perennial exotic cover. Vegetation considered to be native and assigned to PCT 13 – Derived LCV.	No associated plot. Refer to Photo 4.34 showing evidence of recent cropping.
NM_10	54	759333	6092668	0	0	100	**Exotic** - Transect entirely annual exotic species. Vegetation considered to be non-native and assigned to PCT 0.	Not required. Refer to Photo 4.35 showing evidence of recent cropping.

Site ID	Location			Transect results (percent)			Outcome	Associated BAM VI Plot:
	Zone	Easting	Northing	Native	Exotic (perennial)	Exotic (annual)		
NM_11	54	762526	6117063	30	0	55	**Native** - Transect <50 per cent perennial exotic cover. Vegetation considered to be native and assigned to PCT 164 – Derived LCV.	VNI_DR77 Refer to Photo 4.36 for site photo and Photo 4.37 for plot location.
NM_12	54	762313	6115995	34.38	0	65.62	**Native** - Transect <50 per cent perennial exotic cover. Vegetation considered to be native and assigned to PCT 15 – Derived LCV.	VNI_DR76 Refer to Photo 4.38 for site photo and Photo 4.39 for plot location.
NM_13	54	762191	6115297	23.91	0	76.09	**Native** - Transect <50 per cent perennial exotic cover. Vegetation considered to be native and assigned to PCT 164 – Derived LCV.	VNI_DR75 Refer to Photo 4.40 for site photo and Photo 4.41 for plot location.
NM_14	54	763946	6110795	20.79	0	79.21	**Native** - Transect <50 per cent perennial exotic cover. Vegetation considered to be native and assigned to PCT 15 - Derived.	No associated plot. Refer to Photo 4.42 for evidence of historic disturbance.
NM_15	54	762116	6115059	50.47	0	49.53	**Native** - Transect <50 per cent perennial exotic cover. Vegetation considered to be native and assigned to PCT 164 – Derived LCV.	VNI_DR74 Refer to Photo 4.43 for site photo and Photo 4.44 for plot location.
VNI_MP36 Grassland	54	762368	6115887	79.17	0	20.83	**Native** - Transect <50 per cent perennial exotic cover. Vegetation considered to be native and assigned to PCT 15 – Derived LCV.	VNI_MP36 Refer to Photo 4.45 for site photo and Photo 4.46 for plot location.

Site ID	Location			Transect results (percent)			Outcome	Associated BAM VI Plot:
	Zone	Easting	Northing	Native	Exotic (perennial)	Exotic (annual)		
VNI_MPGrassland01	54	761030	6083090	0	0	0	**Exotic** – Transect occurred over a spent cropped paddock with no live native or exotic species recorded. Vegetation considered to be non-native and assigned to PCT 0. See Photo 4.53.	Not required. Refer to Photo 4.47 and Photo 4.48 showing evidence of recent cropping.
W2G_grassland01	55	537350	6104131	54	17	29	**Native** - Transect <50 per cent perennial exotic cover. Vegetation considered to be native and assigned to PCT 277 – Derived LCV.	VNI_DR107
W2G_grassland02	55	544041	6097765	9	30	64	**Exotic** - Transect >50 per cent perennial exotic cover. Vegetation considered to be non-native and assigned to PCT 0.	Not required.
W2G_grassland03	55	536805	6102188	58	18	25	**Native** - Transect <50 per cent perennial exotic cover. Vegetation considered to be native and assigned to PCT 277 – Derived LCV.	VNI_DR109
W2G_grassland04	55	543141	6097627	76	11	13	**Native** - Transect <50 per cent perennial exotic cover. Vegetation considered to be native and assigned to PCT 277 – Derived LCV.	VNI_DR111
W2G_grassland05	55	543925	6097408	16	70	16	**Exotic** - Transect >50 per cent perennial exotic cover. Vegetation considered to be non-native and assigned to PCT 0.	Not required.
W2G_grassland06	55	537169	6102424	27	48	25	**Exotic** - Transect >50 per cent perennial exotic cover. Vegetation considered to be non-native and assigned to PCT 0.	Not required.

Site ID	Location			Transect results (percent)			Outcome	Associated BAM VI Plot:
	Zone	Easting	Northing	Native	Exotic (perennial)	Exotic (annual)		
W2G_grassland07	55	540759	6099273	40	50	10	**Exotic** - Transect >50 per cent perennial exotic cover. Vegetation considered to be non-native and assigned to PCT 0.	Not required.
W2G_grassland08	55	540959	6099147	72	25	3	**Native** - Transect <50 per cent perennial exotic cover. Vegetation considered to be native and assigned to PCT 343 – Derived LCV.	VNI_OZ22
W2G_grassland09	55	541237	6098997	40	11	49	**Native** - Transect <50 per cent perennial exotic cover. Vegetation considered to be native and assigned to PCT 343 – Derived LCV.	VNI_DR118
Grassland246_01	54	759007	6087035	6	5	89	**Exotic –** Transect has 6% perennial native 5% perennial exotic and 86% annual exotic cover. Whilst this suggests a native outcome, the plot is considered exotic due to the only natives being common recolonising species which are not characteristic of a specific PCT. Additionally, the plot occurs in the same cropped paddock as plots 246_02, 03 and 04 which are all exotic. Differences between these plots and 246_01 are evidence of slightly different disturbance timeframes within the past 6 months.	Nil. Refer to Photo 4.49 and Photo 4.50 showing evidence of recent cropping.
Grassland246_02	54	759283	6087183	0	0	100	**Exotic** - Transect >50 per cent perennial exotic cover. Vegetation considered to be non-native and assigned to PCT 0.	Not required. Refer to Photo 4.51 showing evidence of recent cropping.
Grassland246_03	54	759577	6087083	0	3	97	**Exotic** - Transect >50 per cent perennial exotic cover. Vegetation considered to be non-native and assigned to PCT 0.	Not required. Refer to Photo 4.52 showing evidence of recent cropping.

Site ID	Location			Transect results (percent)			Outcome	Associated BAM VI Plot:
	Zone	Easting	Northing	Native	Exotic (perennial)	Exotic (annual)		
Grassland246_04	54	759471	6086616	0	0	100	**Exotic** - Transect >50 per cent perennial exotic cover. Vegetation considered to be non-native and assigned to PCT 0.	Not required. Refer to Photo 4.53 and Photo 4.54 showing evidence of recent cropping.
Vni_gl07	54	761946	6099220	0	0	100	**Exotic** – Transect 100% annual exotic species. Vegetation considered to be non-native and assigned to PCT 0.	Not required.



Photo 4.5 VNI_Grassland01 site photo



Photo 4.6 Location of ‘VNI_Grassland01’



Photo 4.7 VNI_GrasslandDR02 site photo



Photo 4.8 Location of ‘VNI_GrasslandDR02’

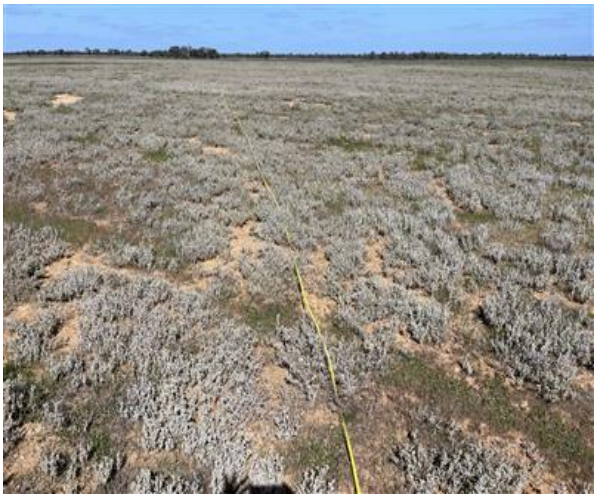


Photo 4.9 VNIGrassland_NM01 site photo



Photo 4.10 Location of ‘VNIGrassland_NM01’ with aerial imagery showing evidence of historic cropping



Photo 4.11 VNIGrassland_NM02 site photo



Photo 4.12 Location of ‘VNIGrassland_NM02’

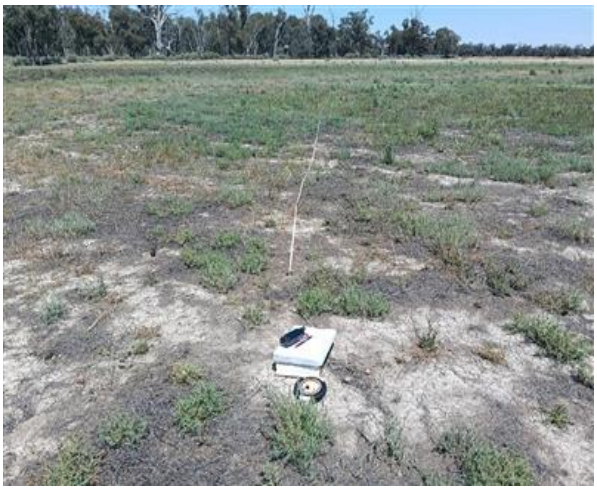


Photo 4.13 VNIGrasslandH258-01 site photo



Photo 4.14 Location of ‘VNIGrasslandH258-01’

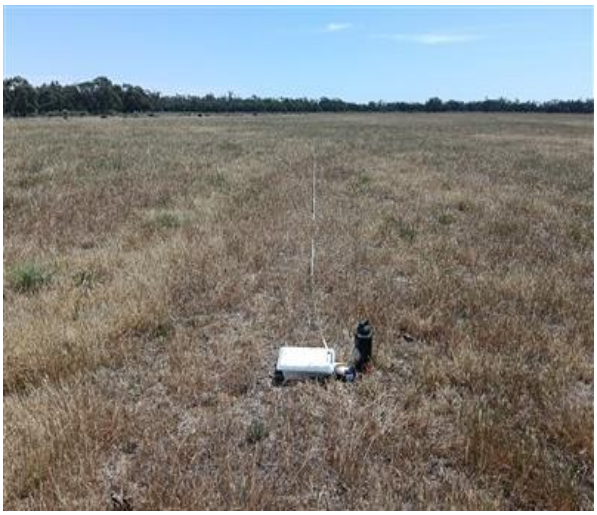


Photo 4.15 VNIGrasslandH258-02 site photo



Photo 4.16 Location of ‘VNIGrasslandH258-02’

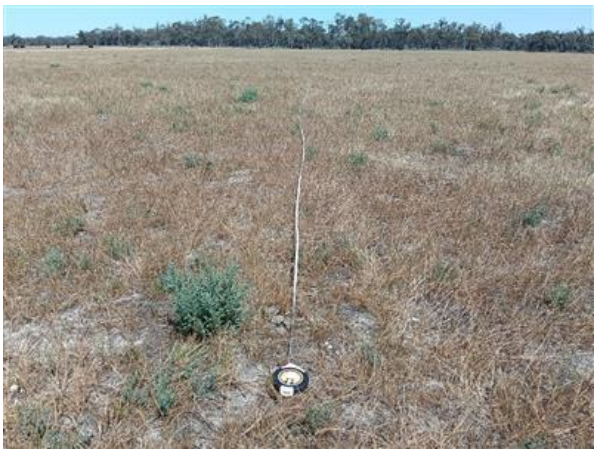


Photo 4.17 VNIGrasslandH258-03 site photo



Photo 4.18 Location of ‘VNIGrasslandH258-03’

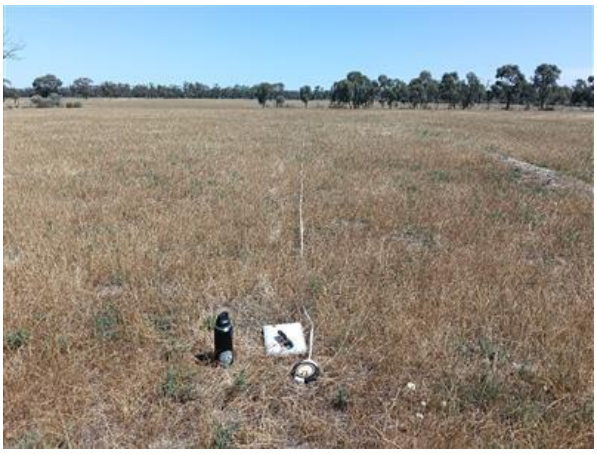


Photo 4.19 VNIGrasslandH258-04 site photo



Photo 4.20 Location of ‘VNIGrasslandH258-04’



Photo 4.21 VNIGRASSH360_01 site photo



Photo 4.22 Location of ‘VNIGRASSH360_01’

No photo available



Photo 4.23 Location of ‘VNIGRASSH360_02’



Photo 4.24 VNI_grassland01 site photo



Photo 4.25 Location of ‘VNI_grassland01’



Photo 4.26 VNI_grassland02 site photo



Photo 4.27 Location of ‘VNI_grassland02’



Photo 4.28 VNI_grassland03 site photo



Photo 4.29 Location of ‘VNI_grassland03’



Photo 4.30 VNI_grassland04 site photo



Photo 4.31 Location of ‘VNI_grassland04’



Photo 4.32 Grasslands_VNI05 site photo



Photo 4.33 Location of ‘Grasslands_VNI05’ with aerial imagery showing evidence of recent cropping



Photo 4.34 Location of ‘NM_09’ with aerial imagery showing evidence of recent cropping



Photo 4.35 Location of ‘NM_10’ with aerial imagery showing evidence of recent cropping

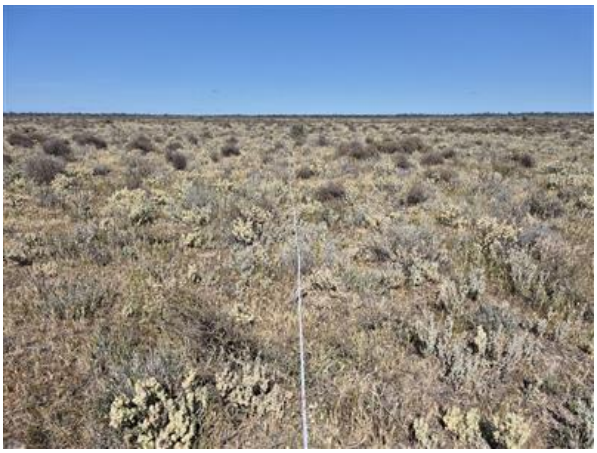


Photo 4.36 NM_11 site photo



Photo 4.37 Location of ‘NM_11’

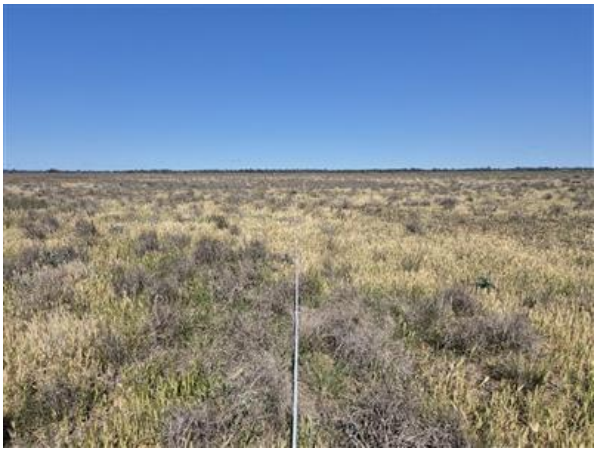


Photo 4.38 NM_12 site photo



Photo 4.39 Location of ‘NM_12’

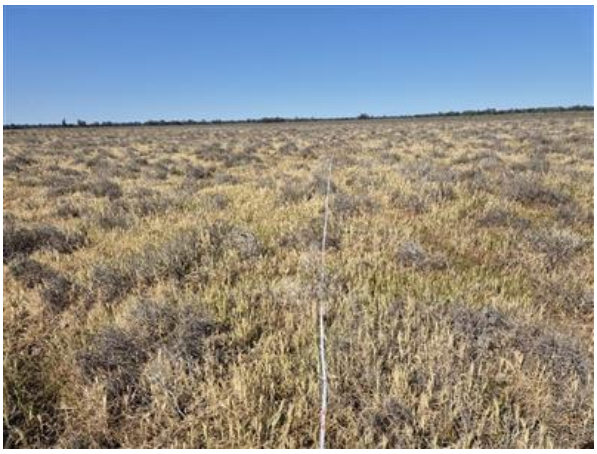


Photo 4.40 NM_13 site photo



Photo 4.41 Location of ‘NM_13’



Photo 4.42 Location of ‘NM_14’



Photo 4.43 NM_15 site photo



Photo 4.44 Location of ‘NM_15’



Photo 4.45 vni mp 36 grassland site photo

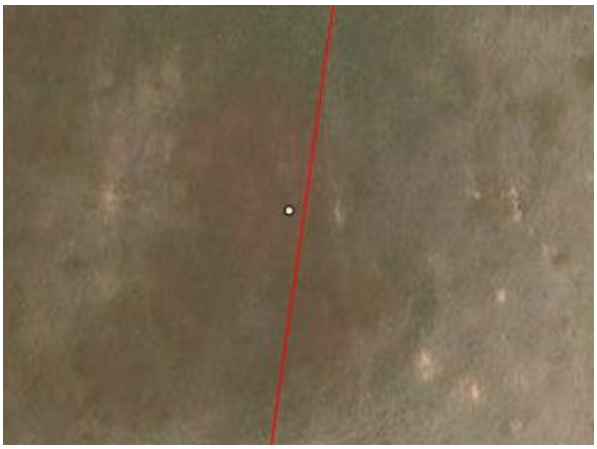


Photo 4.46 Location of ‘vni mp 36 grassland’



Photo 4.47 vni mp grass 01 site photo showing evidence of recent cropping



Photo 4.48 Location of ‘vni mp grass 01’ with aerial imagery showing evidence of recent cropping



Photo 4.49 Grassland246_01 site photo



Photo 4.50 Location of ‘Grassland246_01’ with aerial imagery showing evidence of recent cropping



Photo 4.51 Location of ‘Grassland246_02’ with aerial imagery showing evidence of recent cropping



Photo 4.52 Location of ‘Grassland246_03’ with aerial imagery showing evidence of recent cropping



Photo 4.53 Grassland246_04 site photo



Photo 4.54 Location of ‘Grassland246_04’ with aerial imagery showing evidence of recent cropping

4.2 Plant community types

4.2.1 Overview

Native vegetation has been recorded by vegetation formation, class and associated PCT. The native vegetation recorded within the subject land has been assigned to seven vegetation formations being:

- Arid Shrublands (Chenopod sub-formation)
- Forested Wetlands
- Freshwater Wetlands
- Grasslands
- Grassy Woodlands
- Semi-arid Woodlands (Grassy sub-formation)
- Semi-arid Woodlands (Shrubby sub-formation).

Of the seven recorded native vegetation formations, these have been assigned to 10 vegetation classes, 33 PCTs and 94 vegetation zones. An overview of each PCTs and vegetation condition is presented in Table 4.2.

PCT selection justification was undertaken by quantitative analysis using the BioNet Vegetation Classification PCT filter tool. The specifically criteria used for this justification analysis included:

- dominant canopy species
- main associated species
- landscape position
- characteristic mid-storey species
- characteristic ground cover species
- other diagnostic features and descriptive fields.

This PCT selection and justification analysis is consistent with section 4.2 of BAM and section 3.3.1 of the BAM Operational Manual – Stage 1. A detailed description of each PCT, including selection justification, floristic and structural composition along with representative photos and summary of BAM plot data against IBRA region benchmarks are provided in this Section of the report.

Detailed vegetation integrity plot data for each PCT and associated vegetation zone is presented in Appendix D. Detailed vegetation mapping is shown in Figure 15.8.

Table 4.2 PCTs identified within the subject land

PCT ID	PCT name	Condition classes	BC Act	SAII	EPBC Act	Subject land area (ha)
2	River Red Gum-sedge dominated very tall open forest in frequently flooded forest wetland along major rivers and floodplains in south-western NSW	SVTM	Not Listed	No	Not Listed	0.12
7	River Red Gum - Warrego Grass - herbaceous riparian tall open forest wetland mainly in the Riverina Bioregion	Moderate-good	Not Listed	No	Not Listed	4.67
10	River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Moderate-good	Not Listed	No	Not Listed	13.47
		Thinned	Not Listed	No	Not Listed	12.66
		SVTM	Not Listed	No	Not Listed	1.39
		Derived	Not Listed	No	Not Listed	3.52
		Derived_LCV	Not Listed	No	Not Listed	5.20
11	River Red Gum - Lignum very tall open forest or woodland wetland on floodplains of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Moderate-good	Not Listed	No	Not Listed	0.49

PCT ID	PCT name	Condition classes	BC Act	SAII	EPBC Act	Subject land area (ha)
13	Black Box - Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Moderate-good	Not Listed	No	Not Listed	63.40
		SVTM	Not Listed	No	Not Listed	14.36
		Thinned	Not Listed	No	Not Listed	21.96
		Planted_NatVeg	Not Listed	No	Not Listed	0.20
		Derived	Not Listed	No	Not Listed	15.11
		Derived_LCV	Not Listed	No	Not Listed	49.33
15	Black Box open woodland wetland with chenopod understorey mainly on the outer floodplains in south-western NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Moderate-good	Not Listed	No	Not Listed	74.89
		Thinned	Not Listed	No	Not Listed	3.36
		SVTM	Not Listed	No	Not Listed	1.91
		Derived	Not Listed	No	Not Listed	13.18
		Derived_LCV	Not Listed	No	Not Listed	6.38
17	Lignum shrubland wetland of the semi-arid (warm) plains (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Moderate-good	Not Listed	No	Not Listed	12.63
		SVTM	Not Listed	No	Not Listed	2.38

PCT ID	PCT name	Condition classes	BC Act	SAII	EPBC Act	Subject land area (ha)
19	Cypress Pine woodland of source-bordering dunes mainly on the Murray and Murrumbidgee River floodplains	SVTM	Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregions	No	Not Listed	1.59
20	Buloke - Moonah - Black Box open woodland on sandy rises of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Thinned	*Allocasuarina luehmannii* Woodland in the Riverina and Murray-Darling Depression Bioregions - Endangered	Yes	Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions - Endangered	0.16
		Derived	*Allocasuarina luehmannii* Woodland in the Riverina and Murray-Darling Depression Bioregions – Endangered	Yes	Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions – Endangered	0.99
		Derived_LCV	*Allocasuarina luehmannii* Woodland in the Riverina and Murray-Darling Depression Bioregions – Endangered	Yes	Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions – Endangered	0.77
23	Yarran tall open shrubland of the sandplains and plains of the semi-arid (warm) and arid climate zones	Moderate-good	*Acacia melvillei* Shrubland in the Riverina and Murray-Darling Depression bioregions – Endangered	No	Not Listed	3.41
		Thinned	*Acacia melvillei* Shrubland in the Riverina and Murray-Darling Depression bioregions – Endangered	No	Not Listed	0.20
		Derived	*Acacia melvillei* Shrubland in the Riverina and Murray-Darling Depression bioregions – Endangered	No	Not Listed	2.71
		Derived_LCV	*Acacia melvillei* Shrubland in the Riverina and Murray-Darling Depression bioregions - Endangered	No	Not Listed	3.54

PCT ID	PCT name	Condition classes	BC Act	SAII	EPBC Act	Subject land area (ha)
24	Canegrass swamp tall grassland wetland of drainage depressions, lakes and pans of the inland plains	Moderate-good	Not Listed	No	Not Listed	7.02
26	Weeping Myall open woodland of the Riverina Bioregion and NSW South Western Slopes Bioregion	Moderate-good	Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions - Endangered	No	Weeping Myall Woodlands - Endangered	91.32
		Thinned	Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions - Endangered	No	Not Listed	84.09
		SVTM	Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions - Endangered	No	Weeping Myall Woodlands - Endangered	1.33
		Derived	Not Listed	No	Not Listed	138.90
		Derived_LCV	Not Listed	No	Not Listed	1.29
28	White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone	Moderate-good	Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregions - Endangered	No	Not Listed	2.94
		Thinned	Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregions - Endangered	No	Not Listed	5.65

PCT ID	PCT name	Condition classes	BC Act	SAII	EPBC Act	Subject land area (ha)
		SVTM	Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregions - Endangered	No	Not Listed	6.04
		Derived Tall Shrubland	Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregions - Endangered	No	Not Listed	1.31
		Derived_LCV	Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregions - Endangered	No	Not Listed	5.03
		Derived	Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregions - Endangered	No	Not Listed	19.83
44	Forb–rich Spear grass – Windmill Grass – White Top grassland of the Riverina Bioregion	Moderate-good	Not Listed	No	Natural Grasslands of the Murray Valley Plains – Critically Endangered	14.77
		SVTM	Not Listed	No	Natural Grasslands of the Murray Valley Plains – Critically Endangered	18.96
45	Plains Grass grassland on alluvial mainly clay soils in the Riverina Bioregion and NSW South Western Slopes Bioregion	Moderate-good	Not Listed	No	Natural Grasslands of the Murray Valley Plains – Critically Endangered	3.58
		SVTM	Not Listed	No	Natural Grasslands of the Murray Valley Plains – Critically Endangered	5.96

PCT ID	PCT name	Condition classes	BC Act	SAII	EPBC Act	Subject land area (ha)
46	Curly Windmill Grass – spear grass – wallaby grass grassland on alluvial clay and loam on the Hay Plain, Riverina Bioregion	Moderate-good	Not Listed	No	Natural Grasslands of the Murray Valley Plains – Critically Endangered	39.35
		SVTM	Not Listed	No	Natural Grasslands of the Murray Valley Plains – Critically Endangered	19.07
47	Swamp grassland wetland of the Riverine Plain	Moderate-good	Not Listed	No	Not Listed	0.17
58	Black Oak – Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion	Moderate-good	Not Listed	No	Not Listed	0.26
		Thinned	Not Listed	No	Not Listed	0.70
70	White Cypress Pine woodland on sandy loams in central NSW wheatbelt	SVTM	Not Listed	No	Not Listed	0.16
76	Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	Thinned	Inland Grey Box Woodlands in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions - Endangered	No	Not Listed	0.30
86	Yellow Gum tall woodland of the Murray River floodplain, Riverina Bioregion	Moderate-good	Not Listed	No	Not Listed	0.05
157	Bladder Saltbush shrubland on alluvial plains in the semi-arid (warm) zone including Riverina Bioregion	Moderate-good	Not Listed	No	Not Listed	91.91
		SVTM	Not Listed	No	Not Listed	7.55

PCT ID	PCT name	Condition classes	BC Act	SAII	EPBC Act	Subject land area (ha)
159	Old Man Saltbush shrubland mainly of the semi-arid (warm) climate zone (south western NSW)	SVTM	Not Listed –	No	Not Listed	0.05
160	Nitre Goosefoot shrubland wetland on clays of the inland floodplains	Moderate-good	Not Listed	No	Not Listed	15.46
		SVTM	Not Listed	No	Not Listed	1.41
163	Dillon Bush (Nitre Bush) shrubland of the semi-arid and arid zones	Moderate-good	Not Listed	No	Not Listed	66.06
		SVTM	Not Listed	No	Not Listed	12.28
		Derived_LCV	Not Listed	No	Not Listed	0.68
164	Cotton Bush open shrubland of the semi-arid (warm) zone	Moderate-good	Not Listed	No	Not Listed	256.51
		SVTM	Not Listed	No	Not Listed	95.74
		Derived_LCV	Not Listed	No	Not Listed	5.48
170	Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones	Thinned	Not Listed	No	Not Listed	4.17
		Derived	Not Listed	No	Not Listed	1.42
216	Black Roly Poly low open shrubland of the Riverina Bioregion and Murray Darling Depression Bioregion	Moderate-good	Not Listed	No	Not Listed	10.46

PCT ID	PCT name	Condition classes	BC Act	SAII	EPBC Act	Subject land area (ha)
237	Riverine Western Grey Box grassy woodland of the semi-arid (warm) climate zone	Moderate-good	Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions - Endangered	No	Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia - Endangered	0.84
266	White Box grassy woodland in the upper slopes subregion of the NSW South Western Slopes Bioregion	Moderate-good	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions – Critically Endangered	Yes	White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland – Critically Endangered	0.16
		Thinned	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions – Critically Endangered	Yes	White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland – Critically Endangered	0.02
277	Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	Mod-good	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions – Critically Endangered	Yes	White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland – Critically Endangered	0.19

PCT ID	PCT name	Condition classes	BC Act	SAII	EPBC Act	Subject land area (ha)
		Thinned	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions – Critically Endangered	Yes	White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland – Critically Endangered	3.01
		Derived_LCV	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions – Critically Endangered	Yes	Not listed	40.86
319	Tumbledown Red Gum – White Cypress Pine hill woodland in the southern part of the NSW South Western Slopes Bioregion	Thinned	Not Listed	No	Not Listed	0.83
		Derived_LCV	Not Listed	No	Not Listed	11.66
343	Mugga Ironbark – Red Box – Red Stringybark – Western Grey Box grass/shrub woodland on metamorphic substrates in the Tarcutta – Gundagai region, NSW South Western Slopes Bioregion	Mod-good	Not Listed	No	Not Listed	0.01
		Derived_LCV	Not Listed	No	Not Listed	3.79
Total area						**1431.59**

4.2.2 PCT 2 – River Red Gum-sedge dominated very tall open forest in frequently flooded forest wetland along major rivers and floodplains in south-western NSW

4.2.2.1 PCT overview

PCT 2 - River Red Gum-sedge dominated very tall open forest in frequently flooded forest wetland along major rivers and floodplains in south-western NSW is described by BioNet Vegetation classification system as a very tall open forests dominated by River Red Gum (*Eucalyptus camaldulensis* subsp. *camaldulensis*), which can grow over 30 metres high and sometimes exceed 45 metres. Shrubs are typically absent. The ground cover varies from sparse, covered in litter, to mid-dense or dense, and is primarily composed of sedges such as *Eleocharis acuta, Eleocharis pusilla, Carex inversa, Cyperus exaltatus, Cyperus gymnocaulis, Carex gaudichaudiana*, and *Carex tereticaulis*, along with rushes like *Juncus amabilis* and *Juncus flavidus*. Grass species include Spiny Mudgrass (*Pseudoraphis spinescens*), Blown Grass (*Lachnagrostis filiformis*), and Warrego Grass (*Paspalidium jubiflorum*). Forb species present include *Centipeda cunninghamii, Persicaria prostrata, Rumex brownii, Alternanthera denticulata, Senecio quadridentatus, Centipeda minima* var. *minima, Stellaria angustifolia*, and aquatic plants such as *Triglochin procerum* and *Myriophyllum crispatum*. Common weed species include *Bromus hordeaceus*, Hypochaeris radicata*, Hypochaeris glabra*, Paspalum distichum*, Aster subulatus*, Cirsium vulgare*, Conyza bonariensis*, Sonchus oleraceus** and *Phyla canescens**.

This community is found on black to grey silty-loam-clay alluvial soils, often self-mulching, in frequently flooded areas bordering stream channels, oxbows, and nearby low-lying regions, including intermittent lakes. It is primarily distributed along the Murray River, with smaller areas along the Murrumbidgee and Lachlan Rivers in the Riverina and Murray-Darling Basin Bioregions of New South Wales and Victoria, and small areas in the NSW South-western Slopes Bioregion. The largest areas are located in the middle sections of the Murray River in NSW and Victoria. Extensive logging has reduced the stature of many River Red Gum trees, although some unlogged areas remain. As of 2008, this community is poorly represented in protected areas but remains largely uncleared due to its proximity to river channels. Major threats include weed invasion, inappropriate logging, and reduced flooding due to irrigation draw-off or climate change.

Within the subject land vegetation associated with this PCT is limited to SVTM in areas not subject to survey due to access restrictions. PCT 2 has been mapped by the SVTM along the banks of the Niemur River south west of Moulamein and along the banks of the Murray River where the project crosses into Victoria. Vegetation descriptions and condition state has been described as “Benchmark” as defined by BioNet Vegetation Classification and the BAM-C. Table 4.3 provides an overview of the PCT as outlined in the BioNet Vegetation Classification database.

Table 4.3 PCT 2 River Red Gum-sedge dominated very tall open forest in frequently flooded forest wetland along major rivers and floodplains in south-western NSW community overview

PCT ID	**2**
PCT name	River Red Gum-sedge dominated very tall open forest in frequently flooded forest wetland along major rivers and floodplains in south-western NSW
Vegetation formation	Forested Wetlands
Vegetation class	Inland Riverine Forests
Cleared value	14.29 %
Extent within subject land	Murray Fans - 0.12 ha
BAM VI plots used in assessment	Benchmark condition assumed as defined by the BAM-C.

4.2.2.2 Condition states

Within the subject land, PCT 2 is presented in the following broad condition state (equivalent to vegetation zones):

- SVTM (Benchmark).

4.2.2.3 Justification of PCT selection

Due to land access restrictions, field verification of this PCT in areas of SVTM has not been completed by WSP.

4.2.2.4 Alignment with TECs

As outlined in BioNet Vegetation Classification database, there is no BC Act listed TEC associated with PCT 2.

4.2.2.5 Alignment with EPBC Act listed TECs

As outlined in BioNet Vegetation Classification database, there is no EPBC Act listed TEC associated with PCT 2.

4.2.3 PCT 7 – River Red Gum – Warrego Grass – herbaceous riparian tall open forest wetland mainly in the Riverina Bioregion

4.2.3.1 PCT overview

PCT 7 - River Red Gum - Warrego Grass - herbaceous riparian tall open forest wetland mainly in the Riverina Bioregion is described by BioNet vegetation classification system as a tall open forest to 20 metres, dominated by River Red Gum (*Eucalyptus camaldulensis* subsp. *camaldulensis*) with a canopy cover of about 40 per cent. Shrubs are usually absent with the exception of scattered River Cooba (*Acacia stenophylla*). The ground cover may contain much leaf litter but also a mid-dense herbaceous ground cover dominated by grasses and forbs. Common grasses include Warrego Grass (*Paspalidium jubiflorum*) wheatgrass (*Elymus scab*er), Blown Grass (*Lachnagrostis filiformis)* and wallaby grasses (*Rytidosperma spp*.). Common forbs include *Wahlenbergia fluminalis*, *Senecio quadridentatus, Ranunculus inundatus,* and *Brachyscome basaltica var. gracilis.* It occurs on the inner floodplains and lining channels including on levees of major river systems on alluvial brown or grey cracking clay or clay loam soils. The main threats to this community are altered flooding due to river controls and irrigation, over-logging and weed invasion.

Within the subject land, PCT 7 was recorded along the banks of waterways including Merran Creek, Wakool River, Yerrein Creek and the Edward River. Table 4.4 provides an overview of the PCT as outlined in the BioNet Vegetation Classification database. Table 4.5 provides a detailed description of each species per growth form recorded from BAM plots undertaken in PCT 7 during field survey.

Examples of PCT 7 are provided in Photo 4.55 and Photo 4.56.

Table 4.4 PCT 7 - River Red Gum - Warrego Grass - herbaceous riparian tall open forest wetland mainly in the Riverina Bioregion community overview

PCT ID	**7**
PCT name	River Red Gum - Warrego Grass - herbaceous riparian tall open forest wetland mainly in the Riverina Bioregion.
Vegetation formation	Forested Wetlands
Vegetation class	Inland Riverine Forests
Cleared value	15.00 %
Extent within subject land	Murray Fans – 4.67 ha
BAM VI plots used in assessment	VNI_DR20, VNI_DR46, VNI_DR93, VNI_NM033, VNI_NM037

Table 4.5 PCT 7 – River Red Gum – Warrago Grass – herbaceous riparian tall open forest wetland mainly in the Riverina Bioregion species composition within the subject land

Growth form	Species recorded
Tree	*Eucalyptus camaldulensis*
Shrub	Absent
Fern	Absent
Grass & grasslike	*Paspalidium jubiflorum, Juncus flavidus*
Forbs	*Centipeda cunninghamii, Alternanthera denticulata, Centipeda minima, Senecio quadridentatus, Wahlenbergia fluminalis*
Other	-



Photo 4.55 Example of PCT 7 in moderate-good condition at VI plot VNI_DR46



Photo 4.56 Example of PCT 7 in moderate-good condition at VI plot VNI_DR93

4.2.3.2 Condition states

Within the subject land PCT 7 is presented in the following broad condition state (equivalent to vegetation zones):

- Moderate-good.

4.2.3.3 Justification of PCT selection

This vegetation type occurs on alluvial loam and clay soils along waterways. The overstorey is dominated by *Eucalyptus camaldulensis*, while the ground layer was dominated by forbs and grasses including *Paspalidium jubiflorum*.

A quantitative analysis was undertaken for this community using the BioNet Vegetation Classification (BVC) PCT filter tool. The following search criteria was used:

- IBRA region: Riverina
- IBRA subregion: Murray Fans
- Vegetation formation: Forested Wetlands
- Vegetation class: Inland Riverine Forests
- Species (all strata and growth form groups*): Eucalyptus camaldulensis, Paspalidium jubiflorum, Juncus flavidus, Centipeda cunninghamii, Alternanthera denticulata, Centipeda minima, Senecio quadridentatus*, and *Wahlenbergia fluminalis*. Dominant species of each strata were selected (i.e. those with the highest VI Plot cover values).

The search returned a total of two PCTs with 11 of the 12 search criteria:

- PCT 7 - River Red Gum - Warrego Grass - herbaceous riparian tall open forest wetland mainly in the Riverina Bioregion
- PCT 2 - River Red Gum-sedge dominated very tall open forest in frequently flooded forest wetland along major rivers and floodplains in south-western NSW.

PCT 2 is a River-Red Gum community with a sedge dominated ground stratum and was dismissed due the absence of a sedge dominated ground stratum recorded onsite. A herbaceous ground stratum was recorded, determining PCT 7 to be the most suitable PCT for this vegetation.

Based on floristic and geological characteristics, this vegetation type is considered consistent with the scientific description and distribution information outlined for PCT 7.

4.2.3.4 Alignment with TECs

As outlined in BioNet Vegetation Classification database, there is no BC Act listed TEC associated with PCT 7.

4.2.3.5 Alignment with EPBC Act listed TECs

As outlined in BioNet Vegetation Classification database, there is no EPBC Act listed TEC associated with PCT 7.

4.2.4 PCT 10 – River Red Gum – Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)

4.2.4.1 PCT overview

PCT 10 - River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion) is described in BioNet vegetation classification system as a tall to mid-high woodland averaging about 18 metres high with a canopy dominated by a mixture of River Red Gum (*Eucalyptus camaldulensis*) and Black Box (*Eucalyptus largiflorens*). It occurs on grey to brown loam to medium clays at the junction of River Red Gum and Black Box zones on the swamps, drainage depressions, backplains and alluvial floodplains of major inland rivers in the 450 to 250 millimetres annual rainfall zone. It is often found west of the western edge of the southern wheatbelt in NSW to the western section of the Riverine Plain Bioregion and in the Murray-Darling Depression Bioregion in south-western NSW extending into Victoria and perhaps South Australia.

The understorey may contain dense to very sparse stands of Lignum (*Muehlenbeckia florulenta*) and River Cooba (*Acacia stenophylla*) with the occasional *Exocarpos strictus*. The ground layer is sparse and includes grass species such as *Paspalidium jubiflorum, Enteropogon acicularis, Cynodon dactylon, Rytidosperma caespitosa* and *Austrostipa nodosa*; forb species such as *Sida corrugata*, *Oxalis perennans, Wahlenbergia fluminalis* and *Cyperus exaltatus*. Weeds may be common and usually include *Hordeum spp.*, Lolium spp.*, Vulpia spp.*, Sonchus oleraceus*, Medicago polymorpha** and *Phyla canescens**.

Significant areas in this community's eastern range have been cleared but some large remnants occur in the more inland, drier regions. Extended drought and dieback are major threats. Tree dieback from drought has increased since 2000.

Within the subject land, vegetation associated with PCT 10 was recorded on the upper banks of waterways in a transitional zone between the River Red Gum dominated forests on the inner banks and the Black Box dominated woodlands on the occasionally inundated floodplains. Additionally in areas subject to survey access restrictions, PCT 10 has been mapped by SVTM.

Table 4.6 provides an overview of the PCT as outlines in BioNet Vegetation Classification database. Table 4.7 provides a detailed description of each species per growth form recorded from BAM plots undertaken in PCT 10 during field survey.

Examples of PCT 10 are provided in Photo 4.57 and Photo 4.58.

Table 4.6 PCT 10 - River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion) community overview

PCT ID	**10**
PCT name	River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion).
Vegetation formation	Forested Wetlands
Vegetation class	Inland Riverine Forests
Cleared value	43.00 %
Extent within subject land	36.24 ha
BAM VI plots used in assessment	VNI_DR18, VNI_MP07, VNI_MP33, VNI_MP41, VNI_MP42, VNI_MP50, VNI_MP51, VNI_MP52, VNI_NM032, VNI_NM040, VNI_NM041

Table 4.7 PCT 10 - River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion) composition within the subject land

Growth form	**Species recorded**
Tree	*Eucalyptus camaldulensis, Eucalyptus largiflorens*
Shrub	*Duma florulenta, Chenopodium nitrariaceum, Rhagodia spinescens, Sclerolaena muricata*
Fern	*Marsilea drummondii*
Grass & grasslike	*Paspalidium jubiflorum*
Forbs	*Euphorbia drummondii, Einadia nutans*
Other	-



Photo 4.57 Example of PCT 10 in Moderate-good condition at VI plot VNI_DR18



Photo 4.58 Example of PCT 10 in Thinned condition at VI plot MP_VNI_42

4.2.4.2 Condition states

Within the subject land PCT 10 is presented in the following broad condition state (equivalent to vegetation zones):

- Moderate-good
- Thinned
- Derived
- SVTM (Benchmark).

4.2.4.3 Justification of PCT selection

This vegetation type occurs on alluvial loam and clay soils along waterways and floodplains. The overstorey is dominated by *Eucalyptus camaldulensis* and *Eucalyptus largiflorens*, while the ground layer was dominated by *Duma florulenta* with sparse *Paspalidium jubiflorum*.

A quantitative analysis was undertaken for this community using the BVC PCT filter tool. The following search criteria was used:

- IBRA region: Riverina
- IBRA subregion: Murray Fans
- Vegetation formation: Forested Wetlands
- Vegetation class: Inland Riverine Forests
- Species (all strata and growth form groups): *Eucalyptus camaldulensis* subsp. *camaldulensis, Eucalyptus largiflorens, Duma florulenta, Chenopodium nitrariaceum, Rhagodia spinescens, Sclerolaena muricata, Marsilea drummondii, Paspalidium jubiflorum, Euphorbia drummondii* and *Einadia nutans*. Dominant species of each strata were selected (i.e. those with the highest VI Plot cover values).

The search returned a total of one PCT with 11 search criteria matches:

- PCT 10 - River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion).

Additionally, the search returned a total of one PCT with 10 search criteria matches

- PCT 13 Black Box - Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion).

PCT 13 does not have Forested Wetlands as the Vegetation Formation or Inland Riverine Forests as the Vegetation Class. Additionally, PCT 13 has a dominance of *Eucalyptus largiflorens* with some *Eucalyptus camaldulensis* subsp. *camaldulensis,* while PCT 10 contains a co-dominance of these two species as recorded onsite, leading to the dismissal of PCT 13.

Based on floristic and geological characteristics, this vegetation type is considered consistent with the scientific description and distribution information outlined for PCT 10.

4.2.4.4 Alignment with TECs

As outlined in BioNet Vegetation Classification database, there is no BC Act listed TEC associated with PCT 10.

4.2.4.5 Alignment with EPBC Act listed TECs

As outlined in BioNet Vegetation Classification database, there is no EPBC Act listed TEC associated with PCT 10.

4.2.5 PCT 11 – River Red Gum – Lignum very tall open forest or woodland wetland on floodplains of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)

4.2.5.1 PCT overview

PCT 11 - River Red Gum - Lignum very tall open forest or woodland wetland on floodplains of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion) is described in BioNet Vegetation classification system as a tall open forest or woodland to 20 metres high dominated by River Red Gum (*Eucalyptus camaldulensis* subsp. *camaldulensis*) with Black Box (*Eucalyptus largiflorens*) sometimes present and a shrub understorey dominated by River Cooba (*Acacia stenophylla*), Lignum (*Duma florulenta*) and Nitre Goosefoot (*Chenopodium nitrariaceum*). The ground cover is usually mid-dense or sparse and is dominated by Warrego Grass (*Paspalidium jubiflorum*) and forb species such as *Pratia concolor, Alternanthera denticulata, Wahlenbergia fluminalis, Chenopodium pumilio, Brachyscome basaltica* var. *gracilis, Eclipta platyglossa, Senecio quadridentatus, Asperula gemella, Euchiton sphaericus, Minuria integerrima, Rorippa laciniata, Centipeda minima var. minima, Rumex tenax, Damasonium minus* and *Ranunculus undosus*. The sedge *Cyperus gymnocaulos* is commonly present.

PCT 11 occurs on heavy grey clay soil in drainage depressions and flood-outs of major water courses on the floodplains along western sections of Murray, Murrumbidgee and Lachlan Rivers and extending up the Darling River to Wilcannia. It is mainly found in the Riverina and Murray-Darling Depression Bioregions of the semi-arid (warm) climate zone. Reasonable stands remain and the greatest threat is over-grazing, changed flooding regimes and extended drought. Tree dieback from drought has increased since 2000.

PCT 11 occurs on heavy grey clay soil in drainage depressions and flood-outs of major water courses on the floodplains along western sections of Murray, Murrumbidgee and Lachlan Rivers and extending up the Darling River to Wilcannia. It is mainly found in the Riverina and Murray-Darling Depression Bioregions of the semi-arid (warm) climate zone. Reasonable stands remain and the greatest threat is over-grazing, changed flooding regimes and extended drought. Tree dieback from drought has increased since 2000.

Within the subject land, PCT 11 was recorded on the banks of waterways including the Edward River, Yarrein Creek and Merrian Creek. Additionally in areas subject to survey access restrictions, PCT 11 has been mapped by SVTM.

Table 4.8 provides an overview of the PCT as outlines in BioNet Vegetation Classification database. Table 4.9 provides a detailed description of each species per growth form recorded from BAM plots undertaken in PCT 7 during field survey.

Example of PCT 11 is provided in Photo 4.59.

Table 4.8 PCT 11 - River Red Gum - Lignum very tall open forest or woodland wetland on floodplains of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion) community overview

PCT ID	**11**
PCT name	River Red Gum - Lignum very tall open forest or woodland wetland on floodplains of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
Vegetation formation	Forested Wetlands
Vegetation class	Inland Riverine Forests
Cleared value	42 %
Extent within subject land	Murray Fans – 0.49 ha
BAM VI plots used in assessment	VNI_DR80

Table 4.9 PCT 11 - River Red Gum - Lignum very tall open forest or woodland wetland on floodplains of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion) composition within the subject land

Growth form	Species recorded
Tree	*Eucalyptus camaldulensis*
Shrub	*Duma florulenta, Chenopodium nitrariaceum*
Fern	*Marsilea drummondii*
Grass & grasslike	*Eragrostis parviflora, Austrostipa scabra* subsp. *scabra*
Forbs	*Einadia nutans, Atriplex semibaccata, Vittadinia cuneata* var. *cuneata*
Other	-



Photo 4.59 Example of PCT 11 in Moderate-good condition at VI plot VNI_DR80

4.2.5.2 Condition states

Within the subject land, PCT 11 is presented in the following broad condition state (equivalent to vegetation zones):

- Moderate-good
- SVTM (Benchmark).

4.2.5.3 Justification of PCT selection

This vegetation type occurs on alluvial loam and clay soils along waterways and floodplains. The overstorey is dominated by *Eucalyptus camaldulensis*, while the ground layer was dominated by *Duma florulenta* and *Chenopodium nitrariaceum.*

A quantitative analysis was undertaken for this community using the BVC PCT filter tool. The following search criteria was used:

- IBRA region: Riverina
- IBRA subregion: Murray Fans
- Vegetation formation: Forested Wetlands
- Vegetation class: Inland Riverine Forests

- Species (all strata and growth form groups): *Eucalyptus camaldulensis* subsp. *camaldulensis, Duma florulenta, Chenopodium nitrariaceum, Marsilea drummondii, Eragrostis parviflora, Austrostipa scabra subsp. scabra, Einadia nutans, Atriplex semibaccata, Vittadinia cuneata var. cuneata*. Dominant species of each strata were selected (i.e. those with the highest VI Plot cover values).

The search returned a total of one PCT with 10 search criteria matches:

- PCT 11 - River Red Gum - Lignum very tall open forest or woodland wetland on floodplains of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion).

Additionally, the search returned a total of one PCT with 9 search criteria matches

- PCT 13 Black Box - Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion).

PCT 13 does not have Forested Wetlands as the Vegetation Formation or Inland Riverine Forests as the Vegetation Class. Additionally, PCT 13 has a dominance of *Eucalyptus largiflorens* with some *Eucalyptus camaldulensis* subsp. *camaldulensis,* while PCT 11 contains a dominance of *Eucalyptus camaldulensis* subsp. *camaldulensis* with *Eucalyptus largiflorens* sometimes occurring, leading to the dismissal of PCT 13. No *Eucalyptus largiflorens* was recorded during assessments of this PCT.

Based on floristic and geological characteristics, this vegetation type is considered consistent with the scientific description and distribution information outlined for PCT 11.

4.2.5.4 Alignment with TECs

As outlined in BioNet Vegetation Classification database, there is no BC Act listed TEC associated with PCT 11.

4.2.5.5 Alignment with EPBC Act listed TECs

As outlined in BioNet Vegetation Classification database, there is no EPBC Act listed TEC associated with PCT 11.

4.2.6 PCT 13 – Black Box – Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)

4.2.6.1 PCT overview

PCT 13 - Black Box - Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion) is described in BioNet Vegetation classification system as a Black Box (*Eucalyptus largiflorens*) woodland, open forest or open woodland averaging 15 metres high dominated by sparse to dense stands of Lignum (*Duma florulenta*), Nitre Goosefoot (*Chenopodium nitrariaceum*) and River Cooba (*Acacia stenophylla*). The ground cover includes low shrubs such as *Sclerolaena muricata* var. *muricata, Enchylaena tomentosa, Einadia nutans* subsp. *nutans* and various saltbush species (*Atriplex* spp.). Forb species include *Solanum esuriale, Cotula australis, Oxalis perennans, Alternanthera denticulata* and *Pratia concolor.* Grass species include Warrego Summer Grass (*Paspalidium jubiflorum*), Curly Windmill Grass (*Enteropogon acicularis*) and *Walwhalleya proluta* and wallaby grasses (*Rytidosperma* spp.). Weed species include the shrub African Boxthorn (*Lycium ferocissimum**), the forbs *Cotula bipinnata**, *Erodium cicutarium** and *Sisymbrium irio** and the grasses *Hordeum leporinum** and *Lolium perenne**.

PCT 13 occurs on clay or clay-loam, often gilgaied, soils on inner floodplains and on alluvial plains mostly in depressions that are frequently flooded. It is a widespread community along rivers in south-western NSW including the Murray, Wakool, lower Darling, Lachlan, Murrumbidgee Rivers and Wouldandra Creek. It is mainly located in the semi-arid (warm) climate zone in the Riverina and Murray Darling Depression and southern Cobar Peneplain Bioregions. In arid areas of the Murray-Darling Depression Bioregion this community grades into the Black Box - chenopod community that occurs on higher ground and contains less or no lignum and more chenopod shrubs.

This community has been extensively cleared in eastern areas and is threatened by further clearing for agricultural development, weed invasion, altered flooding regimes and in some places rising saline water tables. Tree dieback from drought has increased since 2000.

Within the subject land, PCT 13 was recorded on semi-regularly inundated floodplains on river terraces and flats higher up the banks and further away from the watercourse than the River Red Gum dominated communities. Additionally in areas subject to survey access restrictions, PCT 13 has been mapped by SVTM.

Table 4.10 provides an overview of the PCT as outlines in BioNet Vegetation Classification database. Table 4.11 provides a detailed description of each species per growth form recorded from BAM plots undertaken in PCT 13 during field survey.

Examples of PCT 13 are provided in Photo 4.60 and Photo 4.61.

Table 4.10 PCT 13 - Black Box - Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion) community overview

PCT ID	**13**
PCT name	Black Box - Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion).
Vegetation formation	Semi-arid Woodlands (Grassy sub-formation)
Vegetation class	Inland Floodplain Woodlands
Cleared value	57 %
Extent within subject land	164.35 ha
BAM VI plots used in assessment	VNI_DR16, VNI_DR17, VNI_DR19, VNI_MP05, VNI_MP06, VNI_MP10, VNI_MP32, VNI_MP34, VNI_NM01, VNI_NM022, VNI_NM024, VNI_NM025, VNI_NM038, VNI_NM039, VNIOZ_10, VNI_MP48, VNI_MP53, VNI_MP54

Table 4.11 PCT 13 - Black Box - Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion) species composition within the subject land

Growth form	**Species recorded**
Tree	*Eucalyptus largiflorens*
Shrub	*Duma florulenta, Chenopodium nitrariaceum, Sclerolaena muricata* var. *muricata, Atriplex semibaccata*
Fern	*Marsilea drummondii*
Grass & grasslike	-
Forbs	*Einadia nutans*
Other	-



Photo 4.60 Example of PCT 13 in moderate-good condition at VI plot VNI_DR16



Photo 4.61 Example of PCT 13 in thinned condition at VI plot NM024

4.2.6.2 Condition states

Within the subject land PCT 13 is presented in the following broad condition state (equivalent to vegetation zones):

- Moderate-good
- Thinned
- Planted Native Vegetation
- Derived
- Derived – Low Conservation Value
- SVTM (Benchmark).

4.2.6.3 Justification of PCT selection

This vegetation type occurs on alluvial loam and clay soils near waterways and on floodplains. The overstorey is dominated by *Eucalyptus largiflorens*, while the ground layer was dominated by *Duma Florulenta.*

A quantitative analysis was undertaken for this community using the BVC PCT filter tool. The following search criteria was used:

- IBRA region: Riverina
- IBRA subregion: Murray Fans and Murrumbidgee
- Vegetation formation: Semi-arid Woodlands (Grassy sub-formation)
- Vegetation class: Inland Floodplain Woodlands
- Species (all strata and growth form groups): *Eucalyptus largiflorens, Duma florulenta, Chenopodium nitrariaceum, Sclerolaena muricata var. muricata, Atriplex semibaccata, Marsilea drummondii, Einadia nutans.* Dominant species of each strata were selected (i.e. those with the highest VI Plot cover values).

The search returned a total of one PCT with 11 of the 12 search criteria:

- PCT 13 - Black Box - Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion).

Additionally, the search returned a total of one PCT with 10 of the 12 search criteria:

- PCT 15 - Black Box open woodland wetland with chenopod understorey mainly on the outer floodplains in south-western NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion).

Given the dominance of *Duma florulenta* in the understorey rather than chenopods, PCT 15 can be dismissed determining PCT 13 to be the most suitable PCT for this vegetation.

Based on floristic and geological characteristics, this vegetation type is considered consistent with the scientific description and distribution information outlined for PCT 13.

4.2.6.4 Alignment with TECs

As outlined in BioNet Vegetation Classification database, there is no BC Act listed TEC associated with PCT 13.

4.2.6.5 Alignment with EPBC Act listed ECs

As outlined in BioNet Vegetation Classification database, there is no EPBC Act listed TEC associated with PCT 13.

4.2.7 PCT 15 – Black Box open woodland wetland with chenopod understorey mainly on the outer floodplains in south-western NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion)

4.2.7.1 PCT overview

PCT 15 - Black Box open woodland wetland with chenopod understorey mainly on the outer floodplains in south-western NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion) is described in BioNet Vegetation classification system as a Black Box open woodland wetland with chenopod understorey mainly on the outer floodplains in south-western NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion). It has been subject to an estimated 50 per cent clearing post European settlement, most of which has occurred on the Hay Plain, NSW. This PCT is dominated by a Black Box (*Eucalyptus largiflorens*) canopy with a predominately chenopod understory consisting of species such as Black Bluebush (*Maireana pyramidata*), Nitre Goosefoot (*Chenopodium nitrariaceum*), Bladder Saltbush (*Atriplex vesicaria*) and Old Man Saltbush (*Atriplex nummularia*). The ground cover consists of forbs, woody herbs, tussock grasses and smaller chenopods with more common species including Climbing Saltbush (*Einadia nutans* subsp. *nutans*), Tangled Copperburr (*Sclerolaena divaricata*), Creeping Saltbush (*Atriplex semibaccata*), Curly Windmill Grass (*Enteropogon acicularis*) and Corrugated Sida (*Sida corrugata*).

PCT 15 occurs on alkaline brown or grey clay soil on alluvial plains or sandy-loam soils on the flood plain of river systems. It has also been observed on sandy lunettes of some dry lakes in the semi-arid (warm) and arid climate zones of far south western NSW. In many places the understorey may have once been dominated by Old Man Saltbush (*Atriplex nummularia*), but this has been reduced due to grazing.

Within the subject land, this PCT has been recorded from the outer floodplains of major river systems and creeks in areas less regularly inundated than PCT 13.

Table 4.12 provides an overview of the PCT as outlined in the BioNet Vegetation Classification database. Table 4.13 provides a detailed description of each species per growth form recorded from BAM plots undertaken in PCT 15 during field survey.

Examples of PCT 15 are provided in Photo 4.62 and Photo 4.63.

Table 4.12 PCT 15 - Black Box open woodland wetland with chenopod understorey mainly on the outer floodplains in south-western NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion) community overview

PCT ID	15
PCT name	Black Box open woodland wetland with chenopod understorey mainly on the outer floodplains in south-western NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
Vegetation formation	Semi-arid woodlands (Grassy sub-formation)
Vegetation class	Inland Floodplain Shrublands
Cleared value	50 %
Extent within subject land	99.72 ha
BAM VI plots used in assessment	VNI_DR04, VNI_DR21, VNI_DR22, VNI_DR23, VNI_DR54, VNI_DR66, VNI_DR68, VNI_DR69, VNI_DR70, VNI_DR71, VNI_DR72, VNI_DR76, VNI_DR94, VNI_DR95, VNI_DR96, VNI_DR97, VNI_GL01, VNI_GL02, VNI_GL03, VNI_GL04, VNI_MP36, VNI_OZ08, VNI_OZ28, VNI_MP22, VNI_MP45, VNI_MP46

Table 4.13 PCT 15 - Black Box open woodland wetland with chenopod understorey mainly on the outer floodplains in south-western NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion) species composition within the subject land

Growth form	Species recorded
Tree	*Eucalyptus largiflorens*
Shrub	*Chenopodium nitrariaceum, Sclerolaena muricata* var. *muricata, Rhagodia spinescens, Maireana decalvans, Enchylaena tomentosa*
Fern	*Marsilea drummondii*
Grass & grasslike	*Enteropogon acicularis, Eragrostis australasica*
Forbs	*Atriplex lindleyi, Einadia nutans*
Other	-



Photo 4.62 Example of PCT 15 in Moderate-good condition at VI plot VNI_DR94



Photo 4.63 Example of PCT 15 in Thinned condition at VI plot VNI_DR97

4.2.7.2 Condition states

Within the subject land, PCT 15 is presented in the following broad condition state (equivalent to vegetation zones):

- Moderate-good
- Thinned
- Derived
- Derived – Low Conservation Value
- SVTM.

4.2.7.3 Justification of PCT selection

This vegetation type occurs on alluvial loam and clay soils near waterways and on floodplains. The overstorey is dominated by *Eucalyptus largiflorens*, while the ground layer was dominated by chenopods.

A quantitative analysis was undertaken for this community using the BVC PCT filter tool. The following search criteria was used:

- IBRA region: Riverina
- IBRA subregion: Murray Fans and Murrumbidgee
- Vegetation formation: Semi-arid Woodlands (Grassy sub-formation)
- Vegetation class: Inland Floodplain Woodlands
- Species (all strata and growth form groups): *Eucalyptus largiflorens, Chenopodium nitrariaceum, Sclerolaena muricata var. muricata, Rhagodia spinescens, Maireana decalvans, Enchylaena tomentosa, Marsilea drummondii, Enteropogon acicularis, Eragrostis australasica, Atriplex lindleyi, Einadia nutans*. Dominant species of each strata were selected (i.e. those with the highest VI Plot cover values).

The search returned a total of two PCTs with 14 of the 16 search criteria:

- PCT 13 - Black Box - Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
- PCT 15 - Black Box open woodland wetland with chenopod understorey mainly on the outer floodplains in south-western NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion).

Given the dominance of chenopods in the understorey rather than *Duma florulenta* PCT 13 can be dismissed, determining PCT 15 to be the most suitable PCT for this vegetation.

Based on floristic and geological characteristics, this vegetation type is considered consistent with the scientific description and distribution information outlined for PCT 15.

4.2.7.4 Alignment with TECs

As outlined in BioNet Vegetation Classification database, there is no BC Act listed TEC associated with PCT 15.

4.2.7.5 Alignment with EPBC Act listed TECs

As outlined in BioNet Vegetation Classification database, there is no EPBC Act listed TEC associated with PCT 15.

4.2.8 PCT 17 – Lignum shrubland wetland of the semi-arid (warm) plains (mainly Riverina Bioregion and Murray Darling Depression Bioregion)

4.2.8.1 PCT overview

PCT 17 - Lignum shrubland wetland of the semi-arid (warm) plains (mainly Riverina Bioregion and Murray Darling Depression Bioregion) is described in BioNet Vegetation classification system as a shrubland wetland of the semi-arid (warm) plains (mainly Riverina Bioregion and Murray Darling Depression Bioregion) to two metres high and dominated by Lignum (*Duma florulenta*) often with Nitre Goosefoot (*Chenopodium nitrariaceum*) and low cover of Canegrass (*Eragrostis australasica*). Scattered trees of Black Box (*Eucalyptus largiflorens*) may be present. Ground cover species include the small shrubs such as Giant Redburr (*Sclerolaena tricuspis*), Roly Poly (*Sclerolaena muricata* var. *muricata*), *Atriplex lindleyi, Atriplex suberecta* and *Salsola tragus* subsp. *tragus*, the fern *Marsilea drummondii*, the rush *Juncus flavidus*, the forbs *Rumex tenax, Einadia nutans* subsp. *nutans, Bulbine bulbosa, Senecio glossanthus* and *Senecio cunninghamii*. Grass species include *Walwhalleya proluata* and *Enteropogon ramosus*. Weed species include *Lolium perenne, Hordeum leporinum* and *Rapistrum rugosum*.

Vegetation occurs on black, brown and grey-cracking clay soils and clay loam soils in river channels and depressions on floodplains subject to regular flooding in south-western NSW extending into Victoria and South Australia mainly in the semi-arid (warm) climate zone. Although very widespread it tends to have a consistent floristic composition.

Vegetation occurs on black, brown and grey-cracking clay soils and clay loam soils in river channels and depressions on floodplains subject to regular flooding in south-western NSW extending into Victoria and South Australia mainly in the semi-arid (warm) climate zone. Although very widespread, it tends to have a consistent floristic composition.

Within the subject land PCT 17 has been recorded from shallow depressions or on the upper bank of larger freshwater swamps on grey clay where water pools following localised rainfall.

Table 4.14 provides and overview of the PCT as outlined in the BioNet Vegetation Classification database. Table 4.15 provides a detailed description of each species per growth form recorded from BAM plots undertaken in PCT 17 during field survey.

Examples of PCT 17 are provided in Photo 4.64 and Photo 4.65.

Table 4.14 PCT 17 - Lignum shrubland wetland of the semi-arid (warm) plains (mainly Riverina Bioregion and Murray Darling Depression Bioregion) community overview

PCT ID	**17**
PCT name	Lignum shrubland wetland of the semi-arid (warm) plains (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
Vegetation formation	Freshwater Wetlands
Vegetation class	Inland Floodplain Shrublands
Cleared value	63 %
Extent within subject land	15.01 ha
BAM VI plots used in assessment	VNI_DR15, VNI_DR81, VNI_NM035

Table 4.15 PCT 17 - Lignum shrubland wetland of the semi-arid (warm) plains (mainly Riverina Bioregion and Murray Darling Depression Bioregion) species composition within the subject land

Growth form	Species recorded
Tree	Absent
Shrub	*Duma florulenta, Chenopodium nitrariaceum*
Fern	*Marsilea drummondii*
Grass & grasslike	*Austrostipa scabra subsp. scabra, Enteropogon acicularis, Eleocharis pusilla, Rytidosperma caespitosum, Juncus flavidus*
Forbs	*Alternanthera nana, Rhodanthe corymbiflora*
Other	-



Photo 4.64 Example of PCT 17 in moderate-good condition at VI plot VNI_DR15



Photo 4.65 Example of PCT 17 in moderate-good condition at VI plot VNI_DR81

4.2.8.2 Condition states

Within the subject land, PCT 17 is presented in the following broad condition state (equivalent to vegetation zones):

- Moderate-good
- SVTM (Benchmark).

4.2.8.3 Justification of PCT selection

This vegetation type occurs on alluvial loam and clay soils near waterways and in depressions on floodplains. The community is dominated by *Duma florulenta.*

A quantitative analysis was undertaken for this community using the BVC PCT filter tool. The following search criteria was used:

- IBRA region: Riverina
- IBRA subregion: Murray Fans and Murrumbidgee
- Vegetation formation: Freshwater Wetlands
- Vegetation class: Inland Floodplain Shrublands

- Species (all strata and growth form groups): *Duma florulenta, Chenopodium nitrariaceum, Marsilea drummondii, Austrostipa scabra subsp. scabra, Enteropogon acicularis, Eleocharis pusilla, Rytidosperma caespitosum, Juncus flavidus, Alternanthera nana, Rhodanthe corymbiflora*. Dominant species of each strata were selected (i.e. those with the highest VI Plot cover values).

The search returned a total of two PCTs with 8 of the 15 search criteria:

- PCT 17 - Lignum shrubland wetland of the semi-arid (warm) plains (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
- PCT 24 - Canegrass swamp tall grassland wetland of drainage depressions, lakes and pans of the inland plains.

Given the absence of a dominance of *Eragrostis australasica* Canegrass and the dominance of *Duma florulenta,* PCT 24 can be dismissed, with PCT 17 determined to be the most suitable PCT for this vegetation.

Based on floristic and geological characteristics, this vegetation type is considered consistent with the scientific description and distribution information outlined for PCT 17.

4.2.8.4 Alignment with TECs

As outlined in BioNet Vegetation Classification database, there is no BC Act listed TEC associated with PCT 17.

4.2.8.5 Alignment with EPBC Act listed TECs

As outlined in BioNet Vegetation Classification database, there is no EPBC Act listed TEC associated with PCT 17.

4.2.9 PCT 19 – Cypress Pine woodland of source-bordering dunes mainly on the Murray and Murrumbidgee River floodplains

4.2.9.1 PCT overview

PCT 19 is a mid-high woodland with trees up to 13 metres tall, predominantly White Cypress Pine (*Callitris glaucophylla*), occasionally accompanied by Slender Cypress Pine (*Callitris gracilis subsp. murrayensis*). The shrub layer is often absent, but when present, the most common shrub is *Calytrix tetragona*, with *Banksia marginata* now rare but historically more common. The ground cover is sparse, including native grasses such as *Rytidosperma caespitosa* and native forbs like *Oxalis perennans* and *Actinobole uliginosum*. Exotic species are very common and dominate most sites, including *Vulpia myuros, Bromus spp., Trifolium spp., Echium plantagineum, Hypochaeris glabra*, and *Schismus barbatus.*

Before European settlement, this community likely contained more shrubs and trees, which have since disappeared due to grazing by livestock and rabbits. It occurs on sandy soils on source-bordering sand dunes along the mid-western sections of the Murray and lower Murrumbidgee Rivers, with mean annual rainfall of about 300 to 450 millimetres. It grades into ID21 to the west, further from the floodplain, where Slender Cypress Pine is more dominant, and the shrub layer is more diverse. This community is limited in extent and threatened by grazing, particularly by rabbits, and soil erosion.

Within the subject land vegetation associated with this PCT is limited to SVTM in areas not subject to survey due to access restrictions. Vegetation descriptions and condition state has been described as “Benchmark” as defined by BioNet Vegetation Classification and the BAM-C. Table 4.16 provides and overview of the PCT as outlined in the BioNet Vegetation Classification database.

Table 4.16 PCT 19 - Cypress Pine woodland of source-bordering dunes mainly on the Murray and Murrumbidgee River floodplains community overview

PCT ID	19
PCT name	Cypress Pine woodland of source-bordering dunes mainly on the Murray and Murrumbidgee River floodplains
Vegetation formation	Semi-arid Woodlands (Shrubby sub-formation)
Vegetation class	Riverine Sandhill Woodlands
Cleared value	70 %
Extent within subject land	1.59 ha
BAM VI plots used in assessment	Benchmark condition assumed as defined by the BAM-C.

4.2.9.2 Condition states

Within the subject land, PCT 19 is presented in the following broad condition state (equivalent to vegetation zones):

- SVTM (Benchmark).

4.2.9.3 Justification of PCT selection

Due to land access restrictions, field verification of this PCT in areas of SVTM has not been completed by WSP.

4.2.9.4 Alignment with TECs

As outlined in the BioNet Vegetation Classification database, PCT 19 is part of the BC Act listed Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes Bioregions Endangered Ecological Community which is discussed further in section 4.3.1.5.

4.2.9.5 Alignment with EPBC Act listed TECs

As outlined in BioNet Vegetation Classification database, there is no EPBC Act listed TEC associated with PCT 19. However, this PCT has recently been nominated for review under the EPBC Act.

4.2.10 PCT 20 – Buloke – Moonah – Black Box open woodland on sandy rises of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)

4.2.10.1 PCT overview

This open woodland is dominated by Buloke (*Allocasuarina luehmannii*), sometimes accompanied by a taller tree layer of Black Box (*Eucalyptus largiflorens*), Moonah (*Melaleuca lanceolata*), and Hooked Needlewood (*Hakea tephrosperma*). White Cypress Pine (*Callitris glaucophylla*) or Slender Cypress Pine (*Callitris gracilis* subsp. *murrayensis*) may also be present. Scattered bluebush (*Maireana* spp.) and Black Roly Poly (*Sclerolaena muricata*) may occur. The ground cover is often sparse, consisting of wallaby grass (*Rytidosperma caespitosa*), wiregrass (*Aristida leptopoda*), corkscrew grass (*Austrostipa nodosa*), and *Enteropogon ramosus*. Several species of the daisy genus *Vittadinia* are usually present. Exotic grass species such as Bromus or Hordeum are common.

This community typically occurs on red-brown loam soils with alkaline sub-soils on small sandy rises on the alluvial plain. It is distributed in the semi-arid (warm) climate zone of south-western NSW, from Urana and east of Deniliquin to Euston along the Murray River, receiving 300 to 450 millimetres of average annual rainfall. This community has mostly been cleared, and the remaining stands are generally over-grazed and subject to rabbit grazing and burrowing due to the loamy soil. In most locations, there are few signs of regeneration.

Within the subject land, PCT 20 has been mapped on a sandy rise where isolated mature individuals of *Allocasuarina luehmanii, Callitris glaucophylla* and *Callitris gracilis* subsp. *murrayensis* occur on the mid to upper slopes and patches of *Eucalyptus largiflorens* with *Alectryon oleifolius* subsp. *canescens* dominated the lower slopes and flats on sandy red soils. Table 4.17 provides and overview of the PCT as outlined in the BioNet Vegetation Classification database. Table 4.18 provides a detailed description of each species per growth form recorded from BAM plots undertaken in PCT 20 during field survey.

Examples of PCT 20 are provided in Photo 4.66 and Photo 4.67.

Table 4.17 PCT 20 Buloke - Moonah - Black Box open woodland on sandy rises of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion) community overview

PCT ID	**20**
PCT name	Buloke - Moonah - Black Box open woodland on sandy rises of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
Vegetation formation	Semi-arid Woodlands (Shrubby sub-formation)
Vegetation class	Riverine Sandhill Woodlands
Cleared value	88 %
Extent within subject land	1.92 ha
BAM VI plots used in assessment	VNI_DR67, VNI_DR104

Table 4.18 PCT 20 Buloke - Moonah - Black Box open woodland on sandy rises of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion) species composition within the subject land

Growth form	**Species recorded**
Tree	*Eucalyptus largiflorens, Alectryon oleifolius subsp. canescens.*
Shrub	*Rhagodia spinescens, Sclerolaena diacantha, Enchylaena tomentosa, Atriplex semibaccata, Sclerolaena muricata var. semiglabra, Atriplex vesicaria, Malacocera tricornis, Chenopodium nitrariaceum, Sclerolaena muricata var. villosa, Salsola australis, Maireana brevifolia, Exocarpos aphyllus, Atriplex pseudocampanulata, Sclerolaena brachyptera*
Fern	*Marsilea drummondii*
Grass & grasslike	*Juncus spp., Austrostipa scabra subsp. scabra, Rytidosperma caespitosum.*
Forbs	*Einadia nutans, Crassula sieberiana, Calandrinia eremaea, Oxalis perennans, Tetragonia eremaea, Rhodanthe moschata, Teucrium racemosum, Sida trichopoda, Atriplex lindleyi, Scleroblitum atriplicinum, Vittadinia cuneata var. hirsuta, Vittadinia cuneata var. cuneata, Erodium crinitum.*
Other	*Lysiana exocarpi subsp. exocarpi.*



Photo 4.66 PCT 20 in Thinned condition in VI plot: VNI_DR104



Photo 4.67 PCT 20 in Derived native grassland condition at VI plot VNI_67

4.2.10.2 Condition states

Within the subject land, PCT 20 is presented in the following broad condition state (equivalent to vegetation zones):

- Moderate-good
- Thinned
- Derived
- Derived – Low Conservation Value.

4.2.10.3 Justification of PCT selection

The PCT is vegetation condition is highly modified in thinned and derived condition, however the PCT was selected due to sandy rises with isolated mature individuals of *Allocasuarina luehmanii, Callitris glaucophylla* and *Callitris gracilis* subsp. *murrayensis* and its occurrence within the IBRA region.

4.2.10.4 Alignment with TECs

As outlined in BioNet Vegetation Classification database, PCT 20 is part of Endangered BC Act listed TEC *Allocasuarina luehmannii* Woodland in the Riverina and Murray-Darling Depression Bioregions, which is discussed further in section 4.3.1.2.

4.2.10.5 Alignment with EPBC Act listed TECs

As outlined in BioNet Vegetation Classification database, PCT 20 is part of Endangered EPBC Act listed TEC Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions, which is discussed further in section 6.2.1.1.

4.2.11 PCT 23 – Yarran tall open shrubland of the sandplains and plains of the semi-arid (warm) and arid climate zones

4.2.11.1 PCT overview

PCT 23 - Yarran tall open shrubland of the sandplains and plains of the semi-arid (warm) and arid climate zones is described in BioNet Vegetation classification system as a tall open shrubland dominated by Yarran (*Acacia melvillei*) on red-brown, sandy-loam soils. Small trees such as Black Oak (*Casuarina pauper*) may be present. It occurs as localised stands on the undulating sandplains and plains of far western NSW from Bourke in the north to Mildura in the south. On alluvial plains it is usually cleared or very severely degraded. Apparently more common as a distinct plant community in the south than the north where it most often occurs as a component of other communities. This semi-arid region receives between 250 and 400 millimetres of rainfall and is subject to frequent drought. Common shrub species include *Rhagodia spinescens, Eremophila sturtii, Maireana decalvans, Maireana microphylla, Nitraria billardierei, Atriplex nummularia* and *Sclerolaena diacantha*. Grass species include *Austrostipa nodosa* and *Rytidosperma caespitosa*. Forb species include *Pycnosorus pleiocephalus, Leiocarpa brevicompta, Leiocarpa tomentosa, Sida corrugata, Goodenia fascicularis*, *Tetragonia eremaea, Brachyscome lineariloba, Leiocarpa leptolepis, Vittadinia cuneata, Sida intricata, Rhodanthe corymbiflora* and *Atriplex stipitata.* The ground cover is most often depleted through grazing by stock and rabbits. Lichen crust is present in untrampled locations.

Within the subject land, vegetation associated with PCT 23 was recorded from red-brown sandy-loam soils and was dominated by *Acacia melvillei*.

Table 4.19 provides an overview of the PCT as outlined in the BioNet Vegetation Classification database. Table 4.20 provides a detailed description of each species per growth form recorded from BAM plots undertaken in PCT 23 during field survey.

Examples of PCT 23 are provided in Photo 4.68 and Photo 4.69.

Table 4.19 PCT 23 – Yarran tall open shrubland of the sandplains and plains of the semi-arid (warm) and arid climate zones community overview

PCT ID	**23**
PCT name	Yarran tall open shrubland of the sandplains and plains of the semi-arid (warm) and arid climate zones
Vegetation formation	Semi-arid Woodlands (Shrubby sub-formation)
Vegetation class	Riverine Sandhill Woodlands
Cleared value	71 %
Extent within subject land	9.86 ha
BAM VI plots used in assessment	VNI_DR101, VNI_DR102, VNI_DR105, VNI_DR65, VNI_GL05, VNI_GL06, VNIOZ_16, VNIOZ_17, VNIOZ_18

Table 4.20 PCT 23 - Yarran tall open shrubland of the sandplains and plains of the semi-arid (warm) and arid climate zones species composition within the subject land

Growth form	Species recorded
Tree	*Acacia melvillei*
Shrub	*Rhagodia spinescens, Enchylaena tomentosa, Sclerolaena muricata var. semiglabra, Atriplex semibaccata, Maireana pyramidata, Nitraria billardierei, Sclerolaena diacantha*
Fern	Absent
Grass & grasslike	*Austrostipa scabra subsp. scabra*
Forbs	*Einadia nutans subsp. nutans, Sida corrugata*
Other	-



Photo 4.68 Example of PCT 23 in moderate-good condition at VI plot VNI_DR101



Photo 4.69 Example of PCT 23 in moderate-good condition at VI plot VNI_DR102

4.2.11.2 Condition states

Within the subject land, PCT 23 is presented in the following broad condition state (equivalent to vegetation zones):

- Moderate-good
- Thinned
- Derived
- Derived – Low Conservation Value.

4.2.11.3 Justification of PCT selection

This vegetation type occurs on red-brown sandy/loam soils. The community is dominated by *Acacia melvilii, Rhagodia spinescens and Enchylaena tomentosa.*

A quantitative analysis was undertaken for this community using the BVC PCT filter tool. The following search criteria was used:

- IBRA region: Riverina
- IBRA subregion: Murrumbidgee
- Vegetation formation: Semi-arid Woodlands (Shrubby sub-formation)
- Vegetation class: Riverine Sandhill Woodlands
- Species (all strata and growth form groups): *Acacia melvillei, Rhagodia spinescens, Enchylaena tomentosa, Sclerolaena muricata* var. *semiglabra, Atriplex semibaccata, Maireana pyramidata, Nitraria billardierei, Sclerolaena diacantha, Austrostipa scabra* subsp. *scabra, Einadia nutans* subsp. *nutans, Sida corrugata*. Dominant species of each strata were selected (i.e. those with the highest VI Plot cover values).

The search returned a total of two PCTs with 11 of the 16 search criteria:

- PCT 23 - Yarran tall open shrubland of the sandplains and plains of the semi-arid (warm) and arid climate zones
- PCT 28 - White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone.

Given the absence of a dominance of *Callitris glaucophylla* and the dominance of *Acacia melvillei,* PCT 28 can be dismissed, with PCT 23 determined to be the most suitable PCT for this vegetation.

Based on floristic and geological characteristics, this vegetation type is considered consistent with the scientific description and distribution information outlined for PCT 23.

4.2.11.4 Alignment with TECs

As outlined in the BioNet Vegetation Classification database, PCT 23 is part of the BC Act listed *Acacia melvillei* Shrubland in the Riverina and Murray-Darling Depression Bioregions Endangered Ecological Community which is discussed further in section 4.3.1.1.

4.2.11.5 Alignment with EPBC Act listed TECs

As outlined in BioNet Vegetation Classification database, there is no EPBC Act listed TEC associated with PCT 23.

4.2.12 PCT 24 – Canegrass swamp tall grassland wetland of drainage depressions, lakes and pans of the inland plains

4.2.12.1 PCT overview

PCT 24 - Canegrass swamp tall grassland wetland of drainage depressions, lakes and pans of the inland plains is described in BioNet Vegetation classification system as a tall swampy grassland wetland of drainage depressions, lakes and pans of the inland plains. It is dominated by the tall, tussock grass, Canegrass (*Eragrostis australasica*) which grows to over 2 m high and ranges in cover from dense to isolated plants. Depending which part of NSW a range of grass species may be present including Windmill Grass (*Chloris truncata*), Blown Grass (*Lachnagrostis filiformis*), Plains grass (*Austrostipa aristiglumis*), Neverfail (*Eragrostis setifolia*) and *Eragrostis parviflora*. A range of low shrubs occur including *Sclerolaena* spp., *Atriplex* spp. and *Teucrium racemosum*. Sedges such as *Eleocharis acuta, Eleocharis pusilla* and *Eleocharis pallens* may be common along with rushes (*Juncus* spp.). The aquatic *Marsilea drummondii, M. costulifera, Azolla filiculoides* and *Myriophyllum* spp. may be present but die off in dry times.

The community occurs on red-grey heavy non-cracking clay and silty clay soils in periodically flooded depressions on floodplains, alluvial plains, claypans in sand dune and sandplain areas, and flood outs of watercourses. These soils form claypans that pond from local runoff after rain.

Within the subject land, vegetation associated with PCT 24 was recorded from shallow clay pans on grey soils where water pools following local rainfall.

Table 4.21 provides an overview of the PCT as outlined in the BioNet Vegetation Classification database. Table 4.22 provides a detailed description of each species per growth form recorded from BAM plots undertaken in PCT 24 during field survey.

Examples of PCT 24 are provided in Photo 4.70 and Photo 4.71.

Table 4.21 PCT 24 - Canegrass swamp tall grassland wetland of drainage depressions, lakes and pans of the inland plains community overview

PCT ID	**24**
PCT name	Canegrass swamp tall grassland wetland of drainage depressions, lakes and pans of the inland plains
Vegetation formation	Freshwater Wetlands
Vegetation class	Inland Floodplain Shrublands
Cleared value	20 %
Extent within subject land	7.02 ha
BAM VI plots used in assessment	VNI_DR36, VNI_DR90, VNI_DR98, VNIOZ_03, VNIOZ_13

Table 4.22 PCT 24 - Canegrass swamp tall grassland wetland of drainage depressions, lakes and pans of the inland plains species composition within the subject land

Growth form	**Species recorded**
Tree	Absent
Shrub	*Chenopodium nitrariaceum, Maireana aphylla, Duma florulenta*
Fern	*Marsilea drummondii*
Grass & grasslike	*Eragrostis australasica, Enteropogon acicularis, Rytidosperma caespitosum*
Forbs	*Einadia nutans, Calocephalus sonderi, Leiocarpa leptolepis*
Other	-



Photo 4.70 Example of PCT 24 in moderate-good condition at VI plot VNI_DR90

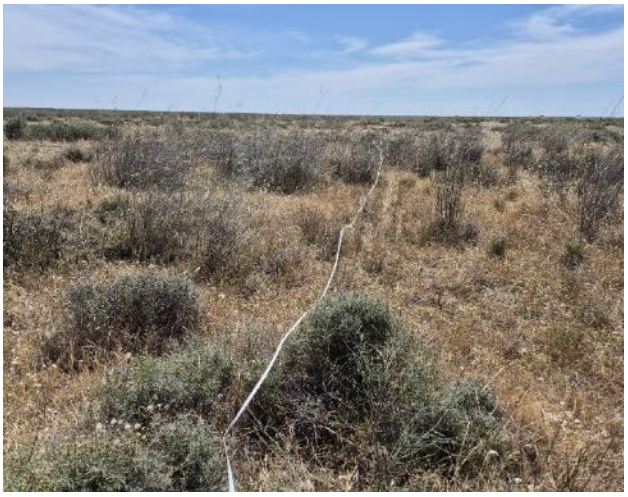


Photo 4.71 Example of PCT 24 in moderate-good condition at VI plot VNI_98

4.2.12.2 Condition states

Within the subject land PCT 24, is presented in the following broad condition state (equivalent to vegetation zones):

- Moderate-good.

4.2.12.3 Justification of PCT selection

This vegetation type occurs on alluvial clay soils in depressions on floodplains/alluvial plains and flood outs. The community is dominated by *Eragrostis australasica*

A quantitative analysis was undertaken for this community using the BVC PCT filter tool. The following search criteria was used:

- IBRA region: Riverina
- IBRA subregion: Murrumbidgee
- Vegetation formation: Freshwater Wetlands
- Vegetation class: Inland Floodplain Shrublands.

Species (all strata and growth form groups): Chenopodium nitrariaceum, Maireana aphylla, Duma florulenta, Marsilea drummondii, Eragrostis australasica, Enteropogon acicularis, Rytidosperma caespitosum, Einadia nutans, Calocephalus sonderi, Leiocarpa leptolepis. Dominant species of each strata were selected (i.e. those with the highest VI Plot cover values).The search returned a total of one PCT with nine of the 14 search criteria:

- PCT 17 - Lignum shrubland wetland of the semi-arid (warm) plains (mainly Riverina Bioregion and Murray Darling Depression Bioregion).

Additionally, the search returned a total of one PCT with eight of the 14 search criteria:

- PCT 24 - Canegrass swamp tall grassland wetland of drainage depressions, lakes and pans of the inland plains.

Given the obvious dominance of *Eragrostis australasica* Canegrass and limited cover of *Duma florulenta* Lignum, PCT 17 can be dismissed, with PCT 24 determined to be the most suitable PCT for this vegetation.

Based on floristic and geological characteristics, this vegetation type is considered consistent with the scientific description and distribution information outlined for PCT 24.

4.2.12.4 Alignment with TECs

As outlined in BioNet Vegetation Classification database, there is no BC Act listed TEC associated with PCT 24.

4.2.12.5 Alignment with EPBC Act listed TECs

As outlined in BioNet Vegetation Classification database, there is no EPBC Act listed TEC associated with PCT 24.

4.2.13 PCT 26 – Weeping Myall open woodland of the Riverina Bioregion and NSW Southwestern Slopes Bioregion

4.2.13.1 PCT overview

PCT 26 - Weeping Myall open woodland of the Riverina Bioregion and NSW Southwestern Slopes Bioregion is described in BioNet Vegetation classification system as a mid-high open woodland to eight metres high dominated by Weeping Myall (*Acacia pendula*). Other tree species which may coexist include Belah (*Casuarina cristata*) and Black Box (*Eucalyptus largiflorens*) with River Red Gum (*Eucalyptus camaldulensis*) occurring in depressions.

Chenopod shrubs may be common or absent and include *Rhagodia spinescens, Maireana decalvans, Atriplex nummularia, Chenopodium nitrariaceum, Hakea leucoptera, Santalum lanceolatum, Exocarpos aphyllus* and *Maireana aphylla*. The ground cover may be dense or sparse depending on rainfall. It is dominated by grass species such as *Rytidosperma caespitosa, Rytidosperma setacea, Austrostipa aristiglumis, Austrostipa scabra, Austrostipa nodosa* and *Sporobolus caroli.* Saltbush species include *Atriplex spinibractea, Atriplex leptocarpa and Atriplex semibaccata*. Forb species include *Alternanthera denticulata, Myriocephalus rhizocephalus, Centipeda cunninghamii, Rhodanthe corymbiflora* and *Vittadinia cuneata var. cuneata.*

PCT 26 occurs on brown clays or loam soils on alluvial plains mainly in the Riverina and NSW South-western Slopes Bioregions of south-western NSW. Apparently extinct in Victoria. Prior to European settlement this community probably contained a dense understorey of saltbush. Much of its original extent has now altered to be a derived native grassland dominated by native grasses and forbs. Weeping Myall is a threatened community due its past extent of clearing and overall is in poor condition.

Within the subject land, vegetation associated with PCT 26 occurred on red-brown clay loam soil around Mabins Well with *Acacia pendula* as the dominant species occasionally interspersed with *Eucalyptus camaldulensis* subsp. *camaldulensis* in small depressions.

Table 4.23 provides an overview of the PCT as outlined in the BioNet Vegetation Classification database. Table 4.24 provides a detailed description of each species per growth form recorded from BAM plots undertaken in PCT 26 during field survey.

Examples of PCT 26 are provided in Photo 4.72 and Photo 4.73.

Table 4.23 PCT 26 - Weeping Myall open woodland of the Riverina Bioregion and NSW Southwestern Slopes Bioregion community overview

PCT ID	26
PCT name	26 - Weeping Myall open woodland of the Riverina Bioregion and NSW Southwestern Slopes Bioregion
Vegetation formation	Semi-arid Woodlands (Grassy sub-formation)
Vegetation class	Riverine Plain Woodlands
Cleared value	90 %
Extent within subject land	316.93 ha
BAM VI plots used in assessment	VNI_DR01, VNI_DR02, VNI_DR05, VNI_DR07, VNI_DR08, VNI_DR28, VNI_DR29, VNI_DR30, VNI_DR57, VNI_DR61, VNI_DR62, VNI_DR73, VNI_DR82, VNI_DR83, VNI_DR84, VNI_DR85, VNI_MP02, VNI_MP19, VNI_MP20, VNI_MP21

Table 4.24 PCT 26 - Weeping Myall open woodland of the Riverina Bioregion and NSW Southwestern Slopes Bioregion species composition within the subject land

Growth form	Species recorded
Tree	*Acacia pendula, Acacia oswaldii*
Shrub	*Atriplex semibaccata, Rhagodia spinescens, Maireana aphylla*
Fern	Absent
Grass & grasslike	*Enteropogon acicularis, Austrostipa scabra subsp. scabra, Rytidosperma caespitosum*
Forbs	*Einadia nutans, Maireana pentagona, Calotis scabiosifolia var. scabiosifolia*
Other	*Amyema quandang var. quandang*



Photo 4.72 Example of PCT 26 in Moderate-good condition at VI plot VNI_DR82



Photo 4.73 Example of PCT 26 in Thinned condition at VI plot VNI_DR30

4.2.13.2 Condition states

Within the subject land, PCT 26 is presented in the following broad condition state (equivalent to vegetation zones):

- Moderate-good
- Thinned
- Derived
- Derived – Low Conservation Value
- Planted Native Vegetation
- SVTM (Benchmark).

4.2.13.3 Justification of PCT selection

This vegetation type occurs on brown loam/clay soils on alluvial plains. The community is dominated by *Acacia pendula.*

A quantitative analysis was undertaken for this community using the BVC PCT filter tool. The following search criteria was used:

- IBRA region: Riverina
- IBRA subregion: Murrumbidgee
- Vegetation formation: Semi-arid Woodlands (Grassy sub-formation)
- Vegetation class: Riverine Plain Woodlands
- Species (all strata and growth form groups): Acacia pendula, Acacia oswaldii, Atriplex semibaccata, Rhagodia spinescens, Maireana aphylla, Enteropogon acicularis, Austrostipa scabra subsp. scabra, Rytidosperma caespitosum, Einadia nutans, Maireana pentagona, Calotis scabiosifolia var. scabiosifolia, Amyema quandang var. quandang. Dominant species of each strata were selected (i.e. those with the highest VI Plot cover values).

The search returned a total of one PCT with 12 of the 16 search criteria:

- PCT 26 - Weeping Myall open woodland of the Riverina Bioregion and NSW Southwestern Slopes Bioregion.

Three additional PCTs returned 10 of the 16 search criteria but given the lower score and the recorded dominance of *Acacia pendula* these PCT's can be dismissed, with PCT 26 determined to be the most suitable PCT for this vegetation

Based on floristic and geological characteristics, this vegetation type is considered consistent with the scientific description and distribution information outlined for PCT 26.

4.2.13.4 Alignment with TECs

As outlined in the BioNet Vegetation Classification database, PCT 26 is part of the BC Act listed Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW Southwestern Slopes bioregions Endangered Ecological Community which is discussed further in section 4.3.1.4.

4.2.13.5 Alignment with EPBC Act listed TECs

As outlined in BioNet Vegetation Classification database, PCT 26 is part of the EPBC Act listed Weeping Myall Woodlands Endangered Ecological Community which is discussed further in section 6.2.1.6.

4.2.14 PCT 28 – White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone

4.2.14.1 PCT overview

PCT 28 - White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone is described in BioNet Vegetation classification system as an open woodland or derived grassland occurring on sandy loam soils on prior streams, source bordering sand dunes and sand plains in south-western NSW. The canopy is characterised by White Cypress Pine (*Callitris glaucophylla*) to 15 metres which are often associated with smaller trees or tall shrubs such as Buloke (*Allocasuarina luehmannii*), Needlewood (*Hakea leucoptera*), Hooked Needlewood (*Hakea tephrosperma*), Sugarwood (*Myoporum platycarpum*), *Pittosporum angustifolium*, Western Rosewood (*Alectryon oleifolius* subsp. *canescens*), Emu Bush (*Eremophila longifolia*) and Wilga (*Geijera parviflora*). Few sites are in good condition due to grazing and clearing therefore canopy trees are often scattered with little regeneration and a sparse shrub understory.

Common chenopod shrub species include Black Bluebush (*Maireana pyramidata*), *Maireana enchylaenoides* and Thorny Saltbush (*Rhagodia spinescens*). Copperburr low shrubs include *Sclerolaena diacantha* and *Sclerolaena obliquicuspis*. Forb species include *Tetragonia tetragonioides, Calandrinia eremaea, Calotis hispidula, Tribulus terrestris* and *Zygophyllum ammophilum*. The ground stratum is dominated by native and exotic grasses and forbs. Native grass species include *Austrostipa scabra* subsp. *scabra, Rytidosperma caespitosa, Aristida behriana, Enteropogon nigricans* and *Paspalidium constrictum*. Exotic species include *Schismus barbatus*, *Brassica tournefortii* and *Medicago polymorpha*.

Within the subject land, vegetation associated with PCT 28 was recorded on red brown sandy loam soils on sandhills and low sandhills. Vegetation was largely altered by historical canopy clearing and has resulted in largely derived grassland and remnant shrubland communities often dominated by tall shrubs (*Hakea tephrosperma*), chenopods (Rhagodia spinescens), grasses (*Austrostipa scabra*) and forbs. This PCT has also been subject to a high degree of disturbance from rabbits and exotic plant invasion (e.g. *Hordeum leporinum*, Vulpia myuros*, Lycium ferocissimum* and Echium plantagineum*).*

Table 4.25 provides an overview of the PCT as outlined in the BioNet Vegetation Classification database. Table 4.26 provides a detailed description of each species per growth form recorded from BAM plots undertaken in PCT 28 during field survey. Photos 4.74 and 4.75 demonstrate PCT 28 as recorded during field survey in Thinned and Derived Tall Shrubland condition states.

Examples of PCT 28 are provided in Photo 4.74 and Photo 4.75.

Table 4.25 PCT 28 - White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone community overview

PCT ID	**28**
PCT name	White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone
Vegetation formation	Semi-arid Woodlands (Shrubby sub-formation)
Vegetation class	Riverine Sandhill Woodlands
Cleared value	73 %
Extent within subject land	40.80 ha
BAM VI plots used in assessment	VNI_DR27, VNI_DR41, VNI_DR42, VNI_DR43, VNI_DR44, VNI_DR55, VNI_DR58, VNI_DR59, VNI_DR60, VNI_DR79, VNI_DR91, VNI_DR92, VNI_MP01, VNI_NM030, VNI_NM08, VNIOZ_01, VNIOZ_07, VNIOZ_12

Table 4.26 PCT 28 - White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone species composition within the subject land

Growth form	Species recorded
Tree	*Callitris glaucophylla, Acacia oswaldii*
Shrub	*Rhagodia spinescens, Hakea tephrosperma, Lycium ferocissimum**
Fern	Absent
Grass & grasslike	*Enteropogon acicularis, Austrostipa scabra subsp. Scabra, Eriochloa crebra*
Forbs	*Einadia nutans, Sida corrugata*
Other	-



Photo 4.74 Example of PCT 28 in Thinned condition at VI plot VNI_DR43



Photo 4.75 Example of PCT 28 in Derived tall shrubland condition in VI plot VNI_DR92

4.2.14.2 Condition states

Within the subject land, PCT 28 is presented in the following broad condition state (equivalent to vegetation zones):

- Moderate-good
- Thinned
- Derived Tall Shrubland
- Derived.

4.2.14.3 Justification of PCT selection

This vegetation type occurs on red brown sandy loam soils on sandhills and low sandhills. The community is dominated by *Callitris glaucophylla* and Rhagodia spinescens.

A quantitative analysis was undertaken for this community using the BVC PCT filter tool. The following search criteria was used:

- IBRA region: Riverina
- IBRA subregion: Murrumbidgee
- Vegetation formation: Semi-arid Woodlands (Shrubby sub-formation)

- Vegetation class: Riverine Sandhill Woodlands
- Species (all strata and growth form groups): Callitris glaucophylla, Acacia oswaldii, Rhagodia spinescens, Hakea tephrosperma, Enteropogon acicularis, Austrostipa scabra subsp. scabra, Eriochloa crebra, Einadia nutans, Sida corrugata. Dominant species of each strata were selected (i.e. those with the highest VI Plot cover values).

The search returned a total of one PCTs with 11 of the 13 search criteria:

- PCT 28 - White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone.
- Three additional PCT's returned nine of the 13 search criteria but given the lower score, differing vegetation formations and class and the recorded dominance of *Callitris glaucophylla* these PCT's can be dismissed, with PCT 28 determined to be the most suitable PCT for this vegetation.

Based on floristic and geological characteristics, this vegetation type is considered consistent with the scientific description and distribution information outlined for PCT 28.

4.2.14.4 Alignment with TECs

As outlined in the BioNet Vegetation Classification database, PCT 28 is part of the BC Act listed Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW Southwestern Slopes bioregions Endangered Ecological Community which is discussed further in section 4.3.1.5.

4.2.14.5 Alignment with EPBC Act listed TECs

As outlined in BioNet Vegetation Classification database, there is no EPBC Act listed TEC associated with PCT 28. However, this PCT has recently been nominated for review under the EPBC Act.

4.2.15 PCT 44 – Forb-rich Spear grass – Windmill Grass – White Top grassland of the Riverina Bioregion

4.2.15.1 PCT overview

PCT 44 – Forb-rich Spear grass – Windmill Grass – White Top grassland of the Riverina Bioregion is described in BioNet Vegetation classification system as an open to closed grassland usually to 0.3 metres high and composed of spear grass (*Austrostipa nodosa*), Windmill Grass (*Chloris truncata*) and Whitetop Wallaby Grass (*Rytidosperma caespitosum*). Associated forbs include a range of daisies such as *Leucochrysum molle* and *Calotis scabiosifolia* and legumes such as *Swainsona* spp. The bluebush species *Maireana pentagona* and *Maireana excavata* are often present as scattered low shrubs. Occurs on grey-cracking clays and red-brown clays often including scalds on the plains of the southern part of the Riverine Plain Bioregion from Urana in the east to Deniliquin in the west and to the north.

A number of threatened plant species such as *Swainsona plagiotropis, Leptorhynchos scaber, Sclerolaena napiformis* and *Lepidium monoplocoides* have been recorded in this community. About 100 native species and over 40 exotic species have been recorded. Some annual exotic species such as Rye Grass (*Lolium* spp.*) and Wild Oats (*Avena* spp.*) can dominate cover in Spring then die off leaving native perennial grasses as dominants. This community is "disclimax" referring to the grassland of today likely being mixed with chenopod shrublands prior to European settlement. A combination of sheep and rabbit grazing and a drought in the 1880s led to the destruction of the larger saltbushes. Grasslands in best condition are found on roadsides, in travelling stock reserves or in lightly grazed paddocks where ploughing has not occurred.

Within the subject land, vegetation associated with PCT 44 was recorded on clay, clay loam and sandy clay soils varying from grey, brown to light-brown, red-brown and red. They were often recorded on scalded soils and dominated by a combination of grasses such as *Austrostipa scabra*, *Enteropogon acicularis* and *Rytidosperma caespitosum*.

Table 4.27 provides an overview of the PCT as outlined in the BioNet Vegetation Classification database. Table 4.28 provides a detailed description of each species per growth form recorded from BAM plots undertaken in PCT 44 during field survey.

Examples of PCT 44 are provided in Photo 4.76 and Photo 4.77.

Table 4.27 PCT 44 – Forb-rich Spear grass – Windmill Grass – White Top grassland of the Riverina Bioregion

PCT ID	**44**
PCT name	Forb–rich Spear grass – Windmill Grass – White Top grassland of the Riverina Bioregion
Vegetation formation	Grasslands
Vegetation class	Riverine Plain Grasslands
Cleared value	73 %
Extent within subject land	33.73 ha
BAM VI plots used in assessment	Q195E, VNI_DR100, VNI_DR14, VNI_DR32, VNI_DR34, VNI_DR63, VNI_DR89, VNI_DR99

Table 4.28 PCT 44 – Forb-rich Spear grass – Windmill Grass – White Top grassland of the Riverina Bioregion

Growth form	**Species recorded**
Tree	Absent
Shrub	*Maireana aphylla, Sclerolaena diacantha, Maireana humillima*
Fern	Absent
Grass & grasslike	*Austrostipa scabra subsp. scabra, Enteropogon acicularis, Rytidosperma caespitosum, Sporobolus caroli, Chloris truncata,*
Forbs	*Maireana pentagona, Leucochrysum molle, Calotis scabiosifolia var. scabiosifolia, Goodenia fascicularis, Goodenia pusilliflora, Daucus glochidiatus*
Other	-



Photo 4.76 Example of PCT 44 in Moderate-good condition VI plot VNI_DR14



Photo 4.77 Example of PCT 44 in Moderate-good condition at VI plot VNI_DR32

4.2.15.2 Condition states

Within the subject land, PCT 44 is presented in the following broad condition state (equivalent to vegetation zones):

- Moderate-good.

4.2.15.3 Justification of PCT selection

This vegetation type occurs on grey-cracking clays and red-brown clays. The community is dominated by *Austrostipa scabra subsp. scabra*.

A quantitative analysis was undertaken for this community using the BVC PCT filter tool. The following search criteria was used:

- IBRA region: Riverina
- IBRA subregion: Murrumbidgee
- Vegetation formation: Grasslands
- Vegetation class: Riverine Plain Grasslands
- Species (all strata and growth form groups): Maireana aphylla, Sclerolaena diacantha, Maireana humillima, Austrostipa scabra subsp. scabra, Enteropogon acicularis, Rytidosperma caespitosum, Sporobolus caroli, Chloris truncata, Maireana pentagona, Leucochrysum molle, Calotis scabiosifolia var. scabiosifolia, Goodenia fascicularis, Goodenia pusilliflora, Daucus glochidiatus. Dominant species of each strata were selected (i.e. those with the highest VI Plot cover values).

The search returned a total of two PCTs with 10 of the 18 search criteria:

- PCT 44 - Forb–rich Spear grass – Windmill Grass – White Top grassland of the Riverina Bioregion
- PCT 46 - Curly Windmill Grass – spear grass – wallaby grass grassland on alluvial clay and loam on the Hay Plain, Riverina Bioregion.

Given the presence of the characteristic species *Chloris truncata* present with spear grasses, PCT 44 is determined to be the most suitable PCT for this vegetation, with PCT 46 dismissed.

Based on floristic and geological characteristics, this vegetation type is considered consistent with the scientific description and distribution information outlined for PCT 44.

4.2.15.4 Alignment with TECs

As outlined in BioNet Vegetation Classification database, there is no BC Act listed TEC associated with PCT 44.

4.2.15.5 Alignment with EPBC Act listed TECs

As outlined in BioNet Vegetation Classification database, PCT 44 is part of the EPBC Act listed Natural Grasslands of the Murray Valley Plains Critically Endangered Ecological Community which is discussed further in section 6.2.1.3.

4.2.16 PCT 45 – Plains Grass grassland on alluvial mainly clay soils in the Riverina Bioregion and NSW Southwestern Slopes Bioregion

4.2.16.1 PCT overview

PCT 45 - Plains Grass grassland on alluvial mainly clay soils in the Riverina Bioregion and NSW Southwestern Slopes Bioregion is described in BioNet Vegetation classification system as a tussock grassland distinguished by Plains Grass (*Austrostipa aristiglumis*) which is co-dominant with *Walwhalleya proluta, Rytidosperma duttoniana, Enteropogon ramosus*, *Sporobolus caroli* and *Chloris truncata*. Nardoo (*Marsilea drummondii*) is common throughout along with forbs such as *Wurmbea dioica* subsp. *dioica, Rumex dumosus, Arthropodium minus, Leptorhynchos squamatus* subsp. *A, Crassula decumbens* var. *decumbens, Goodenia fascicularis, Rhodanthe corymbiflora* and several species of *Swainsona*. The sedge *Eleocharis pallens* is often present. Lignum (*Muehlenbeckia florulenta*) may occur as scattered shrubs and exotic species are common and at some sites may be dominant. Exotics include Cape Weed (*Arctotheca calendula**), *Hypochaeris glabra*, Lolium rigidum*, Trifolium arvense*, Romulea rosea var. australis*, Echium plantagineum*, Medicago truncatula* and Phyla canescens**.

PCT 45 occurs on dark grey, self-mulching clays and clay loam soils in slightly low-lying areas of the floodplains and alluvial plains of central NSW. It often contains a high proportion of annual exotic species in Spring. The community is poorly represented in reserves and threatened due to cropping and grazing.

Within the subject land, PCT 45 was identified on dark grey, alluvial clays primarily in the eastern component towards Dinawan substation. The majority of records for PCT 45 occur in SVTM and have not been field verified by WSP due to land access restrictions. Further field verification is required to determine species presence and further determine the extent of this PCT within the subject land. Table 4.29 provides an overview of the PCT as outlined in the BioNet Vegetation Classification database.

Table 4.29 PCT 45 - Plains Grass grassland on alluvial mainly clay soils in the Riverina Bioregion and NSW Southwestern Slopes Bioregion community overview

PCT ID	**45**
PCT name	Plains Grass grassland on alluvial mainly clay soils in the Riverina Bioregion and NSW Southwestern Slopes Bioregion
Vegetation formation	Grasslands
Vegetation class	Riverine Plain Grasslands
Cleared value	60 %
Extent within subject land	9.54 ha
BAM VI plots used in assessment	Q193E, Q196E

4.2.16.2 Condition states

Within the subject land, PCT 45 is presented in the following broad condition state (equivalent to vegetation zones):

- Moderate-good.

4.2.16.3 Justification of PCT selection

Due to land access restrictions, field verification of this PCT in areas of SVTM has not been completed by WSP. Further field verification is required to determine species composition and justification of PCT suitability.

4.2.16.4 Alignment with TECs

As outlined in BioNet Vegetation Classification database, there is no BC Act listed TEC associated with PCT 45.

4.2.16.5 Alignment with EPBC Act listed TECs

As outlined in BioNet Vegetation Classification database, PCT 45 is part of the EPBC Act listed Natural Grasslands of the Murray Valley Plains Critically Endangered Ecological Community which is discussed further in section 6.2.1.3.

4.2.17 PCT 46 – Curly Windmill Grass – spear grass – wallaby grass grassland on alluvial clay and loam on the Hay Plain, Riverina Bioregion

4.2.17.1 PCT overview

PCT 46 - Curly Windmill Grass – spear grass – wallaby grass grassland on alluvial clay and loam on the Hay Plain, Riverina Bioregion is described in the BioNet Vegetation classification system as an open to closed tussock grassland to 0.3m high. The community occurs on medium brown to grey clays and loams on level alluvial plains on the western Riverine Plain (Hay Plain) near Hay and north-east of Deniliquin in the Riverina Bioregion and is dominated by Curly Windmill Grass (*Enteropogon ramosus*), corkscrew grass (*Austrostipa nodosa* and/or *Austrostipa scabra*) and several wallaby grass species (*Rytidosperma* spp.).

A very sparse shrub layer may be present including *Sclerolaena stelligera, Maireana excavata* and *Maireana aphylla*. The lower stratum often consists of forbs including *Rhodanthe corymbiflora, Crassula colorata var. acuminata, Erodium crinitum, Oxalis perennans, Sida trichopoda, Sida corrugata, Goodenia pusilliflora, Goodenia fascicularis, Calotis scabiosifolia var. scabiosifolia, Calocephalus sonderi, Bulbine semibarbata* and *Daucus glochidiatus* form G. It can also contain a high proportion of annual exotic species in Spring such as Wimmera Rye Grass (*Lolium rigidum*)* and Wild Oats (*Avena fatua**).

PCT 46 is very poorly represented in protected areas as of 2005 and susceptible to clearing for cropping. Within the subject land, vegetation associated with PCT 46 was recorded across the Murrumbidgee IBRA subregion on brown to grey clay loams of level plains. A majority of PCT 46 within the subject land occurs within SVTM mapped areas. Due to land access restrictions, field verification has not been completed in areas of SVTM.

Table 4.30 provides an overview of the PCT as outlined in the BioNet Vegetation Classification database. Table 4.31 provides a detailed description of each species per growth form recorded from BAM plots undertaken in PCT 46 during field survey.

Examples of PCT 46 are provided in Photo 4.78 and Photo 4.79.

Table 4.30 PCT 46 - Curly Windmill Grass – spear grass – wallaby grass grassland on alluvial clay and loam on the Hay Plain, Riverina Bioregion community overview

PCT ID	**46**
PCT name	Curly Windmill Grass – spear grass – wallaby grass grassland on alluvial clay and loam on the Hay Plain, Riverina Bioregion
Vegetation formation	Grasslands
Vegetation class	Riverine Plain Grasslands
Cleared value	20 %
Extent within subject land	58.42 ha
BAM VI plots used in assessment	VNI_DR10, VNI_DR64, VNI_DR88, VNIOZ_11

Table 4.31 PCT 46 - Curly Windmill Grass – spear grass – wallaby grass grassland on alluvial clay and loam on the Hay Plain, Riverina Bioregion

Growth form	Species recorded
Tree	Absent
Shrub	*Maireana aphylla, Atriplex semibaccata*
Fern	Absent
Grass & grasslike	*Enteropogon acicularis, Austrostipa scabra subsp. scabra, Rytidosperma caespitosum, Walwhalleya proluta, Sporobolus caroli*
Forbs	*Einadia nutans, Rhodanthe corymbiflora, Erodium crinitum*
Other	-



Photo 4.78 Example of PCT 46 in Moderate-good condition in VI plot VNI_DR88



Photo 4.79 Example of PCT 46 in Moderate-good condition in VI plot VNI_OZ11

4.2.17.2 Condition states

Within the subject land, PCT 46 is presented in the following broad condition state (equivalent to vegetation zones):

- Moderate-good.

4.2.17.3 Justification of PCT selection

This vegetation type occurs on brown and grey clays/loams on alluvial plains. The community is dominated by *Enteropogon acicularis, Austrostipa scabra* subsp. *scabra, Rytidosperma caespitosum, Walwhalleya proluta*.

A quantitative analysis was undertaken for this community using the BVC PCT filter tool. The following search criteria was used:

- IBRA region: Riverina
- IBRA subregion: Murrumbidgee
- Vegetation formation: Grasslands
- Vegetation class: Riverine Plain Grasslands

- Species (all strata and growth form groups): Maireana aphylla, Atriplex semibaccata, Enteropogon acicularis, Austrostipa scabra subsp. scabra, Rytidosperma caespitosum, Walwhalleya proluta, Sporobolus caroli, Einadia nutans, Rhodanthe corymbiflora, Erodium crinitum. Dominant species of each strata were selected (i.e. those with the highest VI Plot cover values).

The search returned a total of three PCTs with eight of the 14 search criteria:

- PCT 46 - Curly Windmill Grass – spear grass – wallaby grass grassland on alluvial clay and loam on the Hay Plain, Riverina Bioregion
- PCT 13 - Black Box - Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion).
- PCT 55 Belah woodland on alluvial plains and low rises in the central NSW wheatbelt to Pilliga and Liverpool Plains regions.

PCT 13 and PCT 55 are both Woodland communities without the Grassland vegetation formation and Riverine Plain Grasslands vegetation class. Given that no trees were recorded and there was no evidence that this was a derived Woodland community, PCT 13 and PCT 55 can be dismissed. With a dominance of *Enteropogon acicularis* PCT 46 is determined to be the most suitable PCT for this vegetation. Regular inspection of *Eneteropogon sp.* was undertaken with *E. aciciluaris* being consistency recorded within BAM VI plots and opportunistically within the alignment. While *Enteropogon ramosus* is listed as the dominant species of this PCT on BioNet, for the purposes of this assessment *E. acicularis* would be used as a surrogate for *E. ramosus* due to similarity in growth form and ecological function within PCT 46.

Based on floristic, geological characteristics and ecological function, this vegetation type is considered consistent with the scientific description and distribution information outlined for PCT 46.

4.2.17.4 Alignment with TECs

As outlined in BioNet Vegetation Classification database, there is no BC Act listed TEC associated with PCT 46.

4.2.17.5 Alignment with EPBC Act listed TECs

As outlined in BioNet Vegetation Classification database, PCT 46 is part of the EPBC Act listed Natural Grasslands of the Murray Valley Plains Critically Endangered Ecological Community which is discussed further in section 6.2.1.3.

4.2.18 PCT 47 – Swamp grassland wetland of the Riverine Plain

4.2.18.1 PCT overview

PCT 47 - Swamp grassland wetland of the Riverine Plain, Riverina Bioregion is described in BioNet Vegetation classification system as a wetland community dominated by Blowngrass (*Lachnagrostis filiformis*), Dutton Wallaby Grass (*Austrodanthonia duttoniana*) and billy button (*Pycnosorus globosus*). Other common species include *Swainsona procumbens, Alternanthera denticulata, Marsilea drummondii, Myriocephalus rhizocephalus, Myriophyllum crispatum, Crassula decumbens* var. *decumbens, Walwhalleya proluta, Eleocharis pallens, Juncus radula* and *Ranunculus pentandrus* var. *platycarpus.* Canegrass (*Eragrostis australasica*) may occur as an overstorey shrub. Weed species include *Arctotheca calendula*, Cotula bipinnata*, Taraxacum officinale*, Medicago truncatula** and *Juncus articulatus*.*

PCT 47 occurs on grey cracking clays in swamps and depressions on the Riverine Plain in the Riverina Bioregion. It is more restricted than other grassland types in the region and some areas have been cleared for cropping.

Within the subject land vegetation associated with this PCT 47 is limited to moderate-good condition state.

Table 4.32 PCT 47 - Swamp grassland wetland of the Riverine Plain community overview

PCT ID	47
PCT name	Swamp grassland wetland of the Riverine Plain, Riverina Bioregion
Vegetation formation	Freshwater Wetlands
Vegetation class	Inland Floodplain Swamps
Cleared value	50 %
Extent within subject land	0.17 ha
BAM VI plots used in assessment	Q194E

4.2.18.2 Condition states

Within the subject land, PCT 47 is presented in the following broad condition state (equivalent to vegetation zones):

- Moderate-good.

4.2.18.3 Justification of PCT selection

The PCT has been field verified in one small patch in the Eastern section of the alignment and the impacted area is 0.17 hectares.

4.2.18.4 Alignment with TECs

As outlined in BioNet Vegetation Classification database, there is no BC Act listed TEC associated with PCT 47.

4.2.18.5 Alignment with EPBC Act listed TECs

As outlined in BioNet Vegetation Classification database, PCT 47 is part of the EPBC Act listed Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains Critically Endangered Ecological Community which is discussed further in section 6.2.1.5.

4.2.19 PCT 58 – Black Oak – Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion

4.2.19.1 PCT overview

PCT 58 - Black Oak – Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion is described in the BioNet Vegetation classification system as a mid-high (about 7 m) open woodland or isolated clumps of trees dominated by Black Oak (*Casuarina pauper*) and Western Rosewood (*Alectryon oleifolius* subsp. *canescens*) with either a shrubby or grassy understorey. These two tree species often form clumps and may or may not mix. Other small trees include Sugarwood (*Myoporum platycarpum* subsp. *platycarpum*) and *Pittosporum angustifolium*. The shrub layer is sparse or very sparse and includes species such as Wilga (*Geijera parviflora*), *Senna artemisioides* sens lat., Leafless Ballart (*Exocarpos aphyllus*), Thorny Saltbush (*Rhagodia spinescens*), Black Bluebush (*Maireana pyramidata*), *Olearia muelleri, Eremophila deserti, Eremophila sturtii, Eremophila glabra, Acacia oswaldii, Acacia colletioides, Dodonaea viscosa* subsp. *angustissima, Chenopodium curvispicatum* and *Zygophyllum aurantiacum.* The ground cover is generally very sparse and includes low shrubs such as *Sclerolaena diacantha, Dissocarpus paradoxus, Sclerolaena patenticuspis, Sclerolaena obliquicuspis, Salsola tragus* subsp. *tragus* and *Atriplex stipitata*. Spear grass (*Austrostipa nitida, Austrostipa scabra* or *Austrostipa elegantissima*) are common along with a range of forbs. A grassy ground cover exists in some areas that have been partially cleared and heavier soils.

PCT 58 is found on level to undulating sandplains, sandy rises and interdune swales composed of calcareous earths (pH greater than seven) of red to red-brown loam, sand and texture contrast soils. It is widely distributed in far south-western NSW mainly in the Murray Darling Depression Bioregion, in areas generally subject to less than 400 millimetres of annual rainfall. Significant variation is known to occur within the community and its main threats involve clearing for opportunistic cropping and overgrazing that prevents the regeneration of key woody species.

Within the subject land, vegetation associated with PCT 58 was recorded in small stands of Black Oak (*Casuarina pauper*) in Moderate-good, Thinned and Derived condition. It was associated with red-brown sandy soils on the outskirts of dune complexes within the far western component of the project within the Murrumbidgee IBRA subregion.

This community is associated with *Acacia melvillei* Shrubland in the Riverina and Murray-Darling Depression bioregions BC Act listed threatened ecological community. However, Acacia melvillei was absent in the patches of 58 recorded in the subject land so this PCT was excluded from further assessment as a TEC.

Table 4.33 provides an overview of the PCT as outlined in the BioNet Vegetation Classification database. Table 4.34 provides a detailed description of each species per growth form recorded from BAM plots undertaken in PCT 58 during the field survey.

Examples of PCT 58 are provided in Photo 4.80.

Table 4.33 PCT 58 - Black Oak – Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion community overview

PCT ID	**58**
PCT name	Black Oak – Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion
Vegetation formation	Semi-arid Woodlands (Shrubby sub-formation)
Vegetation class	Semi-arid Sand Plain Woodlands
Cleared value	50 %
Extent within subject land	0.94 ha
BAM VI plots used in assessment	VNI_DR24, VNI_NM21

Table 4.34 PCT 58 - Black Oak – Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion

Growth form	**Species recorded**
Tree	*Casuarina pauper*
Shrub	*Maireana brevifolia, Enchylaena tomentosa*
Fern	Absent
Grass & grasslike	*Enteropogon ramosus, Sporobolus caroli, Austrostipa scabra* subsp. *scabra*
Forbs	*Rhodanthe corymbiflora, Einadia nutans*
Other	-



Photo 4.80 Example of PCT 58 in Thinned condition at VI plot NM021

4.2.19.2 Condition states

Within the subject land, PCT 58 is presented in the following broad condition state (equivalent to vegetation zones):

- Moderate-good
- Thinned
- Derived.

4.2.19.3 Justification of PCT selection

This vegetation type occurs on red-brown sandy loam clay. The community is dominated by *Casuarina pauper* in areas of Moderate-good condition.

A quantitative analysis was undertaken for this community using the BVC PCT filter tool. The following search criteria was used:

- IBRA region: Riverina
- IBRA subregion: Murrumbidgee
- Vegetation formation: Semi-arid Woodlands (Shrubby sub-formation)
- Vegetation class: Semi-arid Sand Plain Woodlands
- Species (all strata and growth form groups): Casuarina pauper, Alectryon oleifolius subsp. canescens, Rhagodia spinescens, Maireana brevifolia, Atriplex lindleyi, Enteropogon ramosus, Salsola australis, Einadia nutans, Atriplex leptocarpa, Enchylaena tomentosa, Atriplex semibaccata. Dominant species of each strata were selected (i.e. those with the highest VI Plot cover values).

The search returned one PCT with 9 of the 15 search criteria:

- PCT 15 – Black Box open woodland wetland with chenopod understorey mainly on the outer floodplains in south-western NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion).

The search returned a total of eight PCTs with 8 of the 15 search criteria:

- PCT 13 – Black Box - Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
- PCT 26 – Weeping Myall open woodland of the Riverina Bioregion and NSW South Western Slopes Bioregion

- PCT 28 – White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone
- PCT 55 – Belah woodland on alluvial plains and low rises in the central NSW wheatbelt to Pilliga and Liverpool Plains regions.
- PCT 57 – Belah/Black Oak - Western Rosewood - Wilga woodland of central NSW including the Cobar Peneplain Bioregion
- PCT 58 – Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion
- PCT 159 – Old Man Saltbush shrubland mainly of the semi-arid (warm) climate zone (south western NSW)
- PCT 170 – Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones.

Given the presence of the dominant characteristic species *Casuarina pauper,* this narrows the possible PCTs to PCT 58 and 57. Furthermore, due to its location on sandy rises within the Riverina IBRA region, this excludes PCT 57 from consideration and determines PCT 58 to be the most suitable PCT for this vegetation.

Based on floristic and geological characteristics, this vegetation type is considered consistent with the scientific description and distribution information outlined for PCT 58.

4.2.19.4 Alignment with TECs

As outlined in BioNet Vegetation Classification database, there are two BC Act listed TECs associated with PCT 58, *Acacia loderi* shrublands (listed as Endangered), and *Acacia melvillei* Shrubland in the Riverina and Murray-Darling Depression bioregions (listed as Endangered). Neither of these TECs have been assessed further for PCT 58 due to the absence of *Acacia loderi* and *Acacia melvillei* in the mapped areas.

4.2.19.5 Alignment with EPBC Act listed TECs

As outlined in BioNet Vegetation Classification database, there is no EPBC Act listed TEC associated with PCT 58.

4.2.20 PCT 70 – White Cypress Pine woodland on sandy loams in central NSW wheatbelt

4.2.20.1 PCT Overview

PCT 70 - White Cypress Pine woodland on sandy loams in central NSW wheatbelt is described by BioNet Vegetation Classification system as a tall or mid-high woodland to about 18 m high dominated by White Cypress Pine (*Callitris glaucophylla*) that may occupy >90 per cent of the canopy cover. The canopy structure alters depending on degree of clearing, thinning or regrowth. Various box eucalypts may be present including Poplar Box (*Eucalyptus populnea*) and Western Grey Box (*Eucalyptus microcarpa*). Small trees may include Buloke (*Allocasuarina luehmannii*) or Belah (*Casuarina cristata*). Shrubs are sparse and include Deane's Wattle (*Acacia deanei subsp. deanei*), Wilga (*Geijera parviflora*), hopbush (*Dodonaea viscosa*), *Maireana enchylaenoides*, Thorny Saltbush (*Rhagodia spinescens*) and *Senna* spp. The ground cover is sparse dominated by grasses such as *Austrostipa scabra* subsp. *scabra, Enteropogon acicularis, Thyridolepis mitchellii, Austrodanthonia eriantha, Austrodanthonia setacea, Enteropogon acicularis* and *Eragrostis lacunaria*. Forb species include *Calotis cuneifolia, Sida cunninghamii, Oxalis perennans, Goodenia cycloptera, Xerochrysum bracteatum* and *Chrysocephalum apiculatum*. The rock fern *Cheilanthes sieberi* subsp. *sieberi* is often present. In dry times the ground may be nearly bare.

Occurs on red, brown or yellow sandy or loamy soils on flats and rises on alluvial plains. Vegetation structure varies depending on the history of disturbance including logging. Dense regrowth of young Pines may be present. Distributed in central NSW, generally with annual rainfall between 400 and 600 millimetres. Mainly in the NSW South-western Slopes and Darling Riverine Plain Bioregions. A significant proportion of this community has been cleared as it occurs in the wheatbelt. Remnants occur in state forests, other public lands and on leasehold and private land. This community grades into Poplar Box or Western Grey Box woodlands in the mid-central and south and Poplar Box and Coolabah woodlands in the north that occur on finer texture soils. Grades into White Cypress Pine-Poplar Box community (ID72) in the Cobar Peneplain Bioregion.

Within the subject land, vegetation associated with this PCT is limited to SVTM in areas not subject to survey due to access restrictions. PCT 70 has been mapped by the SVTM within or in close proximity to PCT 28 in the locality where Carathool Road crosses the alignment east of the Steam Plains State Forest. Vegetation descriptions and condition state has been described as "Benchmark" as defined by BioNet Vegetation Classification and the BAM-C. Table 4.35 provides an overview of the PCT as outlined in the BioNet Vegetation Classification database.

Table 4.35 PCT 70 - White Cypress Pine woodland on sandy loams in central NSW wheatbelt community overview

PCT ID	**70**
PCT name	White Cypress Pine woodland on sandy loams in central NSW wheatbelt community overview
Vegetation formation	Grassy Woodlands
Vegetation class	Floodplain Transition Woodlands
Cleared value	65 %
Extent within subject land	0.16 ha
BAM VI plots used in assessment	Benchmark condition assumed as defined by the BAM-C.

4.2.20.2 Condition states

Within the subject land, PCT 70 is presented in the following broad condition state (equivalent to vegetation zones):

- SVTM (Benchmark).

4.2.20.3 Justification of PCT selection

Due to land access restrictions, field verification of this PCT in areas of SVTM has not been completed by WSP.

4.2.20.4 Alignment with TECs

As outlined in BioNet Vegetation Classification database, there is no BC Act listed TEC associated with PCT 70.

4.2.20.5 Alignment with EPBC Act listed TECs

As outlined in BioNet Vegetation Classification database, there is no EPBC Act listed TEC associated with PCT 70.

4.2.21 PCT 76 – Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions

PCT 76 – Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions is described in the BioNet Vegetation classification system as a tall open woodland to 25 metres high dominated by Western Grey box (*Eucalyptus macrocarpa*), often dominating 90 per cent of the canopy cover. Other trees may include Yellow Box (*Eucalyptus melliodora*), White Cypress Pine (*Callitris glaucophylla*) and minor Buloke. The shrub layer is absent or sparse, and includes *Dodonaea viscosa subsp. Cuneata*, *Acacia buxifolia*, *Acacia acinacea*, *Acacia hakeoides* and *Bursaria spinosa*. Ground cover is mid-dense or dense and composed of *Austrodanthonia caespitosa, Austrodanthonia setacea, Austrostipa scabra subsp. falcata, Paspalidium constrictum, Themeda australis, Austrostipa aristiglumis, Aristida behriana and Elymus scaber var. scaber*, along with native and exotic grass and forb species.

PCT 76 is found on texture contrast red or brown earths or grey clay soils on undulating alluvial plains in the predominantly winter rainfall belt of south-central western NSW. This community has lost its original shrub layer in many locations with historically intense grazing pressures. Due to its occurrence on arable soils, this community has largely been cleared, and much of its remaining extent is threatened by grazing and weed invasion.

Examples of PCT 76 are provided in Photo 4.81 and Photo 4.82.

Table 4.36 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions

PCT ID	**76**
PCT name	Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
Vegetation formation	Grassy Woodlands
Vegetation class	Floodplain Transition Woodlands
Per cent cleared value	92 %
Extent within subject land	0.30 ha
BAM VI plots used in assessment	VNI_DR112

Table 4.37 PCT 76 - Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions

Growth form	**Species recorded**
Tree	*Eucalyptus microcarpa*
Shrub	Absent
Fern	Absent
Grass & grasslike	*Panicum effusum, Paspalidium constrictum, Sporobolus creber, Carex inversa* and *Eriochloa pseudoacrotricha*
Forbs	Absent – very low cover of *Oxalis perennans* and *Euphorbia drummondii*
Other	Absent



Photo 4.81 Example of PCT 76 in thinned condition from Plot VNI_DR112



Photo 4.82 Example of PCT 76 in thinned condition from Plot VNI_DR112

4.2.21.1 Condition states

Within the subject land, PCT 76 is presented in the following broad condition state (equivalent to vegetation zones):

- Thinned.

4.2.21.2 Justification of PCT selection

A quantitative analysis was undertaken for this community using the BVC PCT filter tool. The following search criteria was used:

- IBRA region: NSW South Western Slopes (NSS)
- IBRA subregion: Inland Slopes (NSS01)
- Vegetation formation: Grassy Woodlands
- Vegetation class: Floodplain Transition Woodlands
- Species (all strata and growth form groups): *Eucalyptus microcarpa, Panicum effusum, Paspalidium constrictum, Sporobolus creber, Carex inversa* and *Eriochloa pseudoacrotricha.* Native species with the highest percentage cover for each stratum were selected.

The search returned a total of three PCTs with eight out of eight search criteria and another six with seven out of eight search criteria. Of those, PCTs that are associated with the "Revised East Coast PCT Classification" release have been removed as these PCTs are not applicable in the South Western Slopes IBRA region (DPE, 2023). Three PCTs remained, being:

- PCT 74 - Yellow Box - River Red Gum tall grassy riverine woodland of NSW South Western Slopes Bioregion and Riverina Bioregion
- PCT 76 - Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
- PCT 82 - Western Grey Box - Poplar Box - White Cypress Pine tall woodland on red loams mainly of the eastern Cobar Peneplain Bioregion.

PCT 74 is typically dominated by *Eucalyptus melliodora* and / or *Eucalyptus camaldulensis*. Given the recorded vegetation is characterized by *Eucalyptus microcarpa*, PCT 74 has been excluded from further consideration. While PCT 82 is typically dominated by *E. microcarpa,* this PCT is listed to occur within the Cobar Peneplain IBRA Bioregion. As the subject land is within the South western Slopes IBRA Bioregion, PCT 82 is not considered suitable for the recorded vegetation and has been excluded from further consideration. As such, the remaining PCT 76 is considered the best fit for the recorded vegetation based on IBRA region, vegetation formation, vegetation class and dominant species.

4.2.21.3 Alignment with TECs

As outlined in the BioNet Vegetation Classification database, PCT 76 is associated with BC Act listed Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions.

4.2.21.4 Alignment with EPBC Act listed TECs

As outlined in the BioNet Vegetation Classification database, PCT 76 is associated with EPBC Act listed Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia.

4.2.22 PCT 86 – Yellow Gum tall woodland of the Murray River floodplain, Riverina Bioregion

4.2.22.1 PCT overview

PCT 86 - Yellow Gum tall woodland of the Murray River floodplain, Riverina Bioregion is described in BioNet Vegetation classification system as a tall open woodland with trees to about 20 metres high dominated by Yellow Gum (*Eucalyptus leucoxylon* subsp. *pruinosa*), often as pure stands, but may include Western Grey Box (*Eucalyptus microcarpa*), Buloke (*Allocasuarina luehmannii*) and Sugarwood (*Myoporum platycarpum*). The understorey is open and sparse, having been grazed heavily in the past. Shrubs include *Chenopodium nitrariaceum,* Cottonbush (*Maireana aphylla*), *Rhagodia spinescens* and *Acacia oswaldii.* Native species ground cover is sparse but includes *Sclerolaena muricata, Atriplex semibaccata, Austrostipa scabra, Einadia nutans* subsp. *oxycarpa* and Ruby Saltbush (*Enchylaena tomentosa*) along with native and exotic grasses and forbs.

PCT 86 is found on loam-sand soil on the lower slopes of source-bordering dunes and associated terrace flats of floodplains. Annual rainfall ranges between 300 and 350 millimetres and the area experiences hot summers and cool winters. In NSW, this community is mainly restricted to the Riverine Plain Bioregion in southwestern NSW. Many of the stands are threatened by lack of re-generation due to grazing. Dieback is present in some stands, perhaps due to water stress or salinity. Introduced grasses and forbs often dominate the ground cover. Common weed species include *Hordeum leporinum*, Heliotropium europaeum*, Cucumis myriocarpus* subsp. *leptodermis*, Marrubium vulgare*,* and *Lycium ferocissimum**.

Within the subject land, vegetation associated with PCT 86 was recorded in one small (0.30 hectares) area along an access track bordering the Yarrein Creek. Due to the recent design amendments and addition of access tracks, further field work is required to obtain vegetation integrity and species composition data to supply justification for this PCT.

Table 4.38 provides an overview of the PCT as outlined in the BioNet Vegetation Classification database.

Table 4.38 PCT 86 - Yellow Gum tall woodland of the Murray River floodplain, Riverina Bioregion

PCT ID	86
PCT name	Yellow Gum tall woodland of the Murray River floodplain, Riverina Bioregion
Vegetation formation	Semi-arid Woodlands (Shrubby sub-formation)
Vegetation class	Riverine Sandhill Woodlands
cleared value	75 %
Extent within subject land	0.05 ha
BAM VI plots used in assessment	Benchmark condition assumed as defined by the BAM-C.

4.2.22.2 Condition states

Within the subject land, PCT 86 is presented in the following broad condition state (equivalent to vegetation zones):

- Moderate-good
- SVTM.

4.2.22.3 Justification of PCT selection

A search in the BioNet PCT filter tool for PCTs in the Murray Fans IBRA subregion with *Eucalyptus leucoxylon subsp. pruinosa* returned one entry that matches both search criteria was PCT 86: *Yellow Gum tall woodland of the Murray River floodplain, Riverina Bioregion*.

4.2.22.4 Alignment with TECs

As outlined in BioNet Vegetation Classification database, there is no BC Act listed TEC associated with PCT 86.

4.2.22.5 Alignment with EPBC Act listed TECs

As outlined in BioNet Vegetation Classification database, there is no EPBC Act listed TEC associated with PCT 86.

4.2.23 PCT 157 – Bladder Saltbush shrubland on alluvial plains in the semi-arid (warm) zone including Riverina Bioregion

4.2.23.1 PCT overview

PCT 157 – Bladder Saltbush shrubland on alluvial plains in the semi-arid (warm) zone including Riverina Bioregion is described in BioNet Vegetation classification system as a low to mid-high (to 90 centimetres), open to sparse chenopod shrubland dominated by Bladder Saltbush (*Atriplex vesicaria*) often with Desert Glasswort (*Pachycornia triandra*), Three-spined Copperburr (*Sclerolaena tricuspis*), *Sclerolaena intricata* and Pigface (*Disphyma crassifolium* subsp. *clavellatum*). Other commonly occurring small shrubs include Slender Glasswort (*Sclerostegia tenuis*), *Sclerolaena brachyptera, Sclerolaena tenuis, Maireana decalvans, Maireana aphylla, Malacocera tricornis, Dissocarpus biflorus* var. *biflorus, Atriplex lindleyi* and *Atriplex pseudocampanulata*. Grasses include *Chloris truncata, Rytidosperma setacea* and *Sporobolus caroli*. Ephemeral daises occur after rains and include *Minuria cunninghamii, Brachyscome smithwhitei* and *Rhodanthe corymbiflora*. Myall (*Acacia pendula*) or Black Oak (*Casuarina pauper*) may occur as isolated trees.

The community occurs on grey and brown cracking clays and red-brown clay loam soils on alluvial plains including the Hay Plain, in the Darling Ana-Branch region and there are occurrences in the Scotia mallee around salt lakes in south west NSW.

It is estimated that over half of this community has been cleared or severely altered through grazing and dieback over the last 150 years. Due to a combination of stock and rabbit grazing, droughts and grub-herbivory dieback, it is considered that Bladder Saltbush may have retreated 100 kilometres to the west on the Riverine Plain leaving behind "derived" grasslands (IDs 44-46). For this reason, the community is considered vulnerable to further destruction and as of 2005 less than 1 per cent of its original extent was protected in reserves or under property agreements.

Within the subject land, vegetation associated with PCT 157 was recorded within the Murrumbidgee IBRA subregion to the west of the Cobb Highway both through field verification and assignment of the SVTM due to access restrictions and the recent addition of access tracks. Vegetation associated with this PCT was recorded on brown, red brown and light grey clays on flat alluvial plains and was dominated by Bladder Saltbush (*Atriplex vesicaria*) along with low chenopods, grasses and forbs. Parts of this PCT have been subject to heavy grazing impacts.

Table 4.39 provides an overview of the PCT as outlined in the BioNet Vegetation Classification database. Table 4.40 provides a detailed description of each species per growth form recorded from BAM plots undertaken in PCT 157 during the field survey.

Examples of PCT 157 are provided in Photo 4.83 and Photo 4.84.

Table 4.39 PCT 157 - Bladder Saltbush shrubland on alluvial plains in the semi-arid (warm) zone including Riverina Bioregion community overview

PCT ID	**157**
PCT name	Bladder Saltbush shrubland on alluvial plains in the semi-arid (warm) zone including Riverina Bioregion
Vegetation formation	Arid Shrublands (Chenopod sub-formation)
Vegetation class	Riverine Chenopod Shrublands
Cleared value	60 %
Extent within subject land	99.46 ha
BAM VI plots used in assessment	VNI_NM06, VNI_DR09, VNI_DR26, VNI_DR40, VNI_DR49, VNI_DR52, VNI_MP23

Table 4.40 PCT 157 - Bladder Saltbush shrubland on alluvial plains in the semi-arid (warm) zone including Riverina Bioregion

Growth form	**Species recorded**
Tree	Absent
Shrub	*Atriplex vesicaria, Nitraria billardierei, Maireana aphylla*
Fern	Absent
Grass & grasslike	*Sporobolus caroli, Chloris truncata, Rytidosperma caespitosum*
Forbs	*Leiocarpa panaetioides, Einadia nutans, Sida trichopoda*
Other	-



Photo 4.83 Example of PCT 157 in Moderate-good condition at VI plot VNI_DR09



Photo 4.84 Example of PCT 157 in Moderate-good condition at VI plot VNI_DR49

4.2.23.2 Condition states

Within the subject land, PCT 157 is presented in the following broad condition state (equivalent to vegetation zones):

- Moderate-good.

4.2.23.3 Justification of PCT selection

This vegetation type occurs on grey-cracking clays and red-brown clays. The community is dominated by *Atriplex vesicaria.*

A quantitative analysis was undertaken for this community using the BVC PCT filter tool. The following search criteria was used:

- IBRA region: Riverina
- IBRA subregion: Murrumbidgee
- Vegetation formation: Arid Shrublands (Chenopod sub-formation)
- Vegetation class: Riverine Chenopod Shrublands
- Species (all strata and growth form groups): Atriplex vesicaria, Nitraria billardierei, Sporobolus caroli, Atriplex leptocarpa, Rytidosperma caespitosum, Lolium perenne*, Sclerolaena tricuspis, Maireana aphylla, Cressa australis, Hordeum leporinum*, Malacocera tricornis, Maireana pentagona, Vittadinia cuneata. Dominant species of each strata were selected (i.e. those with the highest VI Plot cover values).

The search returned one PCT with 12 of the 17 search criteria:

- PCT 164 - Cotton Bush open shrubland of the semi-arid (warm) zone.

The search returned one PCT with 11 of the 17 search criteria:

- PCT 157 – Bladder Saltbush shrubland on alluvial plains in the semi-arid (warm) zone including Riverina Bioregion.

Whilst Cotton Bush (*Maireana aphylla*) is often a component of this community, vegetation associated with PCT 157 was distinctly dominated by Bladder Saltbush (*Atriplex vesicaria*). Therefore, based on floristic and geological characteristics, this vegetation type is considered consistent with the scientific description and distribution information outlined for PCT 157.

4.2.23.4 Alignment with TECs

As outlined in BioNet Vegetation Classification database, there is no BC Act listed TEC associated with PCT 157.

4.2.23.5 Alignment with EPBC Act listed TECs

As outlined in BioNet Vegetation Classification database, there is no EPBC Act listed TEC associated with PCT 157.

4.2.24 PCT 159 – Old Man Saltbush shrubland mainly of the semi-arid (warm) climate zone (south western NSW)

4.2.24.1 PCT overview

PCT 159 - Old Man Saltbush shrubland mainly of the semi-arid (warm) climate zone (south western NSW) is described in the BioNet Vegetation classification system as a tall shrubland up to 2.5 metres high, dominated by Old Man Saltbush (*Atriplex nummularia*) with a lower chenopod shrub layer dominated by bluebushes such as *Maireana microcarpa*, *Maireana appressa, Maireana pyramidata* and *Maireana brevifolia*, Thorny Rhagodia (*Rhagodia spinescens*), Bladder Saltbush (*Atriplex vesicaria*) and Nitre Goosefoot (*Chenopodium nitrariaceum*). Low ground shrubs include *Dissocarpus biflorus, Atriplex lindleyi* and a number of copperburr species (*Sclerolaena* spp.). Forb species include *Senecio runcinifolius, Brachyscome lineariloba, Geococcus pusillus, Calandrinia eremaea, Bulbine bulbosa, Tetragonia tetragonioides, Crassula colorata* var. *colorata, Crassula sieberiana* subsp. *sieberiana* and *Osteocarpum acropterum* var. *deminuta;* grass species include *Chloris truncata, Austrodanthonia caespitosa, Austrostipa nodosa* and *Walwhalleya prolut.* Exotic species may be common in places and include *Hordeum marinum, Hordeum leporinum, Schismus barbatus, Xanthium spinosum, Heliotropium europaeum* and *Schismus barbatus*. Eastern occurrences in the Riverina Bioregion often contain scattered Myall trees (*Acacia pendula*).

Occurs on cracking grey and brown clay or brown loam soils that are sometimes gilgaied on floodplains in drainage depressions in the Riverina and Murray Darling Depression Bioregions. Prior to European occupation this community would have been extensive. Continuous grazing by stock and rabbits, and perhaps the devastating droughts of the late 19th Century eliminated most of this community leaving "derived" grasslands or shrublands. Most of the remaining areas have been severely degraded and salinity is an increasing problem in the Riverina. Over the last few decades, Old Man Saltbush has been planted in restoration projects for fodder and as a means of reducing rising saline watertables. In assessing its status, it is important to exclude these planted areas. Due to its reduction in extent, this community is considered to be an endangered community and as of 2005 it is poorly represented in conservation reserves. This community grades into Black Box (ID13 or ID15) on floodplains and into Weeping Myall woodland (ID26) or bluebush communities on the outer floodplains. This community shares some species with the Old Man Saltbush shrubland community of north western NSW (1D158).

Within the subject land, vegetation associated with this PCT is limited to SVTM in areas not subject to survey due to access restrictions. PCT 159 has been mapped by the SVTM on the Carathool Road edge near to the intersection with Mabins Well Road, adjacent to a larger area of PCT 26. Vegetation descriptions and condition state has been described as “Benchmark” as defined by BioNet Vegetation Classification and the BAM-C. Table 4.41 provides an overview of the PCT as outlined in the BioNet Vegetation Classification database.

Table 4.41 PCT 159 - Old Man Saltbush shrubland mainly of the semi-arid (warm) climate zone (south western NSW) community overview

PCT ID	159
PCT name	Old Man Saltbush shrubland mainly of the semi-arid (warm) climate zone (south western NSW)
Vegetation formation	Arid Shrublands (Chenopod sub-formation)
Vegetation class	Riverine Chenopod Shrublands
Cleared value	92 %
Extent within subject land	0.05 ha
BAM VI plots used in assessment	Benchmark condition assumed as defined by the BAM-C.

4.2.24.2 Condition states

Within the subject land, PCT 159 is presented in the following broad condition state (equivalent to vegetation zones):

- SVTM (Benchmark).

4.2.24.3 Justification of PCT selection

Due to land access restrictions, field verification of this PCT in areas of SVTM has not been completed.

4.2.24.4 Alignment with TECs

As outlined in BioNet Vegetation Classification database, PCT 159 is associated with BC Act listed Endangered TEC Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions.

4.2.24.5 Alignment with EPBC

As outlined in BioNet Vegetation Classification database, there is no EPBC Act listed TEC associated with PCT 159.

4.2.25 PCT 160 – Nitre Goosefoot shrubland wetland on clays of the inland floodplains

4.2.25.1 PCT overview

PCT 160 - Nitre Goosefoot shrubland wetland on clays of the inland floodplains is described in BioNet Vegetation classification system as a tall shrubland wetland (to two metres high) found on clays of the inland floodplains. It is dominated by Nitre Goosefoot (*Chenopodium nitrariaceum*) often with Black Roly Poly (*Sclerolaena muricata*). Low shrubs often include *Sclerolaena stelligera*, Soft Horns (*Malacocera tricornis*) and *Atriplex semibaccata,* and forb species include *Omphalolappula concava*, *Harmsiodoxa blennodioides* and *Oxalis perennans*. Exotic species may be common including the grasses *Hordeum leporinum**, *Hordeum marinum**, *Lolium perenne** and *Avena fatua** and the forbs *Brassica tournefortii*, Cirsium vulgare*, Echium plantagineum*, Erodium cicutarium*, Hedypnois rhagadioloides* subsp. *cretica** and *Medicago polymorpha**. Tall shrubs of Cooba (*Acacia salicina*) and River Cooba (*Acacia stenophylla*) may be present.

The community occurs on cracking clay or sandy clay soils in lake beds, low lying plains, drainage depressions and alluvial plains subject to flooding in the arid and semi-arid zones of far western NSW. It is widespread but usually found in discrete stands.

Grub infestation has killed large areas since the 1990s and is a potential major threat to this community.

Within the subject land, vegetation associated with PCT 160 was recorded along most of the alignment within the Murrumbidgee and northern Murray Fans IBRA subregions. It occurred on light grey cracking clay soils along drainage depressions at the edge of a gilgai complex and in ephemeral swamps. Vegetation was dominated by the swamp tolerant shrub, Nitre Goosefoot (*Chenopodium nitrariaceum*) with and occasional co-dominance of Lignum (*Duma florulenta*) along with a suite of low chenopod shrubs, grasses and forbs.

Table 4.42 provides an overview of the PCT as outlined in the BioNet Vegetation Classification database. Table 4.43 provides a detailed description of each species per growth form recorded from BAM plots undertaken in PCT 160 during field survey.

Examples of PCT 160 are provided in Photo 4.85 and Photo 4.86.

Table 4.42 PCT 160 - Nitre Goosefoot shrubland wetland on clays of the inland floodplains community overview

PCT ID	**160**
PCT name	Nitre Goosefoot shrubland wetland on clays of the inland floodplains
Vegetation formation	Freshwater Wetlands
Vegetation class	Inland Floodplain Shrublands
Cleared value	28 %
Extent within subject land	16.87 ha
BAM VI plots used in assessment	VNI_DR12, VNI_DR35, VNI_DR38, VNI_MP17, VNI_MP39, VNIOZ_15

Table 4.43 PCT 160 - Nitre Goosefoot shrubland wetland on clays of the inland floodplains

Growth form	**Species recorded**
Tree	Absent
Shrub	*Chenopodium nitrariaceum, Sclerolaena muricata var. semiglabra, Duma florulenta, Lycium ferocissimum**
Fern	*Marsilea drummondii*
Grass & grasslike	*Eragrostis australasica, Eleocharis plana*
Forbs	*Oxalis perennans, Vittadinia cuneata, Einadia nutans, Xanthium spinosum**
Other	-

Notable weeds: *Xanthium spinosum* Lycium ferocissimum**



Photo 4.85 Example of PCT 160 in Moderate-good condition at VI plot VNI_MP39



Photo 4.86 Example of PCT 160 in Moderate-good condition VI plot VNI_DR12

4.2.25.2 Condition states

Within the subject land, PCT 160 is presented in the following broad condition state (equivalent to vegetation zones):

- Moderate-good
- SVTM.

4.2.25.3 Justification of PCT selection

This vegetation type occurs on light grey clays dominated by Nitre Goosefoot (*Chenopodium nitrariaceum*).

A quantitative analysis was undertaken for this community using the BVC PCT filter tool. The following search criteria was used:

- IBRA region: Riverina
- IBRA subregion: Murrumbidgee
- Vegetation formation: Freshwater Wetlands
- Vegetation class: Inland Floodplain Shrublands
- Species (all strata and growth form groups): Chenopodium nitrariaceum, Eragrostis australasica, Eleocharis plana, Sclerolaena stelligera, Sclerolaena muricata var. semiglabra, Marsilea drummondii, Oxalis perennans, Atriplex semibaccata, Euchiton spp., Juncus spp., Vittadinia cuneata, Centipeda minima, Xanthium spinosum*, Alternanthera sp. A. Dominant species of each strata were selected (i.e. those with the highest VI Plot cover values).

The search returned one PCT with nine of the 18 search criteria:

- PCT 160 - Nitre Goosefoot shrubland wetland on clays of the inland floodplains

The search returned two PCTs with eight of the 18 search criteria:

- PCT 17 - Lignum shrubland wetland of the semi-arid (warm) plains (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
- PCT 24 - Canegrass swamp tall grassland wetland of drainage depressions, lakes and pans of the inland plains

PCT 160 returned as the most likely match for this vegetation. Coupled with the floristic and geological characteristics, this vegetation type is considered consistent with the scientific description and distribution information outlined for PCT 160.

4.2.25.4 Alignment with TECs

There are no associated BC listed TECs for this PCT.

4.2.25.5 Alignment with EPBC Act listed ECs

As outlined in BioNet Vegetation Classification database, there is no EPBC Act listed TEC associated with PCT 160.

4.2.26 PCT 163 – Dillon Bush (Nitre Bush) shrubland of the semi-arid and arid zones

4.2.26.1 PCT overview

PCT 163 - Dillon Bush (Nitre Bush) shrubland of the semi-arid and arid zones is described in BioNet Vegetation classification system as a low to mid-high open to sparse shrubland dominated by Dillon Bush (*Nitraria billardierei*) with Cotton Bush (*Maireana aphylla*) and Thorny Saltbush (*Rhagodia spinescens*) also common. The ground cover for PCT 163 may be sparse or dense depending on the season. It includes low shrubs such as Giant Redburr (*Sclerolaena tricuspis*), *Sclerolaena divaricata* and *Sclerolaena obliquicuspis*, Cannonball Burr (*Dissocarpus paradoxus*), *Salsola tragus* subsp. *tragus*, *Atriplex lindleyi* and *Atriplex holocarpa*. Grasses may dominate a site and often include the wallaby grasses *Austrodanthonia setacea, Austrodanthonia caespitosa* and Rough Spear Grass (*Austrostipa scabra*). A high proportion of the ground cover may be composed of weed species including *Hordeum* spp., *Bromus* spp. *Cucumis myriocarpus* subsp. *leptodermis* and medics (*Medicago* spp.).

It occurs on light grey to brown clay and loam soils that may be saline, on alluvial plains and dry lake beds mainly in the Riverina Bioregion in the semi-arid (warm) zone. The community is often found on heavily disturbed sites and is likely a community derived from previous Bladder Saltbush and Old Man Saltbush communities which have been heavily modified by historical sheep and rabbit grazing. Other favourable disturbance patterns include previously grazed cropping lands, dry lake beds or gypsum dune fields where flooding occurs. Scalding and soil erosion is commonplace, as are rabbit warrens.

Within the subject land, vegetation associated with PCT 163 was recorded extensively throughout the Murrumbidgee and Murray Fans IBRA subregions on light grey and light brown clay to clay-loam soils. It was often associated with dry lake or river bads where soils may be more saline. Vegetation associated with PCT 163 was dominated by Dillon Bush (*Nitraria billardierei*) and associated with *Maireana aphylla* and *Sclerolaena muricata var. muricata*.

Table 4.44 provides an overview of the PCT as outlined in the BioNet Vegetation Classification database. Table 4.45 provides a detailed description of each species per growth form recorded from BAM plots undertaken in PCT 163 during the field survey.

Examples of PCT 163 are provided in Photo 4.87 and Photo 4.88.

Table 4.44 PCT 163 - Dillon Bush (Nitre Bush) shrubland of the semi-arid and arid zones community overview

PCT ID	**163**
PCT name	Dillon Bush (Nitre Bush) shrubland of the semi-arid and arid zones
Vegetation formation	Arid Shrublands (Chenopod sub-formation)
Vegetation class	Riverine Chenopod Shrublands
cleared value	26 %
Extent within subject land	79.02 ha
BAM VI plots used in assessment	VNI_DR106, VNI_DR13, VNI_DR25, VNI_DR39, VNI_DR50, VNI_DR51, VNI_MP38, VNI_MP43, VNI_MP44, VNI_NM027, VNI_NM028, VNI_NM031, VNI_NM07, VNIOZ_14

Table 4.45 PCT 163 - Dillon Bush (Nitre Bush) shrubland of the semi-arid and arid zones

Growth form	Species recorded
Tree	Absent
Shrub	*Nitraria billardierei, Sclerolaena muricata* var. *muricata, Maireana aphylla*
Fern	Absent
Grass & grasslike	*Austrostipa scabra* subsp. *scabra, Sporobolus caroli, Rytidosperma caespitosum*
Forbs	*Sida trichopoda, Atriplex lindleyi, Maireana pentagona*
Other	-



Photo 4.87 Example of PCT 163 in Moderate-good condition at VI plot VNI_DR13



Photo 4.88 Example of PCT 163 at VI plot VNI MP43

4.2.26.2 Condition states

Within the subject land, PCT 163 is presented in the following broad condition state (equivalent to vegetation zones):

- Moderate-good
- Low Conservation Value (cropped land)
- SVTM.

4.2.26.3 Justification of PCT selection

This vegetation type occurs on light grey to brown clay-loam soils and is dominated by Dillon Bush (*Nitraria billardierei*).

A quantitative analysis was undertaken for this community using the BVC PCT filter tool. The following search criteria was used:

- IBRA region: Riverina
- IBRA subregion: Murrumbidgee
- Vegetation formation: Arid Shrublands (Chenopod sub-formation)
- Vegetation class: Riverine Chenopod Shrublands

- Species (all strata and growth form groups): Maireana aphylla, Nitraria billardierei, Malacocera tricornis, Atriplex leptocarpa, Sclerolaena brachyptera, Sclerolaena tricuspis, Rytidoserma caespitosum, Rhagodia spinescens, Einadia nutans, Maireana decalvans, Maireana pentagona, Sporobolus caroli, Atriplex pseudocampanulata. Dominant species of each strata were selected (i.e. those with the highest VI Plot cover values).

The search returned one PCT with 14 of the 17 search criteria:

- PCT 164 - Cotton Bush open shrubland of the semi-arid (warm) zone.

The search returned one PCT with 12 of the 17 search criteria:

- PCT 157 - Bladder Saltbush shrubland on alluvial plains in the semi-arid (warm) zone including Riverina Bioregion.

The search returned one PCT with 10 of the 17 search criteria:

- PCT 163 - Dillon Bush (Nitre Bush) shrubland of the semi-arid and arid zones.

Whilst Cotton Bush (*Maireana aphylla*) is often a component of this community, vegetation associated with PCT 163 was distinctly dominated by Dillon Bush (*Nitraria billardierei*). Therefore, based on floristic and geological characteristics, this vegetation type is considered consistent with the scientific description and distribution information outlined for PCT 163.

4.2.26.4 Alignment with TECs

As outlined in BioNet Vegetation Classification database, there is no BC Act listed TEC associated with PCT 163.

4.2.26.5 Alignment with EPBC Act listed TECs

As outlined in BioNet Vegetation Classification database, there is no EPBC Act listed TEC associated with PCT 163.

4.2.27 PCT 164 – Cotton Bush open shrubland of the semi-arid (warm) zone

4.2.27.1 PCT overview

PCT 164 - Cotton Bush open shrubland of the semi-arid (warm) zone is described in BioNet Vegetation classification system as a low to mid-high sparse to mid-dense shrubland usually about 0.8 metres high dominated by Cotton Bush (*Maireana aphylla*) with occasional remnant shrubs of Bladder Saltbush (*Atriplex vesicaria*). Smaller shrubs include copperburr (*Sclerolaena muricata, Sclerolaena tricuspis* and *Sclerolaena bicornis*) and annual saltbushes (*Atriplex lindleyi, Atriplex leptocarpa*). The sparse ground cover contains native forbs such as paper daisies (*Rhodanthe* spp.), *Minuria cunninghamii*, and *Calotis scabiosifolia* var. *scabiosifolia* and grasses such as *Rytidosperma caespitosa*. It often contains a very high cover of weed species including *Hordeum* spp.*, *Bromus* spp.*, *Vulpia* spp.*, *Medicago* spp.*, *Avena fatua** and *Lolium perenne**.

The community generally occurs in highly disturbed areas on grey to grey-brown clays or clay-loam soils on depressed alluvial plains mainly in the Riverina Bioregion of the semi-arid (warm) climatic zone. Areas which it occupies were probably dominated by Bladder Saltbush and other species prior to heavy grazing, which has led to the decline of perennial saltbush species leaving this Cotton Bush-dominated community. The severe droughts of the 1990s and 2000s have led to dieback of areas of Cotton Bush.

Within the subject land, vegetation associated with this PCT 164 was one of the most abundant Plant Community Types with 25.81 hectares of coverage across the subject land. It was recorded on light grey and red brown clay soils associated with an alluvial plain. Vegetation comprised a chenopod shrubland dominated by Cotton Bush (*Maireana aphylla*), along with a suite of low chenopods, grasses and forbs.

Table 4.46 provides an overview of the PCT as outlined in the BioNet Vegetation Classification database. Table 4.47 provides a detailed description of each species per growth form recorded from BAM plots undertaken in PCT 164 during field survey.

Examples of PCT 164 are provided in Photo 4.89 and Photo 4.90.

Table 4.46 PCT 164 - Cotton Bush open shrubland of the semi-arid (warm) zone community overview

PCT ID	164
PCT name	Cotton Bush open shrubland of the semi-arid (warm) zone
Vegetation formation	Arid Shrublands (Chenopod sub-formation)
Vegetation class	Riverine Chenopod Shrublands
Cleared value	8 %
Extent within subject land	357.73 ha
BAM VI plots used in assessment	VNI_DR11, VNI_DR31, VNI_DR33, VNI_DR37, VNI_DR74, VNI_DR75, VNI_DR77, VNI_DR78, VNI_MP03, VNI_MP04, VNI_MP35, VNI_MP37, VNI_NM026, VNI_NM029, VNIOZ_02, VNIOZ_04

Table 4.47 PCT 164 - Cotton Bush open shrubland of the semi-arid (warm) zone

Growth form	Species recorded
Tree	Absent
Shrub	*Maireana aphylla, Nitraria billardierei, Atriplex pseudocampanulata*
Fern	*Marsilea drummondii*
Grass & grasslike	*Enteropogon acicularis, Rytidosperma caespitosum, Sporobolus caroli*
Forbs	*Leiocarpa panaetioides, Eriochlamys behrii*
Other	-



Photo 4.89 Example of PCT 164 in Moderate-good condition at VI plot VNI MP 37



Photo 4.90 Example of PCT 164 in Moderate-good condition at VI plot VNI_DR74

4.2.27.2 Condition states

Within the subject land, PCT 164 is presented in the following broad condition state (equivalent to vegetation zones):

- Moderate-good
- SVTM.

4.2.27.3 Justification of PCT selection

This vegetation type occurs on grey-cracking clays and red-brown clays. The community is dominated by *Cotton bush (Maireana aphylla)*.

A quantitative analysis was undertaken for this community using the BVC PCT filter tool. The following search criteria was used:

- IBRA region: Riverina
- IBRA subregion: Murrumbidgee
- Vegetation formation: Arid Shrublands (Chenopod sub-formation)
- Vegetation class: Riverine Chenopod Shrublands
- Species (all strata and growth form groups): Maireana aphylla, Rytidosperma caespitosum, Sporobolus caroli, Enteropogon acicularis, Leiocarpa panaetioides, Chloris truncata, Juncus usitatus, Austrostipa scabra subsp. scabra. Dominant species of each strata were selected (i.e. those with the highest VI Plot cover values).

The search returned one PCT with eight of the 12 search criteria:

- PCT 157 - Bladder Saltbush shrubland on alluvial plains in the semi-arid (warm) zone including Riverina Bioregion.

The search returned three PCTs with seven of the 12 search criteria:

- PCT 164 – Cotton Bush open shrubland of the semi-arid (warm) zone
- PCT 195 – Bladder Saltbush chenopod shrubland on alluvial plains mainly in the Darling Riverine Plain Bioregion
- PCT 216 - Black Roly Poly low open shrubland of the Riverina Bioregion and Murray Darling Depression Bioregion.

Whilst Bladder saltbush (*Atriplex vesicaria*) and Black Roly Poly (*Sclerolaena muricata*) can be components of this community, vegetation associated with PCT 164 was heavily dominated by Cotton Bush (*Maireana aphylla*)**.** Therefore, based on floristic and geological characteristics, this vegetation type is considered consistent with the scientific description and distribution information outlined for PCT 164.

4.2.27.4 Alignment with TECs

As outlined in BioNet Vegetation Classification database, there is no BC Act listed TEC associated with PCT 164.

4.2.27.5 Alignment with EPBC Act listed ECs

As outlined in BioNet Vegetation Classification database, there is no EPBC Act listed TEC associated with PCT 164.

4.2.28 PCT 170 – Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones

4.2.28.1 PCT overview

PCT 170 - Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones is described in BioNet Vegetation classification system as a mallee woodland or open mallee shrubland usually to 8 m tall and dominated by several mallee species including White Mallee (*Eucalyptus dumosa*), Red Mallee (*Eucalyptus socialis*), Glossy-leaved Red Mallee (*Eucalyptus oleosa*) and Snap and Rattle (*Eucalyptus gracilis*). White Cypress Pine (*Callitris glaucophylla*) or Slender Pine (*Callitris gracilis* subsp. *murrayensis*) may also be present. The mallee species occur in different proportions across the distributional range. The structure can either be bull mallee woodland or whipstick mallee shrubland depending on time since the last fire, other disturbance, or the clay content of the soil. In areas unburnt for decades, large bull mallee trees may feature with large amounts of leaf litter on the ground.

Chenopods shrubs form a major component of the understorey compared to mallee on sandy dunes or the mallee communities of the slightly wetter areas in the east. Common shrubs include *Chenopodium curvispicatum, Enchylaena tomentosa, Atriplex stipitata, Dissocarpus paradoxus, Chenopodium desertorum* subsp*. desertorum, Maireana pentatropis, Maireana georgei, Maireana pyramidata, Maireana sedifolia, Sclerolaena obliquicuspis, Acacia microcarpa, Myoporum platycarpum,* Senna form taxon 'filifolia' and *Rhagodia spinescens.* Forbs include *Zygophyllum aurantiacum, Zygophyllum apiculatum, Ptilotus exaltatus* var*. exaltatus* and *Vittadinia cuneata*. Grasses include *Austrostipa* and *Rytidosperma* species. The floristic composition of the ground flora varies markedly from season to season, with changes in grazing regimes and after fire. Heavily grazed areas contain fewer species and a simpler structure.

This community occurs on calcareous red-brown, sandy-loam or loamy clay soils, sometimes containing limestone nodules, on eolian sandplains or in inter-dune plains or swales. A cryptogam soil crust composed of algae and lichens is commonly present in areas that are protected from trampling by stock or goats.

The community is mainly restricted to the Murray-Darling Depression Bioregion of NSW with small outliers to the north and tends to occur in regions receiving less than 300 millimetres of annual rainfall. Significant areas have been cleared for grazing or cropping but large areas remain uncleared. Most areas outside reserves are grazed by stock and trampling of soils leads to soil erosion. Fire is a key disturbance factor in mallee, and it may be subject to wildfire every two to three decades, but it is burnt by landholders more often in some locations.

Within the subject land vegetation associated with PCT 170 was recorded north west of Moulamein on red-brown sandy soils within a sand dune complex. It was recorded in thinned and derived condition only over an area of 0.15 hectares. Thinned vegetation was dominated by *Eucalyptus socialis* and associated with shrubs; *Rhagodia spinescens* and *Maireana brevifolia.*

Table 4.48 provides an overview of the PCT as outlined in the BioNet Vegetation Classification database. Table 4.49 provides a detailed description of each species per growth form recorded from BAM plots undertaken in PCT 170 during the field survey.

Examples of PCT 170 are provided in Photo 4.91 and Photo 4.92.

Table 4.48 PCT 170 - Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones community overview

PCT ID	170
PCT name	Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones
Vegetation formation	Semi-arid Woodlands (Shrubby sub-formation)
Vegetation class	Sand Plain Mallee Woodlands
Cleared value	41 %
Extent within subject land	5.61 ha
BAM VI plots used in assessment	VNI_MP28, VNI_MP29, VNI_MP30, VNI_NM19, VNI_NM20

Table 4.49 PCT 170 - Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones

Growth form	Species recorded
Tree	*Eucalyptus socialis*
Shrub	*Rhagodia spinescens, Maireana brevifolia*
Fern	Absent
Grass & grasslike	*Fimbristylis nutans*
Forbs	*Rhodanthe corymbiflora, Einadia nutans*
Other	-



Photo 4.91 Example of PCT 170 in Thinned condition at VI plot NM020



Photo 4.92 Example of PCT 170 in Derived condition at VI plot VNI_MP29

4.2.28.2 Condition states

Within the subject land PCT 170 is presented in the following broad condition state (equivalent to vegetation zones):

- Thinned
- Derived.

4.2.28.3 Justification of PCT selection

This vegetation type occurs on red-brown sandy-loam soils within sand dune complexes and is dominated by *Eucalyptus socialis.*

A quantitative analysis was undertaken for this community using the BVC PCT filter tool. The following search criteria was used:

- IBRA region: Riverina
- IBRA subregion: Murrumbidgee
- Vegetation formation: Semi-arid Woodlands (Shrubby sub-formation)
- Vegetation class: Sand Plain Mallee Woodlands
- Species (all strata and growth form groups): Hordeum leporinum*, Marrubium vulgare*, Medicago praecox*, Rhagodia spinescens, Maireana brevifolia, Sisymbrium irio*, Lolium rigidum*, Enchylaena tomentosa, Erodium crinitum, Dissocarpus paradoxus, Sonchus oleraceus*, Austrostipa scabra. Dominant species of each strata were selected (i.e. those with the highest VI Plot cover values).

The search returned one PCT with nine of the 16 search criteria:

- PCT 170 - Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones.

The search returned one PCT with eight of the 16 search criteria:

- PCT 21 – Slender Cypress Pine - Sugarwood - Western Rosewood open woodland on sandy rises mainly in the Riverina Bioregion and Murray Darling Depression Bioregion
- PCT 170 returned as the most likely match for this vegetation. Coupled with the floristic and geological characteristics, this vegetation type is considered consistent with the scientific description and distribution information outlined for PCT 170.

4.2.28.4 Alignment with TECs

As outlined in BioNet Vegetation Classification database, there is no BC Act listed TEC associated with PCT 170.

4.2.28.5 Alignment with EPBC Act listed TECs

As outlined in BioNet Vegetation Classification database, PCT 170 is part of two EPBC Act listed TECs which are the Critically Endangered Plains Mallee Box Woodlands of the Murray Darling Depression, Riverina and Naracoorte Coastal Plain and the Endangered Mallee Bird Community of the Murray Darling Depression Bioregion. Neither of these TECs have been assessed further for PCT 170 due to the absence of Mallee Eucalypt species in the mapped areas.

4.2.29 PCT 216 – Black Roly Poly low open shrubland of the Riverina Bioregion and Murray Darling Depression Bioregion

4.2.29.1 PCT overview

PCT 216 - Black Roly Poly low open shrubland of the Riverina Bioregion and Murray Darling Depression Bioregion is described in BioNet Vegetation classification system as a low or mid-high open chenopod shrubland dominated by Black Roly Poly (*Sclerolaena muricata* var. *semiglabra*), with other low shrubs such as *Sclerolaena diacantha, Maireana microphylla, Leiocarpa panaetioides* and *Teucrium racemosum.* Scattered Black Box trees (*Eucalyptus largiflorens*) may be present. The ground cover is sparse and includes forbs such as *Atriplex semibaccata, Vittadinia cuneata, Vittadinia pterochaeta, Rhodanthe corymbiflora, Sida trichopoda, Geranium solanderi* var. *solanderi* and grass species such as *Austrostipa scabra* subsp. *scabra, Rytidosperma caespitosa, Walwhalleya proluta* and *Chloris truncata*.

The community occurs on grey and brown clays on alluvial plains primarily in the Riverina and Murray-Darling Depression Bioregions of south-western NSW. It is likely to have been derived from a previous Bladder Saltbush-dominated community, it often grades into Bladder Saltbush, Cotton Bush and Dillon Bush communities.

Within the subject land, vegetation associated with PCT 216 was recorded on grey and brown clays within the Murray Fans and far eastern component of the Murrumbidgee IBRA subregions. Vegetation was dominated by Black Roly Poly (*Sclerolaena muricata var. semiglabra*) and coexisted with other chenopods such as *Rhagodia spinescens* and a predominantly grassy understory.

Table 4.50 provides an overview of the PCT as outlined in the BioNet Vegetation Classification database. Table 4.51 provides a detailed description of each species per growth form recorded from BAM plots undertaken in PCT 216 during the field survey.

Example of PCT 216 is provided in Photo 4.93.

Table 4.50 PCT 216 - Black Roly Poly low open shrubland of the Riverina Bioregion and Murray Darling Depression Bioregion community overview

PCT ID	**216**
PCT name	Black Roly Poly low open shrubland of the Riverina Bioregion and Murray Darling Depression Bioregion
Vegetation formation	Arid Shrublands (Chenopod sub-formation)
Vegetation class	Riverine Chenopod Shrublands
Cleared value	0 % (Extent has increased - possibly did not exist before intensive stock grazing eliminated saltbushes from large areas).
Extent within subject land	10.46 ha
BAM VI plots used in assessment	VNI_NM036

Table 4.51 PCT 216 - Black Roly Poly low open shrubland of the Riverina Bioregion and Murray Darling Depression Bioregion

Growth form	Species recorded
Tree	Absent
Shrub	*Sclerolaena muricata, Rhagodia spinescens*
Fern	Absent
Grass & grasslike	*Enteropogon acicularis, Walwhalleya proluta*
Forbs	*Vittadinia cuneata, Oxalis perennans*
Other	-



Photo 4.93 Example of PCT 216 in Moderate-good condition at VI plot NM036

4.2.29.2 Condition states

Within the subject land, PCT 216 is presented in the following broad condition state (equivalent to vegetation zones):

- Moderate-good
- SVTM.

4.2.29.3 Justification of PCT selection

This vegetation type occurs on grey and brown clays of alluvial plains and is dominated by Black Roly Poly (*Sclerolaena muricata var. semiglabra*)

A quantitative analysis was undertaken for this community using the BVC PCT filter tool. The following search criteria was used:

- IBRA region: Riverina
- IBRA subregion: Murray Fans
- Vegetation formation: Arid Shrublands (Chenopod sub-formation)
- Vegetation class: Riverine Chenopod Shrublands

- Species (all strata and growth form groups): *Enteropogon acicularis, Hordeum leporinum*, Lolium rigidum*, Sclerolaena muricata, Vittadinia cuneata, Rhagodia spinescens.* Dominant species of each strata were selected (i.e. those with the highest VI Plot cover values).

The search returned five PCTs with 6 of the 10 search criteria:

- PCT 157 – Bladder Saltbush shrubland on alluvial plains in the semi-arid (warm) zone including Riverina Bioregion
- PCT 163 – Dillon Bush (Nitre Bush) shrubland of the semi-arid and arid zones
- PCT 164 – Cotton Bush open shrubland of the semi-arid (warm) zone
- PCT 216 – Black Roly Poly low open shrubland of the Riverina Bioregion and Murray Darling Depression Bioregion
- PCT 236 – Derived Giant Redburr low shrubland on alluvial plains of the semi-arid (warm) climate zone.

Given the presence of the characteristic dominant species *Sclerolaena muricata var. semiglabra* present with other chenopods and native grasses within the Riverina IBRA region, this vegetation is considered the most consistent with the scientific description and distribution information outlined for PCT 216.

4.2.29.4 Alignment with TECs

As outlined in BioNet Vegetation Classification database, there is no BC Act listed TEC associated with PCT 216.

4.2.29.5 Alignment with EPBC Act listed TECs

As outlined in BioNet Vegetation Classification database, there is no EPBC Act listed TEC associated with PCT 216.

4.2.30 PCT 237 – Riverine Western Grey Box grassy woodland of the semi-arid (warm) climate zone

4.2.30.1 PCT overview

PCT 237 - Riverine Western Grey Box grassy woodland of the semi-arid (warm) climate zone is described in BioNet Vegetation classification system as a tall woodland with trees to 20 metres high dominated by Western Grey Box (*Eucalyptus microcarpa*) often with River Red Gum (*Eucalyptus camaldulensis* subsp. *camaldulensis*) and Black Box (*Eucalyptus largiflorens*) which often grades into Yellow Box (*Eucalyptus melliodora*) and Buloke (*Allocasuarina luehmannii*) on lighter soils. Shrubs are absent or very sparse. Golden dust Wattle (*Acacia acinacea*) may be present along with the low shrub *Maireana enchylaenoides*. The ground cover may be dense or sparse depending on time since rain. It includes grass species such as *Rytidosperma caespitosa, Rytidosperma laevis, Paspalidium jubiflorum* and *Chloris truncata*. The rush *Juncus flavidus* and the sedge *Carex inversa* are often present along with small chenopod shrubs such as *Atriplex semibaccata* and *Einadia nutans* subsp. *nutans*. Forb species include *Sida corrugata, Oxalis perennans* and *Rumex brownii*.

PCT 237 occurs on grey clays on the slight rises of floodplains dominated by River Red Gum forests mainly along the Murray and Murrumbidgee Rivers of south-western NSW from near Albury in the east to west of the Millewa forests near Deniliquin. It is restricted in extent and often grades into River Red Gum, Yellow Box or Black Box woodlands.

Within the subject land, vegetation associated with PCT 237 occurred in three small patches within the Murray Fans component of the project from Swan Hill to the Edward River. It was recorded on grey clays on the inner flood plains of main or tributary flowing rivers where Western Grey Box (*Eucalyptus macrocarpa*) was the dominant tree, along with sub-dominant River Red Gum (*Eucalyptus camaldulensis* subsp. *camaldulensis*).

Table 4.52 provides an overview of the PCT as outlined in the BioNet Vegetation Classification database. Table 4.53 provides a detailed description of each species per growth form recorded from BAM plots undertaken in PCT 237 during the field survey.

Examples of PCT 237 are provided in Photo 4.94 and Photo 4.95.

Table 4.52 PCT 237 - Riverine Western Grey Box grassy woodland of the semi-arid (warm) climate zone community overview

PCT ID	**237**
PCT name	Riverine Western Grey Box grassy woodland of the semi-arid (warm) climate zone
Vegetation formation	Grassy Woodlands
Vegetation class	Floodplain Transition Woodlands
Cleared value	73 %
Extent within subject land	0.84 ha
BAM VI plots used in assessment	VNI_DR47, VNI_NM034

Table 4.53 PCT 237 - Riverine Western Grey Box grassy woodland of the semi-arid (warm) climate zone

Growth form	**Species recorded**
Tree	*Eucalyptus microcarpa, Eucalyptus largiflorens, Eucalyptus camaldulensis, Acacia salicina*
Shrub	*Chenopodium nitrariaceum, Einadia nutans, Sclerolaena muricata* var. *semiglabra*
Fern	Absent
Grass & grasslike	*Paspalidium jubiflorum*
Forbs	*Alternanthera denticulata, Einadia nutans, Centipeda cunninghamii*
Other	-



Photo 4.94 Example of PCT 237 in Moderate-good condition at VI plot VNI_DR47



Photo 4.95 Example of PCT 237 in Moderate-good condition at Vi plot NM034

4.2.30.2 Condition states

Within the subject land, PCT 237 is presented in the following broad condition state (equivalent to vegetation zones):

- Moderate-good.

4.2.30.3 Justification of PCT selection

This vegetation type occurs on grey clays on the banks and inner flood plains of main and tributary flowing rivers and is dominated by Western Grey Box (Eucalyptus microcarpa).

A quantitative analysis was undertaken for this community using the BVC PCT filter tool. The following search criteria was used:

- IBRA region: Riverina
- IBRA subregion: Murray Fans
- Vegetation formation: Grassy Woodlands
- Vegetation class: Floodplain Transition Woodlands
- Species (all strata and growth form groups): Eucalyptus macrocarpa, Eucalyptus largiflorens, Eucalyptus camadulensis, Chenopodium nitrariaceum, Einadia nutans, Solanum nigrum*, Sclerolaena muricata var. semiglabrata, Paspalidium jubiflorum, Alternanthera denticulata, Salsola australis, Acacia salicina, Cirsium vulgare*, Centipeda cunninghamii. Dominant species of each strata were selected (i.e. those with the highest VI Plot cover values).

The search returned two PCTs with 10 of the 17 search criteria:

- PCT 26 – Weeping Myall open woodland of the Riverina Bioregion and NSW South Western Slopes Bioregion
- PCT 240 – River Coobah tall shrubland wetland of the floodplains in the Riverina Bioregion and Murray Darling Depression Bioregion.

The search returned three PCTs with nine of the 17 search criteria:

- PCT 13 – Black Box - Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
- PCT 237 – Riverine Western Grey Box grassy woodland of the semi-arid (warm) climate zone
- PCT 251 – Mixed Eucalypt woodlands of floodplains in the southern-eastern Cobar Peneplain Bioregion.

PCTs 13, 26 and 240 are excluded from further justification due to the lack of dominance by their characteristic species. PCT 251 is also excluded due to its distribution within the Cobar Peneplain Bioregion. As a result, the recorded vegetation is considered the most consistent with the scientific description and distribution information outlined for PCT 237 based on its floristic and geological characteristics.

4.2.30.4 Alignment with TECs

As outlined in the BioNet Vegetation Classification database, PCT 237 is part of the BC Act listed Inland Grey Box Woodland in the Riverina, NSW Southwestern Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions Endangered Ecological Community.

4.2.30.5 Alignment with EPBC Act listed TECs

As outlined in BioNet Vegetation Classification database, PCT 237 is part of the EPBC Act listed Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia Endangered Ecological Community.

4.2.31 PCT 266 – White Box grassy woodland in the upper slopes subregion of the NSW South Western Slopes Bioregion

4.2.31.1 PCT overview

PCT 266 – White Box grassy woodland in the upper slopes subregion of the NSW South Western Slopes Bioregion is described in the BioNet Vegetation Classification database as a tall woodland with trees to 25 metres high dominated by White Box (*Eucalyptus albens),* with Kurrajong (*Brachychiton populneus* subsp. *populneus)* often present. Other eucalypt species including *Eucalyptus bridgesiana*, *Eucalyptus blakelyi* or *Eucalyptus melliodora* may be present as minor components of the canopy. The shrub layer is usually sparse or absent depending on grazing history or soil type, but where present may contain a variety of *Acacia* species, *Dodonaea viscosa* subsp. *cuneata, Bursaria spinosa* subsp. *spinosa* and *Cassinia* species. The ground cover is usually mid-dense to dense except during drought and may be very diverse in grass and forb species. Very few areas contain a native ground cover with a rich flora but where this occurs it typically contains grasses such as *Themeda australis, Poa sieberiana, Elymus scaber* var. *scaber* and a range of *Rytidosperma* species. Forbs in such sites include *Wurmbea dioica, Gonocarpus elatus, Microseris lanceolata, Leptorhynchos squamatus* sens lat., *Craspedia variabilis, Podolepis jaceoides, Hypericum gramineum, Stackhousia monogyna, Ranunculus lappaceous, Dichopogon strictus, Velleia paradoxa* and *Diuris dendrobioides*. In sites exposed to continuous grazing, soil disturbance and fertilizer application, exotic species dominate the ground cover including *Bromus* spp.*, *Vulpia* spp.*, *Avena fatua**, *Echium plantagineum**, *Trifolium* spp.* and *Plantago lanceolata**. Floristic composition varies from north to south and on different aspects and soil types.

The community occurs between 300 to 600 metres altitude in the 500 to 700 millimetres rainfall zone. The soils are mainly red-brown earths, red or yellow podsols with some brown and black earths. The soils are derived from a variety of lithologies including shale, limestone, fine grained metamorphic rocks, granite and basalt. Species composition appears not to vary greatly across these lithologies. The community mainly occurs on hillslopes in low hill or hill landform patterns in the NSW South-western Slopes Bioregion overlapping into the South Eastern Highlands Bioregion.

Most of this community has been cleared and most of the ground cover has been replaced by exotic annual plant species. Sheet erosion has led to topsoil loss on heavily grazed slopes. While this community is poorly represented in public reserves, some progress is being made in protecting remnants in non-reserve conservation measures. This is a highly threatened plant community due to clearing and impacts of grazing and pasture improvement to ground layer vegetation.

Table 4.54 provides an overview of the PCT as outlined in the BioNet Vegetation Classification database. Table 4.55 provides a detailed description of each species per growth form recorded from BAM plots undertaken in PCT 266 during the field survey.

Examples of PCT 266 are provided in Photo 4.96 and Photo 4.97.

Table 4.54 PCT 266 - White Box grassy woodland in the upper slopes subregion of the NSW South Western Slopes Bioregion

PCT ID	**266**
PCT name	White Box grassy woodland in the upper slopes subregion of the NSW South Western Slopes Bioregion
Vegetation formation	Grassy Woodlands
Vegetation class	Western Slopes Grassy Woodlands
Cleared value	94 %
Extent within subject land	0.18 ha
BAM VI plots used in assessment	VNI_DR108, VNI_DR110

Table 4.55 PCT 266 - White Box grassy woodland in the upper slopes subregion of the NSW South Western Slopes Bioregion

Growth form	Species recorded
Tree	*Eucalyptus albens* and *Eucalyptus blakelyi,*
Shrub	Absent
Fern	Absent
Grass & grasslike	*Panicum effusum* and *Enteropogon acicularis*
Forbs	*Dysphania pumilio*
Other	-



Photo 4.96 Example of PCT 266 in Moderate condition



Photo 4.97 Example of PCT 266 in Low condition

4.2.31.2 Condition states

Within the subject land, PCT 266 is presented in the broad condition state of:

- Moderate-good
- Thinned.

4.2.31.3 Justification of PCT selection

A quantitative analysis was undertaken for this community using the BVC PCT filter tool. The following search criteria was used:

- IBRA region: NSW South Western Slopes (NSS)
- IBRA subregion: Inland Slopes (NSS01)
- Vegetation formation: Grassy Woodlands
- Vegetation class: Western Slopes Grassy Woodlands
- Species (all strata and growth form groups): *Eucalyptus albens, Eucalyptus blakelyi, Panicum effusum, Enteropogon acicularis* and *Dysphania pumilio.* Dominant species of each strata were selected (i.e. those with the highest VI Plot cover values).

The search returned a total of six PCTs with seven out of seven of the search criteria:

- PCT 266 – White Box grassy woodland in the upper slopes subregion of the NSW South Western Slopes Bioregion – this PCT was selected as the vegetation data and location was congruent with that of the PCT, namely the tall *Eucalyptus albens* dominant canopy, with minor presence of *Eucalyptus blakelyi*, sparse shrub layer and consistencies in species in the native ground layer (*Panicum effusum, Eneteropogon acicularis)*
- PCT 277 – Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion – excluded given dominance of *Eucalyptus blakelyi* and *Eucalyptus melliodora* in this PCT, which is not reflective of the plot data
- PCT 3388 – Central West Valleys White Box Forest – excluded given the dearth of Acacia species in the shrub layer and the general distribution of this PCT being located within the Central-west Slopes
- PCT 3396 – Northwest Slopes Box-Blakely's Red Gum Woodland – excluded given this PCT is generally dominated by *Eucalyptus melliodora and* is only rarely contains *Eucalyptus albens.* Notable shrub species (*Acacia implexa*) are also absent from the plot data. Its distribution is also generally dispersed further north in NSW, occurring in the Central-west Slopes and upper Hunter Valley regions
- PCT 3397 – Northwest Yellow Box Grassy Woodland – excluded given absence of *Eucalyptus melliodora* from the canopy
- PCT 3399 – Southwest Hills White Box-Blakely's Red Gum Forest – excluded given absence of key ground-stratum species for the PCT, namely *Cheilanthes sieberi* subsp. *sieberi* and *Hydrocotyle laxiflora*, which are generally considered always to be present in this PCT.

4.2.31.4 Alignment with TECs

As outlined in the BioNet Vegetation Classification database, PCT 266 is associated with the BC Act listed White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions Critically Endangered Ecological.

4.2.31.5 Alignment with EPBC Act listed TECs

As outlined in BioNet Vegetation Classification database, PCT 266 is part of the EPBC Act listed White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland Critically Endangered community.

4.2.32 PCT 277 – Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion

4.2.32.1 PCT overview

PCT 277 – Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion is described in the BioNet Vegetation Classification database as a tall woodland to about 20 metres high dominated by Blakely's Red Gum (*Eucalyptus blakelyi)* and Yellow Box (*Eucalyptus melliodora)*. *Eucalyptus blakelyi* and *Eucalyptus melliodora* vary in their dominance and either can be absent in some places, grading into areas with more *Eucalyptus bridgesiana, Eucalyptus goniocalyx* and rarely *Eucalyptus microcarpa*. Shrubs are sparse or absent and may include *Acacia dealbata*. The ground cover may be dense to sparse depending on rainfall and is dominated by grass species including *Poa sieberiana, Bothriochloa macra, Aristida ramosa, Themeda triandra*, *Rytidosperma* species and *Austrostipa* species. Forbs include *Vittadinia cuneata, Chrysocephalum apiculatum* and *Sida corrugata*.

This is a very widespread community that occurs on fertile deep, loam or clay soils derived from a range of substrates including fine-grained sedimentary and metamorphic rocks but also volcanics and fine-grained granite. It is found on flats, footslopes and hillslopes mainly in the upper slopes subregion of the NSW South-western Slopes Bioregion mainly east of Wagga Wagga.

The community is mainly cleared and is threatened by nutrification from fertilisers and associated weed invasion.

Table 4.56 provides an overview of the PCT as outlined in the BioNet Vegetation Classification database. Table 4.57 provides a detailed description of each species per growth form recorded from BAM plots undertaken in PCT 266 during the field survey.

Examples of PCT 277 are provided in Photo 4.98 and Photo 4.99.

Table 4.56 PCT 277 - Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion

PCT ID	**277**
PCT name	Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion
Vegetation formation	Grassy Woodlands
Vegetation class	Western Slopes Grassy Woodlands
Cleared value	94 %
Extent within subject land	44.06 ha
BAM VI plots used in assessment	VNI_OZ19, VNI_OZ23, VNI_DR107, VNI_DR109, VNI_DR111, VNI_DR113

Table 4.57 PCT 277 - Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion

Growth form	**Species recorded**
Tree	*Eucalyptus melliodora, Eucalyptus blakelyi*
Shrub	Absent
Fern	Absent
Grass & grasslike	*Bothriochloa macra, Chloris truncata, Enteropogon acicularis*
Forbs	*Rumex brownii.*
Other	-



Photo 4.98 Example of PCT 277 in Low condition



Photo 4.99 Example of PCT 277 in Moderate condition

4.2.32.2 Condition states

Within the subject land, PCT 277 is presented in the thinned condition state (equivalent to vegetation zones):

- Moderate-good
- Thinned
- Derived_ LCV.

4.2.32.3 Justification of PCT selection

A quantitative analysis was undertaken for this community using the BVC PCT filter tool. The following search criteria was used:

- IBRA region: NSW South Western Slopes (NSS)
- IBRA subregion: Inland Slopes (NSS01)
- Vegetation formation: Grassy Woodlands
- Vegetation class: Western Slopes Grassy Woodlands
- Species (all strata and growth form groups): *Eucalyptus melliodora, Eucalyptus blakelyi, Bothriochloa macra, Chloris truncata, Enteropogon acicularis, Rumex brownii.* Dominant species of each strata were selected (i.e. those with the highest VI Plot cover values).

The search returned a total of eight PCTs with eight out of eight of the search criteria:

- PCT 201 – Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion – excluded given absence of *Eucalyptus conica, Eucalyptus macrocarpa* and *Brachychiton populneus subsp. populneus* from the upper canopy
- PCT 266 – White Box grassy woodland in the upper slopes subregion of the NSW South Western Slopes Bioregion – excluded from consideration given the lack of *Eucalyptus albens* from the canopy
- PCT 276 – Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion – excluded given co-dominance of *Eucalyptus blakelyi* with *Eucalyptus melliodora* in the canopy
- PCT 277 – Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion – was selected as canopy description is consistent with data gathered on site. Co-dominance of *E. melliodora* and *E. blakelyi* and location of site congruent with current known distribution of the PCT. The high exotic cover is also associated with this PCT, which has historically been cleared and subjected to nutrification and weed invasion resulting from fertilizers and agriculture
- PCT 282 – Blakely's Red Gum - White Box - Yellow Box - Black Cypress Pine box grass/shrub woodland on clay loam soils on undulating hills of central NSW South Western Slopes Bioregion – excluded given absence of *E. albens* from canopy
- PCT 3396 – Northwest Slopes Box-Blakely's Red Gum Woodland – excluded, although its canopy is floristically similar to the site, it's distribution is far north of the site, occurring on valley flats and lower slopes in Central and North-western NSW, the Upper-hunter and New England Tablelands
- PCT 3397 – Northwest Yellow Box Grassy Woodland – excluded, PCT generally only rarely associated with *E. blakelyi,* and generally occurs in the North-west slopes and Upper-hunter in NSW
- PCT 3406 – Southwest Hills White Box-Blakely's Red Gum Forest – excluded given its distribution is generally within the Central-western slopes and the absence of *Poa sieberiana* in the ground layer on site – which is almost always present in this PCT.

4.2.32.4 Alignment with TECs

As outlined in the BioNet Vegetation Classification database, PCT 277 is associated with BC Act listed White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions Critically Endangered Ecological community.

4.2.32.5 Alignment with EPBC Act listed TECs

As outlined in BioNet Vegetation Classification database, PCT 277 is part of the EPBC Act listed White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland Critically Endangered community.

4.2.33 PCT 319 – Tumbledown Red Gum – White Cypress Pine hill woodland in the southern part of the NSW South Western Slopes Bioregion

4.2.33.1 PCT overview

PCT 319 - Tumbledown Red Gum – White Cypress Pine hill woodland in the southern part of the NSW South Western Slopes Bioregion is described in BioNet Vegetation classification system as a mid-high to tall open forest or woodland dominated by Tumbledown Red Gum *(Eucalyptus dealbata*) with White Cypress Pine *(Callitris glaucophylla)* and Red Stringybark (*Eucalyptus macrorhyncha*) common on sheltered slopes, and Black Cypress Pine (*Callitris endlicheri*) and Currawang (*Acacia doratoxylon*) potentially occurring on stony sites. The shrub layer is sparse and commonly includes *Acacia buxifolia* subsp. *buxifolia, Acacia pycnantha, Melichrus urceolatus, Brachyloma daphnoides* subsp. *daphnoides* and *Daviesia leptophylla.* Ground cover is sparse and may contain some stony soils or rock outcrops. It includes grasses such as *Aristida ramosa, Austrodanthonia racemosa* var. *racemosa, Joycea pallida, Poa sieberiana* and *Themeda australis.* The graminiode *Lomandra filiformis* subsp. *coriacea* is common. Forbs include *Asperula conferta, Chrysocephalum apiculatum, Dianella revoluta* var. *revoluta, Goodenia hederacea* subsp. *hederacea, Gonocarpus tetragynus, Hydrocotyle laxiflora* and *Hypericum gramineum.* The climber *Hardenbergia violacea* is often present.

PCT 319 occurs within the southern NSW South-western Slopes Bioregion, on shallow loamy grey clay soils, derived from granite or sedimentary rocks, on slopes and low ridges in low hill or hill landscape patterns. This includes granite hills south of Wagga Wagga.

This community has been extensively cleared, and some sites are threatened by over-grazing and weed invasion.

Table 4.58 provides an overview of the PCT as outlined in the BioNet Vegetation Classification database. Table 4.59 provides a detailed description of each species per growth form recorded from BAM plots undertaken in PCT 319 during the field survey.

Examples of PCT 319 are provided in Photo 4.100 and Photo 4.101.

Table 4.58 PCT 319 – Tumbledown Red Gum – White Cypress Pine hill woodland in the southern part of the NSW South Western Slopes Bioregion

PCT ID	**319**
PCT name	Tumbledown Red Gum – White Cypress Pine hill woodland in the southern part of the NSW South Western Slopes Bioregion
Vegetation formation	Semi-arid Woodlands (Shrubby sub-formation)
Vegetation class	Inland Rocky Hill Woodlands
Cleared value	60 %
Extent within subject land	12.49 ha
BAM VI plots used in assessment	WM013E61, WM01613A, VNI_OZ20, VNI_DR114, VNI_DR116, VNI_DR116_PL

Table 4.59 PCT 319 – Tumbledown Red Gum – White Cypress Pine hill woodland in the southern part of the NSW South Western Slopes Bioregion

Growth form	Species recorded
Tree	*Eucalyptus dealbata,*
Shrub	Absent
Fern	Absent
Grass & grasslike	*Austrostipa scabra, Microlaena stipoides var. stipoides, Aristida ramosa*
Forbs	*Dysphania pumilio*
Other	-



Photo 4.100 Example of PCT 319 (derived)



Photo 4.101 Example of PCT 319 (derived)

4.2.33.2 Condition states

Within the subject land, PCT 319 is presented in the broad condition state (equivalent to vegetation zones):

- Thinned
- Derived_ LCV.

4.2.33.3 Justification of PCT selection

A quantitative analysis was undertaken for this community using the BVC PCT filter tool. The following search criteria was used:

- IBRA region: NSW South Western Slopes (NSS)
- IBRA subregion: Inland Slopes (NSS01)
- Vegetation formation: Semi-arid Woodlands (Shrubby sub-formation)
- Vegetation class: Inland Rocky Hill Woodlands
- Species (all strata and growth form groups): Eucalyptus dealbata, Austrostipa scabra, Microlaena stipoides var. stipoides, Aristida ramose and Dysphania pumilio. Dominant species of each strata were selected (i.e. those with the highest VI Plot cover values).

The search returned a total of one PCT with eight out of eight of the search criteria:

- PCT 319 – Tumbledown Red Gum - White Cypress Pine hill woodland in the southern part of the NSW South Western Slopes Bioregion – selected given the sites location south of Wagga Wagga and the *E. dealbata* dominated canopy.

4.2.33.4 Alignment with TECs

As outlined in BioNet Vegetation Classification database, there is no BC Act listed TEC associated with PCT 319.

4.2.33.5 Alignment with EPBC Act listed TECs

As outlined in BioNet Vegetation Classification database, there is no EPBC Act listed TEC associated with PCT 319.

4.2.34 PCT 343 – Mugga Ironbark – Red Box – Red Stringybark – Western Grey Box grass/shrub woodland on metamorphic substrates in the Tarcutta – Gundagai region, NSW South Western Slopes Bioregion

4.2.34.1 PCT overview

PCT 343 – Mugga Ironbark - Red Box - Red Stringybark - Western Grey Box grass/shrub woodland on metamorphic substrates in the Tarcutta - Gundagai region, NSW South Western Slopes Bioregion is described in BioNet Vegetation classification system as a tall to mid-high woodland to open forest. It is dominated by Mugga Ironbark (*Eucalyptus sideroxylon*), Red Box (*Eucalyptus polyanthemos*), Red Stringybark (*Eucalyptus macrorhyncha*) and Western Grey Box (*Eucalyptus microcarpa*), sometimes with White Box (*Eucalyptus albens*) and Blakelys Red Gum (*Eucalyptus blakelyi*). The very sparse shrub layer includes *Daviesia leptophylla*, *Acacia pycnantha*, *Cassinia laevis*, *Dillwynia sericea*, *Acacia genistifolia*, *Cassinia arcuata*, *Einadia hastata*, *Acacia paradoxa*, *Leucopogon rufus*, *Grevillea lanigera*, *Melichrus urceolatus*, *Hibbertia obtusifolia* and *Pultenaea foliolosa*. Although potentially dense after rain, the ground layer is usually sparse to mid-dense. It is dominated by tussock grass species including *Austrodanthonia eriantha, Austrodanthonia fulva, Poa sieberiana, Austrostipa scabra* subsp. *falcata, Austrostipa mollis* and *Dichelachne crinita*. Often present are mat-rushes *Lomandra filiformis* subsp. *coriacea* and *Lomandra multiflora,* as well as the sedge *Carex appressa* in moister depressions. Common forb species include *Stypandra glauca, Opercularia hispida, Geranium solanderi* var. *solanderi, Hydrocotyle laxiflora, Xerochrysum viscosa, Gonocarpus tetragynus, Wahlenbergia stricta* subsp. *stricta, Thysanotus patersonii, Goodenia hederacea* subsp. *hederacea, Dichopogon strictus, Daucus glochidiatus* s. lat. and *Chrysocephalum apiculatum*. Weeds may be abundant within this PCT.

PCT 343 occurs in the Tarcutta region as well as the Brothers Mountain region, between Nangus and Gundagai, in the southern part of the NSW South-western Slopes Bioregion. It is known to occur on clay soils derived from metamorphic rocks.

This community is predominantly cleared, with remaining remnants degraded by grazing.

Table 4.60 provides an overview of the PCT as outlined in the BioNet Vegetation Classification database. Table 4.61 provides a detailed description of each species per growth form recorded from BAM plots undertaken in PCT 343 during the field survey.

Examples of PCT 343 are provided in Photo 4.102 and Photo 4.103.

Table 4.60 PCT 343 - Mugga Ironbark - Red Box - Red Stringybark - Western Grey Box grass/shrub woodland on metamorphic substrates in the Tarcutta - Gundagai region, NSW South Western Slopes Bioregion

PCT ID	343
PCT name	Mugga Ironbark - Red Box - Red Stringybark - Western Grey Box grass/shrub woodland on metamorphic substrates in the Tarcutta - Gundagai region, NSW South Western Slopes Bioregion
Vegetation formation	Dry Sclerophyll Forests (Shrubby sub-formation)
Vegetation class	Western Slopes Dry Sclerophyll Forests
Cleared value	88 %
Extent within subject land	3.80 ha
BAM VI plots used in assessment	VNI_OZ22, VNI_DR117, VNI_DR118

Table 4.61 PCT 343 - Mugga Ironbark - Red Box - Red Stringybark - Western Grey Box grass/shrub woodland on metamorphic substrates in the Tarcutta - Gundagai region, NSW South Western Slopes Bioregion

Growth form	Species recorded
Tree	*Eucalyptus sideroxylon*
Shrub	Absent
Fern	Absent
Grass & grasslike	*Austrostipa scabra*
Forbs	*Hypericum gramineum, Hibbertia obtusifolia, Gonocarpus tetragynus.*
Other	-



Photo 4.102 Example of PCT 343 (derived)



Photo 4.103 *Eucalyptus sideroxylon* in PCT 343

4.2.34.2 Condition states

Within the subject land PCT 343 is presented in the moderate broad condition state (equivalent to vegetation zones).

- Moderate-good
- Derived_LCV.

4.2.34.3 Justification of PCT selection

A quantitative analysis was undertaken for this community using the BVC PCT filter tool. The following search criteria was used:

- IBRA region: NSW South Western Slopes (NSS)
- IBRA subregion: Inland Slopes (NSS01)
- Vegetation formation: Dry Sclerophyll Forests (shrubby sub-formation)
- Vegetation class: Western Slopes Dry Sclerophyll Forests
- Species (all strata and growth form groups): *Eucalyptus sideroxylon, Austrostipa scabra, Hypericum gramineum, Hibbertia obtusifolia, Gonocarpus tetragynus.* Dominant species of each strata were selected (i.e. those with the highest VI Plot cover values).

The search returned a total of one PCT with nine out of nine of the search criteria:

- PCT 331 – Red Stringybark woodland on hillslopes, northern NSW South Western Slopes Bioregion – excluded given absence of *Eucalyptus macrorhyncha* in the canopy and general distribution of this PCT being primarily within Goobang National Park region of the central western slopes of NSW
- PCT 343 – Mugga Ironbark - Red Box - Red Stringybark - Western Grey Box grass/shrub woodland on metamorphic substrates in the Tarcutta - Gundagai region, NSW South Western Slopes Bioregion – selected as the canopy is floristically consistent with the plot data – open forest dominated by *E. sideroxylon* and is known to occur primarily in the NSW South-western Slopes bioregion
- PCT 3753 – Dunedoo Sandstone Ironbark-Pine Forest – excluded given the northern distribution of this PCT is found in the Dunedoo area near the southern boundary of the Brigalow Belt South bioregion. Additionally, the canopy is primarily *E. crebra* or *E. beyeriana* which is not present
- PCT 3756 – Gulgong Ranges Stringybark-Ironbark Forest – excluded given the canopy is most often comprised of *E. punctata, E. dawsonii* or *E. sparsifolia* with high cover. *E. sideroxylon* is considered to occur less frequently. This PCT is generally known to occur in the Gulgong to Coolah area up to the Sydney Basin and Brigalow Belt South Bioregions, however, does occur within the NSW South Western Slopes.

4.2.34.4 Alignment with TECs

As outlined in BioNet Vegetation Classification database, there is no BC Act listed TEC associated with PCT 343.

4.2.34.5 Alignment with EPBC Act listed TECs

As outlined in BioNet Vegetation Classification database, there is no BC Act listed TEC associated with PCT 343.

4.2.35 PCT 346 – White Box – Blakely's Red Gum – White Cypress Pine shrubby woodland on metamorphic hills in the Wagga Wagga – Cootamundra region of the NSW South Western Slopes Bioregion

4.2.35.1 PCT overview

PCT 346 – White Box - Blakely's Red Gum - White Cypress Pine shrubby woodland on metamorphic hills in the Wagga Wagga - Cootamundra region of the NSW South Western Slopes Bioregion is described in BioNet Vegetation classification system as a mid-high woodland or open forest dominated by White Box (*Eucalyptus albens*), Blakely's Red Gum (*Eucalyptus blakelyi*) and White Cypress Pine (*Callitris glaucophylla*). Western Grey Box (Eucalyptus microcarpa) may be present on lower slopes and patches of *Eucalyptus dwyeri,* and Black Cypress Pine (*Callitris endlicheri*) occur on rocky ridges. The PCT occurs on shallow, gravelly or skeletal clay soils derived from fine-grained metamorphic substrates on hillcrests and hillslopes mainly in the Wagga Wagga region in the southern - central part of the NSW South-western Slopes Bioregion. It often grades into White Box - Pine on parna soils to the west (ID267) and into grassy white box woodland (ID266) on better soils on lower slopes.

The PCT is generally composed of a parse to mid-dense shrub layer composed of *Dillwynia sericea* and numerous species of Acacia including *Acacia decora, Acacia pycnantha, Acacia verniciflua* and *Acacia paradoxa*. This shrub layer may be eliminated with heavy grazing. The ground cover is often very sparse and includes grass species such as *Austrostipa densiflora, Austrodanthonia eriantha, Digitaria divaricatissima, Poa sieberiana* and *Austrostipa scabra* subsp. *scabra.* The mat-rush *Lomandra multiflora* subsp. *multiflora* may be common. Forb species include *Gonocarpus elatus, Xerochrysum viscosa, Stypandra glauca, Chrysocephalum*

Within the subject land, PCT 346 occurs in a gully, within the Wagga Wagga region of the Inland Slopes IBRA subregion. It was dominated by White Box (*Eucalyptus albens*), Blakely's Red Gum (*Eucalyptus blakelyi*) and White Cypress Pine (*Callitris glaucophylla*). PCT 346 occurs within the subject land however lies outside of the disturbance footprint, therefore is not included in further assessment.

Table 4.62 provides an overview of the PCT as outlined in the BioNet Vegetation Classification database. Table 4.63 provides a detailed description of each species per growth form recorded from BAM plots undertaken in PCT 346 during the field survey.

Examples of PCT 346 are provided in Photo 4.104 and Photo 4.105.

Table 4.62 PCT 346 - White Box - Blakely's Red Gum - White Cypress Pine shrubby woodland on metamorphic hills in the Wagga Wagga - Cootamundra region of the NSW South Western Slopes Bioregion

PCT ID	**346**
PCT name	White Box - Blakely's Red Gum - White Cypress Pine shrubby woodland on metamorphic hills in the Wagga Wagga - Cootamundra region of the NSW South Western Slopes Bioregion
Vegetation formation	Dry Sclerophyll Forests (Shrubby sub-formation)
Vegetation class	Western Slopes Dry Sclerophyll Forests
Cleared value	60 %
Extent within subject land	0.00014 ha
BAM VI plots used in assessment	Nil

Table 4.63 PCT 346 - White Box - Blakely's Red Gum - White Cypress Pine shrubby woodland on metamorphic hills in the Wagga Wagga - Cootamundra region of the NSW South Western Slopes Bioregion

Growth form	Species recorded
Tree	*Eucalyptus albens, Eucalyptus blakelyi, Callitris glaucophylla*
Shrub	*Acacia implexa*
Fern	Absent
Grass & grasslike	*Aristida ramosa, Digitaria divaricatissima, Rytidosperma fulvum* and *Lomandra filiformis subsp. coriacea.*
Forbs	-
Other	-



Photo 4.104 Example of PCT 346 in Moderate-good condition



Photo 4.105 Example of PCT 346 in Moderate-good condition

4.2.35.2 Condition states

PCT 346 is present within the subject land, however is not expected to be impacted by the project.

4.2.35.3 Justification of PCT selection

This vegetation type occurs on skeletal clay soil within a gully on a hillslope in the Wagga Wagga region and dominated by White Box (*Eucalyptus albens*), Blakely's Red Gum (*Eucalyptus blakelyi*) and White Cypress Pine (*Callitris glaucophylla*).

A quantitative analysis was undertaken for this community using the BVC PCT filter tool. The following search criteria was used:

- IBRA region: NSW South Western Slopes
- IBRA subregion: Inland Slopes
- Vegetation formation: Dry Sclerophyll Forests (Shrubby-sub formation)
- Vegetation class: Western Slopes Dry Sclerophyll Forests
- Species (all strata and growth form groups): Eucalyptus albens, Eucalyptus blakelyi, Callitris glaucophylla, Acacia implexa, Aristida ramosa, Digitaria divaricatissima, Rytidosperma fulvum and Lomandra filiformis subsp. coriacea. Dominant species of each strata were selected (i.e. those with the highest VI Plot cover values).

The search returned two PCTs with 10 of the 12 search criteria:

- PCT 346 – White Box - Blakely's Red Gum - White Cypress Pine shrubby woodland on metamorphic hills in the Wagga Wagga - Cootamundra region of the NSW South Western Slopes Bioregion
- PCT 3753 – Dunedoo Sandstone Ironbark-Pine Forest.

The sampled vegetation was dominated by White Box, with Blakely's Red Gum and White Cypress Pine also present. PCT 3753 is partly dominated by Ironbark which was not present on site and does not have Wagga Wagga listed as an associated Local Government Area. Hence, due to canopy composition and landscape position, PCT 346 is deemed the most suitable to assign this patch of vegetation.

4.2.35.4 Alignment with TECs

As outlined in BioNet Vegetation Classification database, there is no BC Act listed TEC associated with PCT 346.

4.2.35.5 Alignment with EPBC Act listed TECs

As outlined in BioNet Vegetation Classification database, there is no BC Act listed TEC associated with PCT 346.

4.3 Threatened ecological communities

4.3.1 BC Act listed threatened ecological communities

Six BC Act listed TECs were identified within the subject land of which, one is listed as Critically Endangered and two are identified as having Serious or Irreversible Impact (SAII). The identified TEC' within the subject land are listed in Table 4.64 and their extent is shown on Figure 15.9. Further assessment of each TEC against final determination criteria and recorded native vegetation within the indicative disturbance area is provided in section 4.3.1.1 to 4.3.1.6.

Table 4.64 TECs within the subject land and estimated extent within the indicative disturbance area

TEC name	Profile ID (from TBDC)	BC Act status	IBRA subregion	Associated vegetation zones within the subject land	Area within indicative disturbance area (ha)
Acacia melvillei Shrubland in the Riverina and Murray-Darling Depression bioregions	20094	Endangered	Murrumbidgee	PCT 23_Moderate-good	3.41
				PCT 23_Thinned	0.20
				PCT 23_Derived	2.71
				PCT 23_Derived – low conservation value	3.54
Allocasuarina luehmannii Woodland in the Riverina and Murray-Darling Depression Bioregions	20082	Endangered (SAII)	Murrumbidgee	PCT 20_Thinned	0.16
				PCT 20_Derived	0.99
				PCT 20_Derived_LCV	0.77
Inland Grey Box Woodlands in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions	20072	Endangered	Murray Fans	PCT 237_Moderate-good	0.84
			Inland Slopes	PCT 76_Thinned	0.30
Myall Woodlands in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions	10973	Endangered	Murrumbidgee	PCT 26_Moderate-good	91.32
				PCT 26_Thinned	84.09
				PCT 26_SVTM	1.33
Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregions	20083	Endangered	Murray Fans	PCT 19_SVTM	1.59
			Murrumbidgee	PCT 28_Moderate-good	2.94
				PCT 28_Thinned	5.65
				PCT 28_Derived tall shrubland	0.64
				PCT 28_Derived	19.63
				PCT 28_Derived – low conservation value	5.03
				PCT 28_SVTM	6.04

TEC name	Profile ID (from TBDC)	BC Act status	IBRA subregion	Associated vegetation zones within the subject land	Area within indicative disturbance area (ha)
			Murray Fans	PCT 28_Derived	0.20
				PCT 28_Derived – low conservation value	0.67
White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions	10837	Critically Endangered (SAII)	Inland Slopes	PCT 266_Moderate-good	0.16
				PCT 266_Thinned	0.02
				PCT 277_Moderate-good	0.19
				PCT 277_Thinned	3.01
				PCT 277_Derived_LCV	40.86

4.3.1.1 *Acacia melvillei* Shrubland in the Riverina and Murray-Darling Depression bioregions

PCT 23 - Yarran tall open shrubland of the sandplains and plains of the semi-arid (warm) and arid climate zones was recorded within the subject land and is considered by the TBDC to form part of the *Acacia melvillei* shrubland in the Riverina and Murray-Darling Depression bioregions TEC *(Acacia melvillei* shrubland). This TEC is listed under the BC Act as Endangered.

Acacia melvillei shrublands TEC is described as being dominated by *Acacia melvillei* (Yarran) typically occurring as an open canopy of shrubs or small trees, sometimes with scattered mid-stratum shrubs, and with a sometimes sparse, but highly variable ground layer dominated by grasses, chenopods and herbs. The structure and species composition of the community varies depending on disturbance history and temporal variability in rainfall. The open stratum of large shrubs or small trees may be reduced to isolated individuals or may be absent as a result of past clearing. The shrub/tree layer may also occur as either a pure stand or with a range of other less abundant trees or tall shrubs including Western Rosewood (*Alectryon oleifolius* subsp. *canescens*), Belah (*Casuarina pauper*) and Sugarwood (*Myoporum platycarpum*).

This community is known to occur in the south-western portion of NSW in the Riverina and Murray-Darling Depression bioregions on sandhills and undulating sandplains made up of red-brown, sandy loam soils. This community grades into BC act listed TEC Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregions on slight sand rises where soil sand content is slightly higher and the dominant species transitions to *Callitris glaucophylla.*

A comparison of the final determination for *Acacia melvillei* shrubland TEC and candidate PCT 23 is provided in Table 4.65. Each criterion for the final determination including locality, species composition, characteristic species and resilience is compared to all condition classes for candidate PCT 23 to determine if vegetation recorded is consistent with the listing criteria. Within the subject land, PCT 23 was recorded to occur in Moderate-good, Thinned, Derived and Derived - low conservation value condition states.

A summary of impact area for *Acacia melvillei* shrublands TEC is outlined in Table 4.66 and shown on Figure 15.9 with photographic representation provided in Photo 4.106 to Photo 4.108.

Table 4.65 Assessment of PCT 23 against the BC Act listed *Acacia melvillei* shrubland final determination

Scientific determination	**PCT 23**
Does the PCT occur in the South-Western portion of NSW in the Riverina or Murray Darling Depression bioregions?	Yes PCT 23 was recorded to occur in the Riverina (Murrumbidgee subregion) IBRA bioregion.
Does the PCT occur on sandhills and undulating sandplains?	Yes The PCT was recorded on the edges of sandhills and on undulating sandplains.
Does the PCT occur on red-brown, sandy loam soils?	Yes The PCT was recorded on red-brown, sandy loam soils.
Does the PCT have an upper stratum that is dominated by *Acacia melvillei*?	Yes *Acacia melvillei* was often the only tree species present within the associated PCT and recorded a projected foliar cover between 3-10 per cent. Areas of vegetation assigned to Derived or Derived – low conservation value condition classes have been recorded to contain evidence of the previous dominance by A. melvillei including dead A. melvillei and/or evidence of historic clearing (cut-stumps). Additionally, these areas are typically recorded in adjacent or in close proximity to intact patches of PCT 23 where soil type, landscape position and understorey species composition mirrors that of the intact community.

Scientific determination	PCT 23
Does the PCT structure comprise of an open canopy of shrubs or small trees, sometimes with scattered mid-shrubs and with a sometimes sparse, but highly variable ground layer dominated by grasses, chenopods and herbs? The open stratum of large shrubs or small trees may be reduced to isolated individuals or may be absent as a result of past clearing.	Yes The PCT generally occurs as an open canopy of shrubs or tall trees. Vegetation assigned to Derived or Derived – Low conservation value condition classes have a largely reduced or absent canopy due to historic clearing. Ground layer has a high cover of chenopod mid-shrubs (15-40 per cent) and native grasses (5-40 per cent).
Paragraph 2: Does the PCT contain an assemblage of species that are listed as frequently occurring within this EEC?	Yes Species recorded include *Acacia melvillei, Enchylaena tomentosa, Nitraria billardierei, Rhagodia spinescens, Maireana pyramidata, Einadia nutans subsp. nutans, Erodium crinitum, Plantago cunninghamii, Rhodanthe pygmaea, Sclerolaena diacantha, Sida corrugata, Salsola australis (*syn. *Salsola tragus)* and *Triptilodiscus pygmaeus*.
There is no condition threshold described for this community in the determination. Any vegetation in which characteristic native species dominate any structural layer present is considered to constitute the community.	Yes Vegetation assigned to PCT 23 in all condition states have at least one structural layer dominated characteristic native species outlines in Paragraph 2 of the listing advice and are considered to form part of the community.
Outcome	**Meets criteria – forms part of the threatened ecological community.**

Table 4.66 Summary of *Acacia melvillei* Shrubland within the indicative disturbance area

Threatened ecological community	Vegetation type	IBRA subregion	Veg zone name (BAM-C)	Impact (ha)
Acacia melvillei Shrubland in the Riverina and Murray-Darling Depression bioregions	PCT 23 - Yarran tall open shrubland of the sandplains and plains of the semi-arid (warm) and arid climate zones	Murrumbidgee	VZ 9 Moderate-good	3.41
			VZ 49 Thinned	0.20
			VZ 7 Derived	2.71
			VZ 8 Derived – low conservation value	3.54
Total				**9.86**



Photo 4.106 Example of the community in the form of PCT 23 in Moderate-good condition state at BAM VI Plot location VNI_DR102



Photo 4.107 Example of the community in the form of PCT 23 in Derived condition state at BAM VI Plot location VNIOZ_16



Photo 4.108 Example of the community in the form of PCT 23 in Derived – low conservation value condition state at BAM VI Plot location VNI_DR105

4.3.1.2 *Allocasuarina luehmannii* Woodland in the Riverina and Murray-Darling Depression Bioregions

PCT 20 - Buloke - Moonah - Black Box open woodland on sandy rises of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion) is considered to form part of the *Allocasuarina luehmannii* Woodland in the Riverina and Murray-Darling Depression Bioregions (*Allocasuarina luehmanii* woodland) TEC listed as Endangered under the BC Act.

This TEC is described in the TBDC as being dominated by Buloke (*Allocasuarina luehmannii*) and is characterised by an open tree stratum which may also include in lower abundance White Cypress Pine (*Callitris glaucophylla*) or Moonah (*Melaleuca lanceolata*). The community may have a scattered shrub layer present including Black Roly-poly (*Sclerolaena muricata*), Ruby Saltbush (*Enchylaena tomentosa*), Bluebushes (*Maireana spp.)* and Hooked Needlewood (*Hakea tephrosperma*). The groundcover is highly variable in structure and composition, although it is typically sparse, but may be more continuous within patches or following substantial rainfall events. Common grass species include Ringed Wallaby Grass (*Rytidosperma caespitosa*), Small-flowered Wallaby Grass (*A. setacea*), Feather Speargrass (*Austrostipa elegantissima*), Rough Speargrass (*A. scabra*), Curly Windmill Grass (*Enteropogon acicularis*) and *Walwhalleya proluta* (syn. *Homopholis proluta*). With sedges including *Carex inversa* and *Juncus subsecundus*, as well

as forbs; Slender-fruit Saltbush (*Atriplex leptocarpa*), Climbing Saltbush (*Einadia nutans*), *Oxalis perennans* and Corrugated Sida (*Sida corrugata*). The structure and species composition of the community varies depending on disturbance history and temporal variability in rainfall.

This community is known to occur in the southern part of the Riverina bioregion from near Urana and Mulwala in the east to the Barham district and may extend as far west as Euston in the southern part of the Murray-Darling Depression bioregion. The community occurs in small patches within this range and is currently estimated to cover less than 500-1500 hectares.

Allocasuarina luehmannii Woodland shares a number of species with another endangered ecological community listed under the *Threatened Species Conservation Act 1995* being Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregions. These two ecological communities inhabit similar soils and landforms and have similar geographic distributions. They may be distinguished on the basis of the relative abundance of their tree species and subtle differences in composition of their understorey. When tree abundance is assessed at hectare scales, *A. luehmannii* is the most abundant tree species in *Allocasuarina luehmannii* Woodland, whereas *Callitris glaucophylla* is the most abundant tree species in Sandhill Pine Woodland TEC. Vegetation with intermediate characteristics between the two TECs are covered collectively under the two Determinations (Department of Climate Change, Energy the Environment and Water 2021b)

A comparison of the final determination for *Allocasuarina luehmannii* Woodland TEC and candidate PCT 20 is provided in Table 4.67. Each criterion for the final determination including locality, species composition, characteristic species and resilience is compared to all condition classes for candidate PCT 20 to determine if vegetation recorded is consistent with the listing criteria. Within the subject land, PCT 20 was recorded to occur in Thinned, Derived and Derived - low conservation value condition states. This TEC is not subject to a listed condition threshold, all vegetation in which characteristic native species dominate any structural layer present is considered to constitute the community.

A summary of impact area for *Allocasuarina luehmannii* Woodland TEC is outlined in Table 4.68 and shown on Figure 15.9 with photographic representation provided in Photo 4.109 to Photo 4.112.

Table 4.67 Assessment of PCT 20 against BC Act listed *Allocasuarina luehmannii* Woodland EEC final determination

Scientific determination	**PCT 20**
Does the PCT occur in the Riverina or Murray – Darling depression bioregions?	Yes PCT recorded within the Riverina IBRA Bioregion.
Does this PCT occur on red-brown loamy sands with alkaline sub-soils on an alluvial plain of the Murray River or its tributaries?	Yes The PCT was recorded on red sandy-loam soils on a sand hill element of an alluvial plain (Hay Plain).
Does the PCT structure comprise of an open tree canopy with scattered shrubs and/or small trees, and with a sparse, but highly variable ground layer dominated by grasses and herbs.	Yes PCT structure was composed of an open tree canopy (5 per cent cover), scattered shrubs and a very sparse ground layer of herbs and grasses.
Does the PCT have an upper stratum that is dominated by *Allocasuarina luehmanii*? Other canopy species may include *Callitris glaucophylla, Callitris gracilis, Eucalyptus largiflorens* and *Melaleuca lanceolata*.	Yes Vegetation associated with the PCT within the subject land occurs at the edge of a large patch of sandhill woodland where vegetation has been largely degraded due to historic clearing, weed incursion and feral herbivory which has caused a reduction in canopy cover.

Scientific determination	PCT 20
	Data recorded, in the form of BAM VI plots, for this assessment do not correctly represent this community as canopy species are not present within the subject land. However, at a landscape level, vegetation associated with the PCT is dominated by *Allocasuarina luehmanii* with individuals of *Callitris glaucophylla* and *Callitris gracilis subsp. murrayensis* being recorded (Photo 4.109 and Photo 4.110).
Does the PCT have the assemblage of species, paragraph 2 of the listing advice, which are listed as frequently and infrequently occurring within this EEC?	Yes Frequently occurring species recorded include *Allocasuarina luehmanii, Callitris glaucophylla, Enchylaena tomentosa, Rhagodia spinescens, Austrostipa scabra* and *Oxalis perennans*. Infrequently occurring species recorded include *Callitris gracilis* and *Hakea tephrosperma.*
There is no condition threshold described for this community in the determination. Any vegetation in which characteristic native species dominate any structural layer present is considered to constitute the community.	Yes This PCT has characteristic dominant native species in the canopy layer, understorey and ground-layer for all condition classes recorded. All condition classes would meet criteria.
Outcome	**Meets criteria – forms part of the threatened ecological community**

Table 4.68 Summary of *Allocasuarina luehmannii* Woodland TEC within the indicative disturbance area

Threatened ecological community	Vegetation type	IBRA subregion	Veg zone name (BAM-C)	Impact (ha)
Allocasuarina luehmannii Woodland in the Riverina and Murray-Darling Depression Bioregions	PCT 20 - Buloke - Moonah - Black Box open woodland on sandy rises of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion	Murrumbidgee	VZ 6 Thinned	0.16
			VZ 5 Derived	0.99
			VZ 47 Derived – low conservation value	0.77
Total				**1.92**



Photo 4.109 Example of the community in the form of PCT 20 from a rapid vegetation assessment survey undertaken adjacent to the subject land



Photo 4.110 Example of the community in the form of PCT 20 from a rapid vegetation assessment survey undertaken within the subject land



Photo 4.111 Example of the community in the form of PCT 20 in Thinned condition state at BAM VI Plot location VNI_DR104



Photo 4.112 Example of the community in the form of PCT 20 in Derived – low conservation value condition state at BAM VI Plot location VNI_DR67

4.3.1.3 Inland Grey Box Woodlands in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions

PCT 237 - Riverine Western Grey Box grassy woodland of the semi-arid (warm) climate zone and PCT 76 - Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions, are considered to be a part of the Inland Grey Box Woodlands in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions TEC listed as endangered under the BC Act.

This TEC is described in the TBDC as those woodlands in which the most characteristic tree species Inland Grey Box (*Eucalyptus microcarpa*)**,** is often found in association with Bimble or Poplar Box (*E. populnea subsp. bimbil*), White Cypress Pine (*Callitris glaucophylla*)**,** Kurrajong (*Brachychiton populneus*)**,** Bulloak (*Allocasuarina luehmannii*) or Yellow Box (*E. melliodora*), and occasionally White Box (*E. albens*). Shrubs are either absent or sparse, although this component can be diverse and may be locally common, especially in drier western portions of the community. A variable ground layer of grass and herbaceous species is present at most sites. At severely disturbed sites the ground layer may be absent. The community generally occurs as an open woodland 15–25 metres tall but in some locations the overstorey may be absent as a result of past clearing or thinning, leaving only an understorey.

Inland Grey Box Woodland occurs predominately within the Riverina and South Western Slopes bioregions of NSW down to the Victorian border. It includes Albury to the east and may extend out west towards Hay. This community also extends across the slopes and plains in Central and Northern NSW up to the Queensland Border. This includes Yetman and Inverell in the North, Molong to the east of the Central Slopes and plains and out towards Nymagee to the west.

In some regions, Inland Grey Box Woodland can be differentiated from similar White Box-Yellow Box communities by present ground layer grass species. Rough Speargrass (*Austrostipa scabra*), *Rytidosperma spp*. and *Enteropogon spp*. characterise Inland Grey Box Woodland, compared to the Kangaroo Grass (*Themeda australis)* and *Poa sieberiana* association with White Box-Yellow Box, although the correlation is weakened with disturbance (Department of Climate Change, Energy the Environment and Water 2021c).

A comparison of the final determination for Inland Grey Box Woodland TEC and candidate PCT 237 is provided in Table 4.69. Each criterion for the final determination including locality, species composition, characteristic species and resilience is compared to all condition classes for candidate PCT 237 to determine if vegetation recorded is consistent with the listing criteria.

A summary of impact area for Inland Grey Box Woodland TEC is outlined in Table 4.70 and shown on Figure 15.9 with photographic representation provided in Photo 4.109 to Photo 4.112.

Table 4.69 Assessment of PCT 76 and 237 against BC Act listed Inland Grey Box Woodland EEC final determination

Scientific determination	PCT 76	PCT 237
Does the PCT occur within the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions?	Yes This PCT was recorded in the NSW South Western Slopes bioregion.	Yes This PCT was recorded in the NSW Riverina IBRA bioregion (Murray Fans subregion).
Is or was the characteristic tree species *Eucalyptus microcarpa* (Inland Grey Box) often accompanied by *Eucalyptus populnea* subsp. *bimbil* (Bimbil Box), *Callitris glaucophylla* (White Cypress-pine), *Brachychiton populneus* (Kurrajong), *Allocasuarina luehmannii* (Buloke) or *Eucalyptus melliodora* (Yellow Box), and sometimes with *Eucalyptus albens* (White Box)?	Yes This PCT was recorded to be dominated by *Eucalyptus macrocarpa* (Inland Grey Box). Other associated canopy species not recorded.	Yes This PCT was recorded to be dominated by *Eucalyptus microcarpa* (Inland Grey Box). Other associated canopy species not recorded.
Is the PCT found on soils of Tertiary and Quaternary alluvial (or occasionally colluvial or eluvial) origin, largely corresponding with Red Brown Earths?	Yes The PCT was found on brown clay-loam alluvial soils.	Yes The PCT was recorded on brown sandy clay-loam alluvial soils.
The shrub layer can range from sparse-absent to diverse and locally common. A variable ground layer of grass and herbaceous species is present at most sites.	Yes The shrub layer was absent, with a ground cover dominated by 23 per cent native grass and minimal forbs.	Yes The shrub layer was recorded to range from 2-20 per cent cover while the ground cover comprised of a mix of grassy and sometimes abundant native herbaceous species.

Scientific determination	PCT 76	PCT 237
Does the PCT contain the characteristic assemblage of species?	Yes Characteristic species recorded include *Eucalyptus microcarpa*, *Carex inversa* and *Oxalis perennans.*	Yes Characteristic species recorded include *Eucalyptus microcarpa*, *Enchylaena tomentosa, Goodenia pinnatifida, Einadia nutans, Eucalyptus camaldulensis, Eucalyptus largiflorens, Eucalyptus microcarpa, Paspalidium jubiflorum* and *Sclerolaena muricata.*
There is no condition threshold described for this community in the determination. Any vegetation in which characteristic native species dominate any structural layer present is considered to constitute the community.	Yes This PCT has characteristic dominant native species in the canopy layer and ground-layer for all condition classes recorded. All condition classes would meet criteria.	Yes This PCT has characteristic dominant native species in the canopy layer, understorey and ground-layer for all condition classes recorded. All condition classes would meet criteria.
Outcome	**Meets criteria – forms part of the threatened ecological community.**	**Meets criteria – forms part of the threatened ecological community.**

Table 4.70 Summary of Inland Grey Box Woodland TEC within the indicative disturbance area

Threatened ecological community	Vegetation type	IBRA subregion	Veg zone name (BAM-C)	Impact (ha)
Inland Grey Box Woodlands in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions	PCT 76 - Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	Inland Slopes	VZ 1 Thinned	0.30
	PCT 237 - Riverine Western Grey Box grassy woodland of the semi-arid (warm) climate zone	Murray Fans	VZ 21 Moderate-good	0.84
Total				**1.14**



Photo 4.113 Example of PCT 76 in thinned condition from a rapid assessment in a road reserve forming part of the Inland Grey box TEC



Photo 4.114 Example of PCT 76 in thinned condition from a rapid assessment in a road reserve forming part of the Inland Grey box TEC



Photo 4.115 Example of PCT 237 from a rapid assessment undertaken adjacent to the subject land forming part of the Inland Grey box TEC



Photo 4.116 Example of PCT 237 in Moderate-good condition at BAM VI Plot location VNI_DR47 forming part of the Inland Grey box TEC

4.3.1.4 Myall Woodlands in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregion

PCT 26 - Weeping Myall open woodland of the Riverina Bioregion and NSW South Western Slopes Bioregion is considered to be a part of the Myall Woodlands in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions (Myall Woodlands) TEC listed as Endangered under the BC Act.

This TEC is described in the TBDC as low woodland and low open woodland, to low sparse woodland or open shrubland structure, depending on site disturbance history and quality. Heavy grazing and clearing in some areas may have reduced or eliminated the canopy and shrub stratum, leaving a derived grassland that may still constitute this plant community type. Growing up to a height of about 10 metres, the tree layer is dominated or singularly made up of Weeping Myall / Boree (*Acacia pendula*). Other common tree species include *Casuarina cristata*, Yarran (*Acacia homalophylla*), Miljee (*A. oswaldii*), Rosewood (*Alectryon oleifolius*), Warrior Bush (*Apophyllum anomalum*) and *Capparis spp*. Common on the branches of Myall is the mistletoe *Amyema quandang*. A layer of chenopod shrubs and other woody plant species make up the open understorey layer, with an open to continuous groundcover of herbs and grasses. Common groundcover throughout the community's range includes Windmill Grass (*Chloris truncata*), Climbing Saltbush (*Einadia*

nutans), Curly Windmill Grass (*Enteropogon acicularis*), Small White Sunray (*Rhodanthe corymbiflora)*, Quena (*Solanum esuriale*) and Fairy Grass (*Sporobolus caroli*).

Chenopod shrubs including Creeping Saltbush (A*triplex semibaccata*), Ruby Saltbush (*Enchylaena tomentosa*), Cotton Bush (*Maireana aphylla*) Black Cotton Bush (*M. decalvens*), Hairy Bluebush (*M. pentagona*), Thorny Saltbush (*Rhagodia spinescens*) and Black Rolypoly (*Sclerolaena muricata*) are more common south of the Lachlan River district. With common grassy groundcover to the south including Wallaby Grasses (*Rytidosperma spp.),* Rough Speargrass (*Austrostipa scabra*), and herbs such as Common Everlasting (*Chrysocephalum apiculatum*), *Goodenia pusilliflora,* Wooly Heads (*Myriocephalus rhizocephalus*) and Bladder peas *(Swainsona spp*.). While woody species and summer grasses are more prominent further north. Including Spotted Fuchsia (*Eremophila maculata),* Warrior Bush (*Apophyllum anomalum*) and Whitewood (*Atalaya hemiglauca*), with common groundcover including Mitchell Grasses (*Astrebla spp.),* Plains Grass (*Austrostipa aristiglumis*), Queensland Bluegrass (*Dichanthium sericeum*) and Native Millet (*Panicum decompositum*). These latitudinal differences contributing to the variation of the community's structure and composition.

Within the southern part of this community's distribution, it may be known as Boree, while its range is scattered across the eastern parts of the alluvial plains of the Murray-Darling River system. This TEC is known from parts of the Berrigan, Bland, Bogan, Carrathool, Conargo, Coolamon, Coonamble, Corowa, Forbes, Gilgandra, Griffith, Gwydir, Inverell, Jerilderie, Lachlan, Leeton, Lockhart, Moree Plains, Murray, Murrumbidgee, Narrabri, Narrandera, Narromine, Parkes, Urana, Wagga Wagga and Warren LGAs. Typically found on red-brown earths and heavy textured grey and brown alluvial soils, the mean annual rainfall of its known range is between 375 and 500 millimetres (Department of Climate Change, Energy, the Environment and Water 2021d).

A comparison of the final determination for Myall Woodlands TEC and candidate PCT 26 is provided in Table 4.71. Each criterion for the final determination including locality, species composition, characteristic species and resilience is compared to all condition classes for candidate PCT 26 to determine if vegetation recorded is consistent with the listing criteria. Where PCT 26 has been identified by State Vegetation Type Mapping, vegetation has been assumed to meet benchmark conditions outlined in BioNet Vegetation Classification system for the purposes of this assessment.

A summary of impact area for Myall Woodland TEC is outlined in Table 4.72 and shown on Figure 15.9 with photographic representation provided in Photo 4.117 to Photo 4.120.

Table 4.71 Assessment of PCT 26 against BC Act listed Myall Woodland EEC final determination

Scientific determination	PCT 26
Does the PCT occur in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions?	Yes The PCT was recorded to occur in the Riverina (Murrumbidgee subregion) IBRA bioregion.
Does the community occur on red-brown earths, heavy textured grey or brown alluvial soils?	Yes The PCT was recorded on red-brown, brown and grey clay to clay loam and sandy clay alluvial soils.
Is Acacia pendula (Weeping Myall) the characteristic or only tree species present?	Yes Acacia pendula is the characteristic dominant tree species present.
The structure of the community can vary based on condition and disturbance history from low woodland, low open woodland, low sparse woodland or shrubland. The understorey would include an open layer of chenopod shrubs and other woody plant species and open to continuous groundcover of grasses and herbs.	Partial The structure of the community varied across sites from low woodland to low sparse woodland with an understorey containing both chenopods and other woody plant species. Ground covers varied based off recent rainfall, seasonality and grazing pressures.

Scientific determination	PCT 26
	Areas where the canopy has been eliminated and no longer form a low woodland, low open woodland, low sparse woodland or shrubland (where dominant shrub species is *Acacia pendula*) are not considered to form part of the community including Derived and Derived – low conservation value condition states.
Does the PCT contain the assemblage of species that characterises Weeping Myall Woodland?	Yes Species recorded include: *Acacia oswaldii, Acacia pendula, Amyema quandang, Atriplex leptocarpa, Atriplex semibaccata, Austrostipa scabra, Calocephalus sonderi, Chloris truncata, Chrysocephalum apiculatum, Convolvulus erubescens, Daucus glochidiatus, Einadia nutans, Enchylaena tomentosa, Enteropogon acicularis, Goodenia pusilliflora, Maireana aphylla, Maireana decalvans, Maireana excavata, Maireana pentagona, Marsilea drummondii, Myriocephalus rhizocephalus, Oxalis perennans, Panicum decompositum, Rhagodia spinescens, Rhodanthe corymbiflora, Sclerolaena stelligera, Sida corrugata, Sida trichopoda, Sporobolus caroli, Swainsona procumbens, Teucrium racemosum, Triptilodiscus pygmaeus* and *Vittadinia cuneata.*
There is no condition threshold described for this community in the determination. Any vegetation in which characteristic native species dominate any structural layer present is considered to constitute the community.	Yes This PCT has characteristic dominant native species in the canopy layer, understorey and ground layer for all condition classes recorded. All condition classes that have retained their canopy structure would meet criteria.
Outcome	**Partially meets criteria – some vegetation forms part of the threatened ecological community.**

Table 4.72 Summary of Myall Woodland TEC within the indicative disturbance area

Threatened ecological community	Vegetation type	IBRA subregion	Veg zone name (BAM-C)	Impact (ha)
Myall Woodlands in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions	PCT 26 - Weeping Myall open woodland of the Riverina Bioregion and NSW South Western Slopes Bioregion	Murrumbidgee	VZ 13 Moderate-good	91.32
			VZ 14 Thinned	84.09
			VZ 34 SVTM	1.33
Total				**176.74**



Photo 4.117 Example of the community in the form of PCT 26 in Moderate-good condition state at BAM VI Plot location VNI_DR82



Photo 4.118 Example of the community in the form of PCT 26 in Moderate-good condition state at BAM VI Plot location VNI_DR62



Photo 4.119 Example of the community in the form of PCT 26 in Thinned condition state at BAM VI Plot location VNI_DR30



Photo 4.120 Example of the community in the form of PCT 26 in Planted native vegetation condition state at BAM VI Plot location VNI_MP_19 where *Acacia pendula* have been planted

4.3.1.5 Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregion

Two PCTs recorded within the subject land, PCT 28 - White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone and PCT 19 - Cypress Pine woodland of source-bordering dunes mainly on the Murray and Murrumbidgee River floodplains, are considered to form part of the Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregions TEC listed under the BC Act as Endangered.

This TEC is described in the TBDC as an open woodland dominated by *Callitris glaucophylla* (White Cypress Pine) which may be reduced to isolated individuals or may be absent as a result of past clearing. The structure of the community varies depending on past and current disturbances, particularly clearing, logging, grazing and soil erosion, with species composition of sites being influenced by their size, recent rainfall or drought conditions and by their disturbance history, including grazing, land clearing and fire. The community has a sometimes sparse, but highly variable ground layer dominated by grasses and herbs, sometimes with scattered shrubs and/or small trees.

This community typically occurs on red-brown loamy sands with alkaline sub-soils on the Murray River and its tributaries, and on parts of the sandplain in south-western NSW. In the Riverina bioregion and the far south-western portion of the NSW South Western Slopes bioregion, the community is typically associated with prior streams and aeolian source-bordering dunes, which are scattered within an extensive alluvial clay plain dominated by chenopod shrublands (Department of Climate Change, Energy, the Environment and Water 2021e).

A comparison of the final determination for Sandhill Pine Woodland TEC and the candidate PCTs is provided in Table 4.73. Each criterion for the final determination including locality, species composition, characteristic species and resilience is compared to all condition classes for candidate PCTs to determine if vegetation recorded is consistent with the listing criteria. As this TEC is not subject to a listed condition threshold, all vegetation in which characteristic native species dominate any structural layer present is considered to constitute the community, including locations subject to historic clearing reducing *Callitris glaucophylla* density to isolated individuals or to be entirely absent. Where candidate PCTs have been identified by State Vegetation Type Mapping, vegetation has been assumed to meet benchmark conditions outlined in BioNet Vegetation Classification for the purposes of this assessment.

A summary of impact area for Myall Woodland TEC is outlined in Table 4.74 and shown on Figure 15.9 with photographic representation provided in Photo 4.121 to Photo 4.124.

Table 4.73 Assessment of candidate PCTs against BC Act listed Sandhill Pine Woodland EEC final determination

Scientific determination	PCT 19	PCT 28
Does the PCT occur in the Riverina, Murray-Darling Depression or NSW South Western Slopes Bioregions?	Yes The PCT was identified by SVTM in the Riverina IBRA bioregion (Murray Fans subregions).	Yes The PCT was recorded in the Riverina IBRA bioregion (Murrumbidgee and Murray Fans subregions).
Is the PCT dominated by Callitris glaucophylla or infrequently by *Callitris gracilis subsp. murrayensis*?	Yes The PCT is listed by BioNet Vegetation Classification to be dominated by *Callitris glaucophylla* with occasional instants of *Callitris gracilis subsp. murrayensis.*	Yes The PCT was dominated by *Callitris glaucophylla* except for derived condition states where the canopy layer was absent.
Does the PCT occur on red-brown loamy sands with alkaline sub-soils on the alluvial plain of the Murray River and its tributaries, and on parts of the sandplain in south-western NSW? Or In the Riverina bioregion and the far south-western portion of the NSW South Western Slopes bioregion, the community is typically associated with prior streams and aeolian source-bordering dunes, which are scattered within an extensive alluvial clay plain dominated by chenopod shrublands. Or Murray-Darling Depression bioregion, the community occurs as scattered patches on sandhills and lunettes within an extensive aeolian sandplain dominated by woodlands of mallee eucalypts or belah.	Yes The PCT is listed by BioNet Vegetation Classification to occur on sandy soils on source-bordering sand dunes.	Yes This PCT occurred on, often isolated, aeolian sand dunes within a larger alluvial clay plain (Hay plain) on red-brown loamy-sand clays.

Scientific determination	PCT 19	PCT 28
Does the PCT structure comprise of an open tree canopy with sometimes sparse, but highly variable ground layer dominated by grasses and herbs, sometimes with scattered shrubs and/or small trees?	Yes The PCT is listed by BioNet Vegetation Classification to be a mid-high woodland with a generally absent shrub layer and sparse ground layer dominated by native grasses.	Yes This PCT has an open tree canopy with percentage tree cover ranging from 3–5 per cent where canopy trees were present. The understory is often dominated by a high per cent cover of grasses. A low percentage cover of forbs and shrubs was recorded.
Does the PCT have the assemblage of species that are listed as frequently and infrequently occurring within this EEC?	Yes Species identified by BioNet Vegetation Classification that are listed to frequently occur in the EEC include *Allocasuarina luehmannii, Rytidosperma caespitosa (syn. Austrodanthonia caespitosa), Austrostipa scabra, Einadia nutans, Actinobole uliginosum, Oxalis perennans, Senecio quadridentatus* and *Crassula colorata.* Species identified by BioNet Vegetation Classification that are listed to infrequently occur in the EEC include *Callitris gracilis subsp. murrayensis*.	Yes Species recorded that frequently occur with this EEC include *Atriplex semibaccata, Austrostipa scabra, Callitris glaucophylla, Crassula sieberiana, Einadia nutans, Enteropogon acicularis, Erodium crinitum, Oxalis perennans* and *Sida corrugata.* Infrequent species recorded that also characterise this EEC include *Acacia oswaldii, Enchylaena tomentosa, Hakea tephrosperma* and *Rhagodia spinescens.*
There is no condition threshold described for this community in the determination. Any vegetation in which characteristic native species dominate any structural layer present is considered to constitute the community.	Yes This PCT has characteristic dominant native species in the canopy layer, understorey and ground-layer.	Yes This PCT has characteristic dominant native species in the canopy layer, understorey and ground-layer.
Outcome	**Meets criteria – forms part of the threatened ecological community.**	**Meets criteria – forms part of the threatened ecological community.**

Table 4.74 Summary of Sandhill Pine Woodland TEC within the indicative disturbance area

Threatened ecological community	Vegetation type	IBRA subregion	Veg zone name (BAM-C)	Impact (ha)
Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregion	PCT 19 - Cypress Pine woodland of source-bordering dunes mainly on the Murray and Murrumbidgee River floodplains	Murray Fans	VZ 26 SVTM	1.59
	PCT 28 - White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone	Murrumbidgee	VZ 48 Moderate-good	2.94
			VZ 18 Thinned	5.65
			VZ 16 Derived Tall Shrubland	0.64
			VZ 15 Derived	19.63
			VZ 17 Derived – low conservation value	5.03
			VZ 35 SVTM	6.04
		Murray Fans	VZ 13 Derived	0.20
			VZ 14 Derived Tall Shrubland	0.67
Total				**42.39**



Photo 4.121 Example of the community in the form of PCT 28 in Thinned condition state at a rapid vegetation survey site



Photo 4.122 Example of the community in the form of PCT 28 in Thinned condition state at a rapid vegetation survey site



Photo 4.123 Example of the community in the form of PCT 28 in Derived tall shrubland condition state at BAM VI plot location VNI_DR92



Photo 4.124 Example of the community in the form of PCT 28 in Derived condition state at BAM VI plot location VNI_DR42

4.3.1.6 White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions

Two PCTs identified within the subject land, PCT 266 - White Box grassy woodland in the upper slopes subregion of the NSW South Western Slopes Bioregion and PCT 277 - Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion are considered to form part of the White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions (Box Gum Woodland) TEC listed under the BC Act as Critically Endangered and SAII.

This TEC is described in the TBDC as an open woodland community, occasionally forest, dominated by one or more of the following: White Box (*Eucalyptus albens)*, Yellow Box (*E. melliodora)* and/or Blakely's Red Gum (*E. blakelyi)*. Shrubs are generally sparse or absent. While the understorey of intact sites is dominated by native grasses and herbs. These commonly include Kangaroo Grass (*Themeda australis*), Poa Tussock (*Poa sieberiana*), wallaby grasses (*Rytidosperma* spp.), spear-grasses (*Austrostipa* spp.), Common Everlasting (*Chrysocephalum apiculatum*), Scrambled

Eggs (*Goodenia pinnatifida*), Small St John's Wort (*Hypericum gramineum*), Narrow-leafed New Holland Daisy (*Vittadinia muelleri*) and blue-bells (*Wahlenbergia* spp.).

Box-Gum Woodland is found from the Queensland border in the north, to the Victorian border in the south. It occurs in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions. Intact sites contain a high diversity of plant species, however intact stands that contain diverse upper, mid and ground layers are rare. Remnants generally occur on fertile lower parts of the landscape where soil fertility is relatively high compared to the surrounding landscape. Modified sites include areas where the main tree species are present, ranging from an open woodland formation to a forest structure, and the ground layer is predominantly composed of exotic species; and sites where the trees have been removed and only the grassy ground layer and some herbs remain (Department of Climate Change, Energy, the Environment and Water 2021e).

A comparison of the final determination for Box Gum Woodland TEC and the candidate PCTs is provided in Table 4.75. Each criterion for the final determination including locality, species composition, characteristic species and resilience is compared to all condition classes for candidate PCTs to determine if vegetation recorded is consistent with the listing criteria. As this TEC is not subject to a listed condition threshold, all vegetation in which characteristic native species dominate any structural layer present is considered to constitute the community, including locations subject to historic clearing reducing density to isolated individuals or to be entirely absent. Where candidate PCTs have been identified as part of Project EnergyConnect, data has been extracted from the BDAR and utilised in this assessment (WSP, 2022). Lastly, specific mitigation measures, including a Special Biodiversity Protection Zone, have been identified in section 9.4.2 and Table 9.28 to reduce impacts to this community.

A summary of impact area for Box Gum Woodland TEC is outlined in Table 4.76 and shown on Figure 15.9.

Table 4.75 Assessment of candidate PCTs against BC Act listed Box-Gum Woodland EEC final determination

Scientific determination	**PCT 266**	**PCT 277**
The site is in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South-Eastern Highlands or NSW South-Western Slopes Bioregions?	Yes The PCT was recorded within the South Western Slopes IBRA Bioregion (Inland Slopes subregion).	Yes The PCT was recorded within the South Western Slopes IBRA Bioregion (Inland Slopes subregion).
There are native species in the understorey, and/or the site is likely to respond to assisted natural regeneration?	Yes Native species were recorded in the understorey in all vegetation zones.	Yes Native species were recorded in the understorey in all vegetation zones.
The site has trees OR The site is treeless, but is likely to have supported White Box, Yellow Box or Blakely's Red Gum prior to clearing:	The plots sampled in Moderate-good and Thinned condition vegetation recorded canopy species.	The plots sampled in Moderate-good and Thinned condition vegetation recorded canopy species. Derived Low Conservation Value condition vegetation did not contain trees but would have supported White Box, Yellow Box or Blakely's Red Gum prior to clearing.
White Box, Yellow Box or Blakely's Red Gum, or a combination of these species, are or were present?	White Box is dominant in this PCT. Blakely's Red Gum was also recorded.	Blakely's Red Gum dominant, then Yellow and White Box.
Outcome	**Meets criteria – forms part of the threatened ecological community.**	**Meets criteria – forms part of the threatened ecological community.**

Table 4.76 Summary of Box-Gum Woodland TEC within the indicative disturbance area

Threatened ecological community	Vegetation type	IBRA subregion	Veg zone name (BAM-C)	Impact (ha)
White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions	PCTs 266 - White Box grassy woodland in the upper slopes subregion of the NSW South Western Slopes Bioregion. and	Inland Slopes	266_Moderate-good	0.16
			266_Thinned	0.02
	PCT 277 - Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion.	Inland Slopes	277_Moderate-good	0.19
			277_Thinned	3.01
			277_Derived_LCV	40.86
Total				**44.24**

4.4 Vegetation zones

The vegetation within the subject land was firstly assessed to a PCT which was then divided into vegetation zones based on condition using features such as disturbance to growth form groups for tree, shrub and ground cover, and/or extent of exotic species. A vegetation zone is defined in the BAM as 'an area of native vegetation on the project site that is the same PCT and has the same broad condition state'. A broad condition state infers that the vegetation has a similar tree cover, shrub cover, ground cover, weediness or combinations of these attributes which determine vegetation condition.

Broad condition state is used for stratifying areas of the same PCT into a vegetation zone for determining vegetation integrity score. The broad condition states used for this report are outlined in Table 4.77. The VI score of each plot was variable due the different vegetation communities' composition, structure and function attributes.

Benchmark data has been used in circumstances where areas were inaccessible and therefore an absence of survey data. Each PCT has been assigned vegetation zone where applicable and the benchmark data entered into the BAM calculator. The benchmark VI scores should not be regarded as representing on ground condition of the vegetation zone. Benchmark VI scores are likely to be higher than the actual condition and thus avoiding underestimation of VI scores. This provides a cautious assessment of vegetation integrity by overestimating biodiversity values in these vegetation zones.

Patch size was determined in accordance with BAM Subsection 4.3.2. A patch is an area of native vegetation that occurs on the subject land and includes native vegetation that has a gap of less than 100 metres from the next area of native vegetation (or ≤ 30 metres for non-woody ecosystems). A patch may extend onto adjoining land. Within the Murray Fans and Murrumbidgee IBRA subregion, the vegetation zones in the subject land are connected to large areas of good condition bushland that are in excess of 100 hectares in size. As such, each vegetation zone has been assigned to the ≥ 100 hectare class. Within the Inland Slopes IBRA subregion, due to the highly modified landscape, a patch size analysis has been undertaken utilising methodology outlined in the approved HumeLink BDAR (Niche, 2024), being:

- extract Woody vegetation from "NSW_Native_Vegetation_Extent_v1p2_5m_2017.tif" where type is Tree Cover (pixel value is 1) and convert to simplified polygon
- clip to an arbitrary 10 kilometres radius of the subject land
- replace woody polygons within the subject land with the WSP woody vegetation polygons (i.e. vegetation mapping that indicates treed vegetation)
- buffer the polygons by 50 metres (i.e. 100 metres from patch to patch)
- dissolve and explode the buffers into contiguous polygons

- calculate patch size and allocate to one of the following categories:
  - <5 hectares
  - 5 to <25 hectares
  - 25 to < 100 hectares
  - ≥ 100 hectares.

Appropriate patch size class for each vegetation zone is provided in Table 4.80.

Vegetation zones are illustrated in Figure 15.10. Table 4.78 to Table 4.80 outlines the vegetation zones and patch size for each vegetation zone mapped in each IBRA subregion.

Table 4.77 Native vegetation broad condition states

Condition	Code used in BAM-C	Description	VI Score
Moderate-good	Moderate_good	Native vegetation is relatively intact but may have some altered structural layers. Exotic weed cover is generally low, and the soil types are representative for each PCT. This vegetation class includes Woodland, Chenopod shrublands and grasslands. Woodland canopy vegetation is generally connected as a patch usually with native ground storey representative for the particular PCT. Chenopod shrublands consist of species dominated by chenopods with native grasses and forbs. These areas are subject to stock grazing. Grasslands are generally restricted by soil type and dominated by native grasses and generally an absence of dominant chenopods.	30–90
Thinned	Thinned	Native vegetation that has obvious altered structural layers (i.e. canopy thinning, shrub layer removal, significant canopy regeneration) but otherwise retains native ground storey species. Ground storey may be sparse in some areas due to significant regrowth of canopy vegetation or grazing. Exotic weed cover is generally low and consists of annual species.	30–60
Derived Tall Shrubland	Derived_TS	Applies only in PCT 28 where the canopy trees are absent, but the shrub layer is present and greater than 4m in height, and the ground storey is both native and exotic forbs and grasses.	35–45

Condition	Code used in BAM-C	Description	VI Score
Derived	Derived	Grasslands that contain a dominance of native species (i.e. native species cover is greater than exotic species cover) but are derived or secondary forms resulting from clearing of a PCT. For this BDAR, it includes PCTs that have changed to an alternative state because of land management practices since European settlement. Over-storey structural components of derived communities have either entirely been removed or are severely reduced (i.e. derived native grasslands with or without scattered paddock trees). These areas can contain regrowth trees. Additionally, these areas do not display evidence of previous intensive agricultural practices (i.e. historic cropping).	Variable but generally <20
Derived Low Conservation Value	Derived_LCV	Chenopod shrublands in cropping land (usually pivot irrigation) and natural regeneration has occurred with various chenopods, native grasses and forbs.	55–80
		Derived grasslands in historically cropped land (usually post irrigation) where natural regeneration has occurred with various native grasses, chenopods and forbs where the natural pre-European state of the vegetation would have been a woodland and when assessed against the criteria outlined in the interim grasslands and groundcover assessment method vegetation is considered a low conservation value grassland.	Generally <15
Planted Native Vegetation	Planted_NatVeg	Areas of native vegetation subject to supplemental plantings designed to replicate a natural plant community.	30–50
State Vegetation Type Mapping	SVTM	NSW State Vegetation Type Mapping has been used on the subject land where areas could not be surveyed within the access timeframe or there was limited access. Vegetation integrity scores used benchmark data.	Benchmark VIS

Table 4.78 Vegetation zones within the Murray Fans IBRA subregion

Murray Fans IBRA Subregion								
Vegetation zone ID	**PCT ID number and name**	**Condition**	**Area (ha)**	**Patch size class (select multiple if areas of native vegetation are discontinuous)**	**No. vegetation integrity plots required**	**No. vegetation integrity plots completed**	**No. vegetation integrity plots used in assessment**	**Plot IDs of vegetation integrity plots used in assessment**
22	2 - River Red Gum-sedge dominated very tall open forest in frequently flooded forest wetland along major rivers and floodplains in south-western NSW	SVTM	0.12	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	1	0	0	No plots were completed or used in the assessment for this PCT. Benchmark condition has been assumed.
1	7 - River Red Gum - Warrego Grass - herbaceous riparian tall open forest wetland mainly in the Riverina Bioregion	Moderate-good	4.67	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	2	5	5	VNI_DR20 VNI_DR46 VNI_DR93 VNI_NM033 VNI_NM037
3	10 - River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Moderate-good	13.47	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	3	4	4	VNI_DR18 VNI_MP07 VNI_MP33 VNI_NM032

Murray Fans IBRA Subregion								
Vegetation zone ID	**PCT ID number and name**	**Condition**	**Area (ha)**	**Patch size class (select multiple if areas of native vegetation are discontinuous)**	**No. vegetation integrity plots required**	**No. vegetation integrity plots completed**	**No. vegetation integrity plots used in assessment**	**Plot IDs of vegetation integrity plots used in assessment**
4	10 - River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Thinned	12.66	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	3	3	3	VNI_MP41 VNI_MP42 VNI_MP52
23	10 - River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	SVTM	1.39	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	1	0	0	No plots were completed or used in the assessment for this PCT. Benchmark condition has been assumed.
2	10 - River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Derived	3.52	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	2	2	2	VNI_NM040 VNI_NM041
33	10 - River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Derived_LCV	5.20	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	3	2	3	VNI_MP50 VNI_MP50b VNI_MP51

Murray Fans IBRA Subregion								
Vegetation zone ID	**PCT ID number and name**	**Condition**	**Area (ha)**	**Patch size class (select multiple if areas of native vegetation are discontinuous)**	**No. vegetation integrity plots required**	**No. vegetation integrity plots completed**	**No. vegetation integrity plots used in assessment**	**Plot IDs of vegetation integrity plots used in assessment**
5	11 - River Red Gum - Lignum very tall open forest or woodland wetland on floodplains of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Moderate-good	0.49	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	1	1	1	VNI_DR80
7	13 - Black Box - Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Moderate-good	59.66	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	5	5	5	VNI_DR16 VNI_DR19 VNI_MP32 VNI_NM038 VNI_NM039
8	13 - Black Box - Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Thinned	21.96	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	4	3	3	VNI_DR17 VNI_MP10 VNI_NM024

Murray Fans IBRA Subregion								
Vegetation zone ID	**PCT ID number and name**	**Condition**	**Area (ha)**	**Patch size class (select multiple if areas of native vegetation are discontinuous)**	**No. vegetation integrity plots required**	**No. vegetation integrity plots completed**	**No. vegetation integrity plots used in assessment**	**Plot IDs of vegetation integrity plots used in assessment**
24	13 - Black Box - Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	SVTM	14.36	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	3	0	0	No plots were completed or used in the assessment for this PCT. Benchmark condition has been assumed.
34	13 - Black Box - Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Planted_NatVeg	0.20	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	1	1	1	VNI_MP48
31	13 - Black Box - Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Derived	15.11	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	3	2	3	VNI_MP53 VNI_MP53b VNI_MP54
6	13 - Black Box - Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Derived_LCV	49.33	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	4	5	5	VNI_MP05 VNI_MP06 VNI_MP34 VNI_NM01 VNI_NM025

Murray Fans IBRA Subregion								
Vegetation zone ID	**PCT ID number and name**	**Condition**	**Area (ha)**	**Patch size class (select multiple if areas of native vegetation are discontinuous)**	**No. vegetation integrity plots required**	**No. vegetation integrity plots completed**	**No. vegetation integrity plots used in assessment**	**Plot IDs of vegetation integrity plots used in assessment**
10	15 - Black Box open woodland wetland with chenopod understorey mainly on the outer floodplains in south-western NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Moderate-good	12.44	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	3	3	3	VNI_DR22 VNI_DR23 VNI_DR94
11	15 - Black Box open woodland wetland with chenopod understorey mainly on the outer floodplains in south-western NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Thinned	2.64	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	2	4	4	VNI_DR21 VNI_DR95 VNI_DR96 VNI_DR97
25	15 - Black Box open woodland wetland with chenopod understorey mainly on the outer floodplains in south-western NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	SVTM	1.58	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	1	0	0	No plots were completed or used in the assessment for this PCT. Benchmark condition has been assumed.

Murray Fans IBRA Subregion								
Vegetation zone ID	**PCT ID number and name**	**Condition**	**Area (ha)**	**Patch size class (select multiple if areas of native vegetation are discontinuous)**	**No. vegetation integrity plots required**	**No. vegetation integrity plots completed**	**No. vegetation integrity plots used in assessment**	**Plot IDs of vegetation integrity plots used in assessment**
32	15 - Black Box open woodland wetland with chenopod understorey mainly on the outer floodplains in south-western NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Derived	5.23	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	3	1	3	VNI_OZ28 VNI_OZ28b VNI_OZ28c
9	15 - Black Box open woodland wetland with chenopod understorey mainly on the outer floodplains in south-western NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Derived_LCV	6.36	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	3	6	6	VNI_DR76 VNI_GL01 VNI_GL02 VNI_GL03 VNI_GL04 VNI_MP36
12	17 - Lignum shrubland wetland of the semi-arid (warm) plains (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Moderate-good	0.14	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	1	1	1	VNI_NM035

Murray Fans IBRA Subregion								
Vegetation zone ID	**PCT ID number and name**	**Condition**	**Area (ha)**	**Patch size class (select multiple if areas of native vegetation are discontinuous)**	**No. vegetation integrity plots required**	**No. vegetation integrity plots completed**	**No. vegetation integrity plots used in assessment**	**Plot IDs of vegetation integrity plots used in assessment**
26	19 - Cypress Pine woodland of source-bordering dunes mainly on the Murray and Murrumbidgee River floodplains	SVTM	1.59	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	1	0	0	No plots were completed or used in the assessment for this PCT. Benchmark condition has been assumed.
13	28 - White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone	Derived	0.20	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	1	1	1	VNI_NM030
14	28 - White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone	Derived_TS	0.67	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	1	1	1	VNI_DR79
27	44 - Forb-rich Speargrass - Windmill Grass - White Top grassland of the Riverina Bioregion	SVTM	10.16	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	3	0	0	No plots were completed or used in the assessment for this PCT. Benchmark condition has been assumed.

Murray Fans IBRA Subregion								
Vegetation zone ID	**PCT ID number and name**	**Condition**	**Area (ha)**	**Patch size class (select multiple if areas of native vegetation are discontinuous)**	**No. vegetation integrity plots required**	**No. vegetation integrity plots completed**	**No. vegetation integrity plots used in assessment**	**Plot IDs of vegetation integrity plots used in assessment**
35	86 - Yellow Gum tall woodland of the Murray River floodplain, Riverina Bioregion	Moderate-good	0.05	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	1	0	0	No plots were completed or used in the assessment for this PCT. Benchmark condition has been assumed.
15	160 - Nitre Goosefoot shrubland wetland on clays of the inland floodplains	Moderate-good	0.14	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	1	1	1	VNI_MP39
28	160 - Nitre Goosefoot shrubland wetland on clays of the inland floodplains	SVTM	0.04	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	1	0	0	No plots were completed or used in the assessment for this PCT. Benchmark condition has been assumed.
17	163 - Dillon Bush (Nitre Bush) shrubland of the semi-arid and arid zones	Moderate-good	14.08	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	3	5	5	VNI_MP38 VNI_MP43 VNI_MP44 VNI_NM027 VNI_NM031

Murray Fans IBRA Subregion								
Vegetation zone ID	**PCT ID number and name**	**Condition**	**Area (ha)**	**Patch size class (select multiple if areas of native vegetation are discontinuous)**	**No. vegetation integrity plots required**	**No. vegetation integrity plots completed**	**No. vegetation integrity plots used in assessment**	**Plot IDs of vegetation integrity plots used in assessment**
29	163 - Dillon Bush (Nitre Bush) shrubland of the semi-arid and arid zones	SVTM	1.02	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	1	0	0	No plots were completed or used in the assessment for this PCT. Benchmark condition has been assumed.
16	163 - Dillon Bush (Nitre Bush) shrubland of the semi-arid and arid zones	Derived_LCV	0.68	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	1	1	1	VNI_NM028
19	164 - Cotton Bush open shrubland of the semi-arid (warm) zone	Moderate-good	3.46	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	2	4	4	VNI_DR78 VNI_MP35 VNI_MP37 VNI_NM029
30	164 - Cotton Bush open shrubland of the semi-arid (warm) zone	SVTM	0.09	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	1	0	0	No plots were completed or used in the assessment for this PCT. Benchmark condition has been assumed.

Murray Fans IBRA Subregion								
Vegetation zone ID	**PCT ID number and name**	**Condition**	**Area (ha)**	**Patch size class (select multiple if areas of native vegetation are discontinuous)**	**No. vegetation integrity plots required**	**No. vegetation integrity plots completed**	**No. vegetation integrity plots used in assessment**	**Plot IDs of vegetation integrity plots used in assessment**
18	164 - Cotton Bush open shrubland of the semi-arid (warm) zone	Derived_LCV	5.48	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	3	4	4	VNI_DR74 VNI_DR75 VNI_DR77 VNI_NM026
20	216 - Black Roly Poly low open shrubland of the Riverina Bioregion and Murray Darling Depression Bioregion	Moderate-good	0.66	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	1	1	1	VNI_NM036
21	237 - Riverine Western Grey Box grassy woodland of the semi-arid (warm) climate zone	Moderate-good	0.84	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	1	2	2	VNI_DR47 VNI_NM034

Table 4.79 Vegetation zones within the Murrumbidgee IBRA subregion

Murrumbidgee IBRA Subregion								
Vegetation zone ID	**PCT ID number and name**	**Condition**	**Area (ha)**	**Patch size class (select multiple if areas of native vegetation are discontinuous)**	**No. vegetation integrity plots required**	**No. vegetation integrity plots completed**	**No. vegetation integrity plots used in assessment**	**Plot IDs of vegetation integrity plots used in assessment**
1	PCT 13 Black Box - Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Moderate-good	3.75	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	2	1	2	VNIOZ_10 VNIOZ_10b
31	PCT 13 Black Box - Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	SVTM	0.01	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	1	0	0	No plots were completed or used in the assessment for this PCT. Benchmark condition has been assumed.
3	PCT 15 Black Box open woodland wetland with chenopod understorey mainly on the outer floodplains in south-western NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Moderate-good	62.45	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	5	8	8	VNI_DR04 VNI_DR54 VNI_DR68 VNI_DR69 VNI_DR70 VNI_DR71 VNI_DR72 VNI_OZ08

Murrumbidgee IBRA Subregion								
Vegetation zone ID	**PCT ID number and name**	**Condition**	**Area (ha)**	**Patch size class (select multiple if areas of native vegetation are discontinuous)**	**No. vegetation integrity plots required**	**No. vegetation integrity plots completed**	**No. vegetation integrity plots used in assessment**	**Plot IDs of vegetation integrity plots used in assessment**
46	PCT 15 - Black Box open woodland wetland with chenopod understorey mainly on the outer floodplains in south-western NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Thinned	0.72	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	1	0	0	No plots were completed or used in the assessment for this PCT. Benchmark condition has been assumed.
32	PCT 15 Black Box open woodland wetland with chenopod understorey mainly on the outer floodplains in south-western NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	SVTM	0.33	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	1	0	0	No plots were completed or used in the assessment for this PCT. Benchmark condition has been assumed.
2	PCT 15 Black Box open woodland wetland with chenopod understorey mainly on the outer floodplains in south-western NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Derived	7.95	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	3	4	4	VNI_DR66 VNI_MP22 VNI_MP45 VNI_MP46

Murrumbidgee IBRA Subregion								
Vegetation zone ID	**PCT ID number and name**	**Condition**	**Area (ha)**	**Patch size class (select multiple if areas of native vegetation are discontinuous)**	**No. vegetation integrity plots required**	**No. vegetation integrity plots completed**	**No. vegetation integrity plots used in assessment**	**Plot IDs of vegetation integrity plots used in assessment**
4	PCT 17 Lignum shrubland wetland of the semi-arid (warm) plains (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Moderate-good	12.49	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	3	2	3	VNI_DR15 VNI_DR81 VNI_DR81b
33	PCT 17 Lignum shrubland wetland of the semi-arid (warm) plains (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	SVTM	2.38	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	2	0	0	No plots were completed or used in the assessment for this PCT. Benchmark condition has been assumed.
6	PCT 20 Buloke - Moonah - Black Box open woodland on sandy rises of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Thinned	0.16	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	1	1	1	VNI_DR104
5	PCT 20 Buloke - Moonah - Black Box open woodland on sandy rises of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Derived	0.99	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	1	1	1	No plots were completed or used in the assessment for this PCT. Benchmark condition has been assumed.

Murrumbidgee IBRA Subregion								
Vegetation zone ID	**PCT ID number and name**	**Condition**	**Area (ha)**	**Patch size class (select multiple if areas of native vegetation are discontinuous)**	**No. vegetation integrity plots required**	**No. vegetation integrity plots completed**	**No. vegetation integrity plots used in assessment**	**Plot IDs of vegetation integrity plots used in assessment**
47	PCT 20 - Buloke – Moonah – Black Box open woodland on sandy rises of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Derived_LCV	0.77	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	1	1	1	VNI_DR67
9	PCT 23 Yarran tall open shrubland of the sandplains and plains of the semi-arid (warm) and arid climate zones	Moderate-good	3.41	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	2	3	3	VNI_DR101 VNI_DR102 VNIOZ_18
49	PCT 23 Yarran tall open shrubland of the sandplains and plains of the semi-arid (warm) and arid climate zones	Thinned	0.20	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	1	0	0	No plots were completed or used in the assessment for this PCT. Benchmark condition has been assumed.
7	PCT 23 Yarran tall open shrubland of the sandplains and plains of the semi-arid (warm) and arid climate zones	Derived	2.71	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	2	3	3	VNI_DR65 VNIOZ_16 VNIOZ_17

Murrumbidgee IBRA Subregion								
Vegetation zone ID	**PCT ID number and name**	**Condition**	**Area (ha)**	**Patch size class (select multiple if areas of native vegetation are discontinuous)**	**No. vegetation integrity plots required**	**No. vegetation integrity plots completed**	**No. vegetation integrity plots used in assessment**	**Plot IDs of vegetation integrity plots used in assessment**
8	PCT 23 Yarran tall open shrubland of the sandplains and plains of the semi-arid (warm) and arid climate zones	Derived_LCV	3.54	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	2	3	3	VNI_GL05 VNI_GL06 VNI_DR105
10	PCT 24 Canegrass swamp tall grassland wetland of drainage depressions, lakes and pans of the inland plains	Moderate-good	7.02	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	3	5	5	VNI_DR36 VNI_DR90 VNI_DR98 VNIOZ_03 VNIOZ_13
13	PCT 26 Weeping Myall open woodland of the Riverina Bioregion and NSW South Western Slopes Bioregion	Moderate-good	91.32	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	6	7	7	VNI_DR02 VNI_DR07 VNI_DR08 VNI_DR62 VNI_DR73 VNI_DR82 VNI_DR85

Murrumbidgee IBRA Subregion								
Vegetation zone ID	**PCT ID number and name**	**Condition**	**Area (ha)**	**Patch size class (select multiple if areas of native vegetation are discontinuous)**	**No. vegetation integrity plots required**	**No. vegetation integrity plots completed**	**No. vegetation integrity plots used in assessment**	**Plot IDs of vegetation integrity plots used in assessment**
14	PCT 26 Weeping Myall open woodland of the Riverina Bioregion and NSW South Western Slopes Bioregion	Thinned	84.09	☐ <5 ha ☐ 5–24 ha ☒ 25–100 ha ☐ >100 ha	5	6	6	VNI_DR29 VNI_DR30 VNI_DR61 VNI_DR83 VNI_DR84 VNI_MP19
34	PCT 26 Weeping Myall open woodland of the Riverina Bioregion and NSW South Western Slopes Bioregion	SVTM	1.33	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	1	0	0	No plots were completed or used in the assessment for this PCT. Benchmark condition has been assumed.
11	PCT 26 Weeping Myall open woodland of the Riverina Bioregion and NSW South Western Slopes Bioregion	Derived	138.9	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	6	6	6	VNI_DR01 VNI_DR05 VNI_DR28 VNI_DR57 VNI_MP02 VNI_MP20

Murrumbidgee IBRA Subregion								
Vegetation zone ID	**PCT ID number and name**	**Condition**	**Area (ha)**	**Patch size class (select multiple if areas of native vegetation are discontinuous)**	**No. vegetation integrity plots required**	**No. vegetation integrity plots completed**	**No. vegetation integrity plots used in assessment**	**Plot IDs of vegetation integrity plots used in assessment**
12	PCT 26 Weeping Myall open woodland of the Riverina Bioregion and NSW South Western Slopes Bioregion	Derived_LCV	1.29	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	1	1	2	VNI_MP21 VNI_MP21b
48	PCT 28 - White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone	Moderate-good	2.94	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	2	0	0	No plots were completed or used in the assessment for this PCT. Benchmark condition has been assumed.
18	PCT 28 White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone	Thinned	5.65	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	3	3	3	VNI_DR43 VNI_DR59 VNIOZ_07
35	PCT 28 White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone	SVTM	6.04	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	3	0	0	No plots were completed or used in the assessment for this PCT. Benchmark condition has been assumed.

Murrumbidgee IBRA Subregion								
Vegetation zone ID	**PCT ID number and name**	**Condition**	**Area (ha)**	**Patch size class (select multiple if areas of native vegetation are discontinuous)**	**No. vegetation integrity plots required**	**No. vegetation integrity plots completed**	**No. vegetation integrity plots used in assessment**	**Plot IDs of vegetation integrity plots used in assessment**
15	PCT 28 White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone	Derived	19.63	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	3	5	5	VNI_DR42 VNI_DR44 VNI_DR91 VNI_NM08 VNIOZ_12
16	PCT 28 White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone	Derived _TS	0.64	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	1	3	3	VNI_DR41 VNI_DR92 VNI_MP01
17	PCT 28 White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone	Derived_LCV	5.03	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	3	5	5	VNI_DR27 VNI_DR55 VNI_DR58 VNI_DR60 VNIOZ_01

Murrumbidgee IBRA Subregion								
Vegetation zone ID	**PCT ID number and name**	**Condition**	**Area (ha)**	**Patch size class (select multiple if areas of native vegetation are discontinuous)**	**No. vegetation integrity plots required**	**No. vegetation integrity plots completed**	**No. vegetation integrity plots used in assessment**	**Plot IDs of vegetation integrity plots used in assessment**
19	PCT 44 Forb–rich Spear grass – Windmill Grass – White Top grassland of the Riverina Bioregion	Moderate-good	14.77	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	3	8	8	Q195E VNI_DR100 VNI_DR14 VNI_DR32 VNI_DR34 VNI_DR63 VNI_DR89 VNI_DR99
36	PCT 44 Forb–rich Spear grass – Windmill Grass – White Top grassland of the Riverina Bioregion	SVTM	8.79	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	3	0	0	No plots were completed or used in the assessment for this PCT. Benchmark condition has been assumed.
20	PCT 45 Plains Grass grassland on alluvial mainly clay soils in the Riverina Bioregion and NSW South Western Slopes Bioregion	Moderate-good	3.58	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	2	2	2	Q193E Q196E

Murrumbidgee IBRA Subregion								
Vegetation zone ID	**PCT ID number and name**	**Condition**	**Area (ha)**	**Patch size class (select multiple if areas of native vegetation are discontinuous)**	**No. vegetation integrity plots required**	**No. vegetation integrity plots completed**	**No. vegetation integrity plots used in assessment**	**Plot IDs of vegetation integrity plots used in assessment**
37	PCT 45 Plains Grass grassland on alluvial mainly clay soils in the Riverina Bioregion and NSW South Western Slopes Bioregion	SVTM	5.96	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	3	0	0	No plots were completed or used in the assessment for this PCT. Benchmark condition has been assumed.
21	PCT 46 Curly Windmill Grass – spear grass – wallaby grass grassland on alluvial clay and loam on the Hay Plain, Riverina Bioregion	Moderate-good	39.35	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	4	4	4	VNI_DR10 VNI_DR64 VNI_DR88 VNIOZ_11
44	PCT 46 - Curly Windmill Grass – spear grass – wallaby grass grassland on alluvial clay and loam on the Hay Plain, Riverina Bioregion	SVTM	19.07	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	3	0	0	No plots were completed or used in the assessment for this PCT. Benchmark condition has been assumed.
22	PCT 47 Swamp grassland wetland of the Riverine Plain	Moderate-good	0.17	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	1	1	1	Q194E

Murrumbidgee IBRA Subregion								
Vegetation zone ID	**PCT ID number and name**	**Condition**	**Area (ha)**	**Patch size class (select multiple if areas of native vegetation are discontinuous)**	**No. vegetation integrity plots required**	**No. vegetation integrity plots completed**	**No. vegetation integrity plots used in assessment**	**Plot IDs of vegetation integrity plots used in assessment**
23	PCT 58 Black Oak – Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion	Moderate-good	0.26	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	1	1	1	VNI_DR24
24	PCT 58 Black Oak – Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion	Thinned	0.70	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	1	1	1	VNI_NM21
38	PCT 70 White Cypress Pine woodland on sandy loams in central NSW wheatbelt	SVTM	0.16	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	1	0	0	No plots were completed or used in the assessment for this PCT. Benchmark condition has been assumed.

Murrumbidgee IBRA Subregion								
Vegetation zone ID	**PCT ID number and name**	**Condition**	**Area (ha)**	**Patch size class (select multiple if areas of native vegetation are discontinuous)**	**No. vegetation integrity plots required**	**No. vegetation integrity plots completed**	**No. vegetation integrity plots used in assessment**	**Plot IDs of vegetation integrity plots used in assessment**
25	PCT 157 Bladder Saltbush shrubland on alluvial plains in the semi-arid (warm) zone including Riverina Bioregion	Moderate-good	94.00	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	5	7	7	VNI_DR09 VNI_DR26 VNI_DR40 VNI_DR49 VNI_DR52 VNI_MP23 VNI_NM06
39	PCT 157 Bladder Saltbush shrubland on alluvial plains in the semi-arid (warm) zone including Riverina Bioregion	SVTM	7.55	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	3	0	0	No plots were completed or used in the assessment for this PCT. Benchmark condition has been assumed.
40	PCT 159 Old Man Saltbush shrubland mainly of the semi-arid (warm) climate zone (south western NSW)	SVTM	0.05	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	1	0	0	No plots were completed or used in the assessment for this PCT. Benchmark condition has been assumed.

Murrumbidgee IBRA Subregion								
Vegetation zone ID	**PCT ID number and name**	**Condition**	**Area (ha)**	**Patch size class (select multiple if areas of native vegetation are discontinuous)**	**No. vegetation integrity plots required**	**No. vegetation integrity plots completed**	**No. vegetation integrity plots used in assessment**	**Plot IDs of vegetation integrity plots used in assessment**
26	PCT 160 Nitre Goosefoot shrubland wetland on clays of the inland floodplains	Moderate-good	15.32	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	3	5	5	VNI_DR12 VNI_DR35 VNI_MP17 VNIOZ_15
45	PCT 160 - Nitre Goosefoot shrubland wetland on clays of the inland floodplains	SVTM	1.37	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	1	0	0	No plots were completed or used in the assessment for this PCT. Benchmark condition has been assumed.
27	PCT 163 Dillon Bush (Nitre Bush) shrubland of the semi-arid and arid zones	Moderate-good	51.98	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	5	8	8	VNI_NM07 VNI_DR106 VNI_DR13 VNI_DR39 VNI_DR50 VNI_DR25 VNI_DR51 VNIOZ_14

Murrumbidgee IBRA Subregion								
Vegetation zone ID	**PCT ID number and name**	**Condition**	**Area (ha)**	**Patch size class (select multiple if areas of native vegetation are discontinuous)**	**No. vegetation integrity plots required**	**No. vegetation integrity plots completed**	**No. vegetation integrity plots used in assessment**	**Plot IDs of vegetation integrity plots used in assessment**
41	PCT 163 Dillon Bush (Nitre Bush) shrubland of the semi-arid and arid zones	SVTM	9.17	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	3	0	0	No plots were completed or used in the assessment for this PCT. Benchmark condition has been assumed.
28	PCT 164 Cotton Bush open shrubland of the semi-arid (warm) zone	Moderate-good	253.05	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	7	8	8	VNI_DR11 VNI_DR31 VNI_DR33 VNI_DR37 VNI_MP03 VNI_MP04 VNIOZ_02 VNIOZ_04
43	PCT 164 Cotton Bush open shrubland of the semi-arid (warm) zone	SVTM	95.65	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	5	0	0	No plots were completed or used in the assessment for this PCT. Benchmark condition has been assumed.

Murrumbidgee IBRA Subregion								
Vegetation zone ID	**PCT ID number and name**	**Condition**	**Area (ha)**	**Patch size class (select multiple if areas of native vegetation are discontinuous)**	**No. vegetation integrity plots required**	**No. vegetation integrity plots completed**	**No. vegetation integrity plots used in assessment**	**Plot IDs of vegetation integrity plots used in assessment**
30	PCT 170 Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones	Thinned	4.17	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	2	2	2	VNI_NM19 VNI_NM20
29	PCT 170 Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones	Derived	1.42	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	1	3	3	VNI_MP28 VNI_MP29 VNI_MP30
42	PCT 216 Black Roly Poly low open shrubland of the Riverina Bioregion and Murray Darling Depression Bioregion	Moderate-good	9.80	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	3	0	0	No plots were completed or used in the assessment for this PCT. Benchmark condition has been assumed.

Table 4.80 Vegetation zones within the Inland Slopes IBRA subregion

Inland Slopes IBRA Subregion								
Vegetation zone ID	**PCT ID number and name**	**Condition**	**Area (ha)**	**Patch size class (select multiple if areas of native vegetation are discontinuous)**	**No. vegetation integrity plots required**	**No. vegetation integrity plots completed**	**No. vegetation Integrity plots used in assessment**	**Plot IDs of vegetation integrity plots used in assessment**
1	76 - Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	Thinned	0.30	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	1	1	1	VNI_DR112
2	266-White Box grassy woodland in the upper slopes subregion of the NSW South Western Slopes Bioregion	Moderate-good	0.16	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	1	1	1	VNI_DR108
3	266-White Box grassy woodland in the upper slopes subregion of the NSW South Western Slopes Bioregion	Thinned	0.02	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	1	1	1	VNI_DR110
9	277-Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	Moderate-good	0.19	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	1	0	0	No plots were completed or used in the assessment for this PCT. Benchmark condition has been assumed.

Inland Slopes IBRA Subregion								
Vegetation zone ID	**PCT ID number and name**	**Condition**	**Area (ha)**	**Patch size class (select multiple if areas of native vegetation are discontinuous)**	**No. vegetation integrity plots required**	**No. vegetation integrity plots completed**	**No. vegetation Integrity plots used in assessment**	**Plot IDs of vegetation integrity plots used in assessment**
4	277-Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	Derived_LCV	40.86	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	4	4	4	VNI_DR107 VNI_DR109 VNI_DR111 VNI_OZ23
5	277-Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	Thinned	3.01	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	2	2	2	VNI_DR113 VNI_OZ19
6	319-Tumbledown Red Gum - White Cypress Pine hill woodland in the southern part of the NSW South Western Slopes Bioregion	Derived_LCV	11.66	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	3	5	5	VNI_DR114 VNI_DR116_PL VNI_OZ20 WM013E61 WM01613A
7	319-Tumbledown Red Gum - White Cypress Pine hill woodland in the southern part of the NSW South Western Slopes Bioregion	Thinned	0.83	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	1	1	1	VNI_DR116

Inland Slopes IBRA Subregion								
Vegetation zone ID	**PCT ID number and name**	**Condition**	**Area (ha)**	**Patch size class (select multiple if areas of native vegetation are discontinuous)**	**No. vegetation integrity plots required**	**No. vegetation integrity plots completed**	**No. vegetation Integrity plots used in assessment**	**Plot IDs of vegetation integrity plots used in assessment**
8	343-Mugga Ironbark - Red Box - Red Stringybark - Western Grey Box grass/shrub woodland on metamorphic substrates in the Tarcutta – Gundagai region, NSW South Western Slopes Bioregion	Derived_LCV	3.79	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	2	3	3	VNI_DR117 VNI_DR118 VNI_OZ22
10	343-Mugga Ironbark - Red Box - Red Stringybark - Western Grey Box grass/shrub woodland on metamorphic substrates in the Tarcutta – Gundagai region, NSW South Western Slopes Bioregion	Moderate-good	0.01	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	1	0	0	No plots were completed or used in the assessment for this PCT. Benchmark condition has been assumed.

4.5 Vegetation integrity (vegetation condition)

4.5.1 Vegetation integrity survey plots

There were 197 vegetation integrity plots completed during the survey from December 2023 to February 2025 that have been retained for assessment. The location of vegetation integrity plots are shown in Figure 15.7 while Table 4.82 provides an overview of the plots completed during field survey that have been used in the BAM calculator.

Table 4.81 to Table 4.82 outlines the number of vegetation integrity survey plots required for each vegetation zone and whether the minimum number of plots has been sampled in accordance with BAM Table 3.

In instances where a single vegetation zone spans across IBRA subregions, vegetation plot data from the adjacent subregion has not been used in the BAM-C. An example of this is with PCT 15 Moderate_good which spans the Murrumbidgee and Murray Fans IBRA subregion. Plot VNI_DR04 and Plot VNI_DR21 were both completed within this vegetation zone (refer to Figure 15.7 for plot locations). Both plots are located within the same PCT and condition state, but Plot VNI_DR04 is mapped in the Murrumbidgee IBRA subregion while VNI_DR21 is mapped in the Murray Fans IBRA subregion. As vegetation plot data from one IBRA region cannot be used in an adjacent IBRA region (even if they are in the same patch of vegetation).

Plot shortfalls were also created due to access restrictions as the plot-based vegetation survey could not be undertaken within all parts of the subject land or in all PCTs or vegetation zones. Where there were shortfalls in the minimum number of plots required for a vegetation zones the approach taken to the data was as follows:

- Where a vegetation zone has been sampled within a IBRA subregion, but there was still a shortfall in number of plots required to meet minimum plot numbers, the sampled plot with the highest VI score was duplicated to account for the plot shortfall.
- Where a vegetation zone was not sampled within a IBRA subregion (i.e. no plot data was available for the vegetation zone), data from a higher quality vegetation zone within the same PCT, benchmark data for the relevant PCT was used to inform the assessment.

Duplication of the plot with the highest VI score to account for the minimum plot shortfall for a vegetation zone is a cautious approach to deriving a total VI score for a vegetation zone where plot data is lacking. The VI scores presented in this BDAR for vegetation zones that used replicated plots would be higher than if the full suite of plots were collected for the vegetation zone. Likewise, the use of benchmark data (i.e. the highest quality score available) for vegetation zones that are degraded is not reflective of actual on ground conditions. Both methods result in some unintended consequences in terms of VI scores matching the vegetation zone condition descriptors. Vegetation zones that use replicated plots or PCT benchmark data are likely to have higher VI scores. Table 4.81 outlines the vegetation zone that have duplicated plots and the vegetation zones that have benchmark values applied in place of field collected data.

Note that using benchmark data for disturbed vegetation zones such as Derived Native Grassland and Tall Shrubland that have missing structural layers (e.g. no trees) and absent functional attributes such as no large trees, no tree stem size classes, no fallen logs, etc. would result in the maximum vegetation integrity score being applied to a degraded vegetation zone and this would not be reflective of on ground conditions. To account for this, the scores for Tree composition, Shrub composition, Tree structure, Shrub structure, Length of fallen logs, Tree stem size classes, and Tree regeneration were set to zero for Derived Native Grassland vegetation zones where benchmark data had to be used. Tree composition, Tree structure, Tree composition, Length of fallen logs, Tree stem size classes, and Tree regeneration were set to zero for Regrowth shrubland vegetation zones where benchmark data had to be used. Note that this is not modification of PCT benchmark data held within the BAM-C.

Version 1.2 benchmarks as of 31 January 2023 were used. The default PCT benchmarks held within the BAM-C (i.e. the reference data for each PCT) were not modified (see Tab 3 of the BAM-C for each case). More appropriate local data has not been used to modify the PCT benchmarks that form the basis for VI assessment within the BAM-C.

Table 4.81 Vegetation integrity plots that were duplicated in the BAM-C to account for plot shortfalls

Vegetation zone ID	Vegetation zone name	Reason for plot duplication
Murray Fans IBRA subregion		
31	13_Derived	For VZ 31, three VI plots were required to meet the hectare requirements under BAM however only two plots were completed. Therefore, VNI_MP53 was duplicated and named VNI_MP53b (in BAM_C). Plot VNI_MP53 was used as it provides an accurate representation of site conditions for PCT 13 in derived condition based on the vegetation integrity score.
32	15_Derived	For VZ 32, three VI plots were required however only one plot was completed. Therefore, VNI_OZ28 was duplicated twice and named VNI_OZ28b and VNI_OZ28c (in BAM_C) to meet the hectare requirements under BAM. Plot VNI_OZ28 provides an accurate representation of site conditions for PCT 15 in derived condition based on the vegetation integrity score.
33	10_Derived_LCV	For VZ 33, three VI plots were required to meet the hectare requirements under BAM however only two plots were completed. Therefore, VNI_MP50 was duplicated and named VNI_MP50b (in BAM C). Plot VNI_MP50 was used as it provides an accurate representation of site conditions for PCT 10 in derived low conservation value condition based on the vegetation integrity score.
Murrumbidgee IBRA subregion		
1	13_Moderate_good	For VZ 1, two VI plots were required to meet the hectare requirements under BAM however only one plot was completed. Therefore, VNIOZ_10 was duplicated and named VNIOZ_10b (in BAM_C). Plot VNIOZ_10 was used as it provides an accurate representation of site conditions for PCT 13 in moderate-good condition based on the vegetation integrity score.
4	17_Moderate_good	For VZ 4, three VI plots were required to meet the hectare requirements under BAM however only two plots were completed. Therefore, VNI_DR81 was duplicated and named VNI_DR81b (in BAM C). Plot VNI_DR81 was used as it provides an accurate representation of site conditions for PCT 17 in moderate-good condition based on the vegetation integrity score.
12	26_Derived_LCV	VNI_MP21 duplicated to be VNI_MP21b to meet the hectare requirements under BAM-C and the vegetation integrity score based on the derived low conservation value conditions.

Table 4.82 Vegetation integrity plots used in the BAM Calculator

Plot number	PCT ID	Area (ha)	Condition class	Zone	Easting	Northing
Murray Fans						
VNI_DR20	7	4.67	Moderate-good	54	758712	6092367
VNI_DR46	7	4.67	Moderate-good	54	764032	6117315
VNI_DR93	7	4.67	Moderate-good	54	758983	6092240
VNI_NM033	7	4.67	Moderate-good	54	760709	6083631
VNI_NM037	7	4.67	Moderate-good	54	760871	6083477
VNI_NM040	10	3.52	Derived	54	763090	6111936
VNI_NM041	10	3.52	Derived	54	763251	6111686
VNI_DR18	10	13.47	Moderate-good	54	758302	6087834
VNI_MP07	10	13.47	Moderate-good	54	758942	6092344
VNI_MP33	10	13.47	Moderate-good	54	759014	6095336
VNI_NM032	10	13.47	Moderate-good	54	762598	6112524
VNI_MP41	10	12.66	Thinned	54	760814	6083430
VNI_MP42	10	12.66	Thinned	54	760969	6083215
VNI_MP52	10	12.66	Thinned	54	760153	6070248
VNI_DR80	11	0.49	Moderate-good	54	763674	6117316
VNI_MP05	13	49.33	Derived_LCV	54	762835	6096097
VNI_MP06	13	49.33	Derived_LCV	54	762835	6096097
VNI_MP34	13	49.33	Derived_LCV	54	762999	6095712
VNI_NM01	13	49.33	Derived_LCV	54	762592	6096144
VNI_NM022	13	49.33	Derived_LCV	54	761377	6094868
VNI_NM025	13	49.33	Derived_LCV	54	762968	6095536
VNI_DR16	13	59.66	Moderate-good	54	757565	6088900
VNI_DR19	13	59.66	Moderate-good	54	758643	6087454
VNI_MP32	13	59.66	Moderate-good	54	761165	6094654
VNI_NM038	13	59.66	Moderate-good	54	757348	6089905
VNI_NM039	13	59.66	Moderate-good	54	757464	6089987
VNI_DR17	13	21.96	Thinned	54	757468	6089099
VNI_MP10	13	21.96	Thinned	54	730005	6107048
VNI_NM024	13	21.96	Thinned	54	761719	6095294
VNI_OZ28	15	5.23	Derived	54	763831	6110864
VNI_DR76	15	6.36	Derived_LCV	54	762315	6115999

Plot number	PCT ID	Area (ha)	Condition class	Zone	Easting	Northing
VNI_GL01	15	6.36	Derived_LCV	54	758592	6091992
VNI_GL02	15	6.36	Derived_LCV	54	758220	6091819
VNI_GL03	15	6.36	Derived_LCV	54	757721	6090592
VNI_GL04	15	6.36	Derived_LCV	54	757779	6090938
VNI_MP36	15	6.36	Derived_LCV	54	762340	6115891
VNI_DR22	15	12.44	Moderate-good	54	757797	6091182
VNI_DR23	15	12.44	Moderate-good	54	758084	6091610
VNI_DR94	15	12.44	Moderate-good	54	758851	6092103
VNI_DR21	15	2.64	Thinned	54	758667	6092162
VNI_DR95	15	2.64	Thinned	54	758703	6091961
VNI_DR96	15	2.64	Thinned	54	758095	6091396
VNI_DR97	15	2.64	Thinned	54	757901	6091021
VNI_NM035	17	0.14	Moderate-good	54	760677	6083551
VNI_NM030	28	0.20	Derived	54	762028	6113970
VNI_DR79	28	0.67	Derived_TS	54	763412	6117338
VNI_MP39	160	0.14	Moderate-good	54	762072	6113348
VNI_NM028	163	0.67	Derived_LCV	54	762317	6115676
VNI_MP38	163	14.08	Moderate-good	54	761937	6114114
VNI_MP43	163	14.08	Moderate-good	54	757262	6089429
VNI_MP44	163	14.08	Moderate-good	54	757305	6089254
VNI_NM027	163	14.08	Moderate-good	54	762180	6115763
VNI_NM031	163	14.08	Moderate-good	54	761922	6113780
VNI_DR74	164	5.48	Derived_LCV	54	762128	6115071
VNI_DR75	164	5.48	Derived_LCV	54	762191	6115298
VNI_DR77	164	5.48	Derived_LCV	54	762526	6117068
VNI_NM026	164	5.48	Derived_LCV	54	762402	6116720
VNI_DR78	164	3.46	Moderate-good	54	763076	6117212
VNI_MP35	164	3.46	Moderate-good	54	762333	6116522
VNI_MP37	164	3.46	Moderate-good	54	761985	6114581
VNI_NM029	164	3.46	Moderate-good	54	762065	6114672
VNI_NM036	216	0.66	Moderate-good	54	760830	60883278
VNI_DR47	237	0.84	Moderate-good	54	763881	6117406
VNI_NM034	237	0.84	Moderate-good	54	760717	6083653

Plot number	PCT ID	Area (ha)	Condition class	Zone	Easting	Northing
VNI_MP48	13	0.20	Planted_NatVeg	54	762392	6101065
VNI_MP50	10	5.20	Derived_LCV	54	760514	6071891
VNI_MP51	10	5.20	Derived_LCV	54	760457	6071583
VNI_MP53	13	15.11	Derived	54	761313	6077626
VNI_MP54	13	15.11	Derived	54	762192	6080595
Murrumbidgee						
VNIOZ_10	13	3.75	Moderate_good	55	372437	6123084
VNI_DR66	15	7.95	Derived	55	232802	6121436
VNI_DR04	15	62.45	Moderate_good	55	371569	6122866
VNI_DR54	15	62.45	Moderate_good	55	367004	6121213
VNI_DR68	15	62.45	Moderate_good	55	268133	6126554
VNI_DR69	15	62.45	Moderate_good	55	268465	6126473
VNI_DR70	15	62.45	Moderate_good	55	267757	6126492
VNI_DR71	15	62.45	Moderate_good	55	270323	6125683
VNI_DR72	15	62.45	Moderate_good	55	368315	6121575
VNI_OZ08	15	62.45	Moderate_good	55	370094	6121853
VNI_DR66	15	7.95	Derived	55	232803	6121436
VNI_MP22	15	7.95	Derived	55	278701	6118984
VNI_MP45	15	7.95	Derived	55	278589	6118934
VNI_MP46	15	7.95	Derived	55	274665	6122002
VNI_DR15	17	12.49	Moderate_good	55	326393	6112078
VNI_DR81	17	12.49	Moderate_good	55	365316	6120723
VNI_DR67	20	0.99	Derived_LCV	55	268298	6126417
VNI_DR104	20	0.16	Thinned	55	267190	6126611
VNI_DR105	23	3.54	Derived_LCV	55	266033	6126889
VNI_DR65	23	2.71	Derived	55	232660	6121419
VNIOZ_16	23	2.71	Derived	55	269426	6126239
VNIOZ_17	23	2.71	Derived	55	268808	6126464
VNI_GL05	23	3.54	Derived_LCV	55	266516	6126781
VNI_GL06	23	3.54	Derived_LCV	55	265671	6126947
VNI_DR101	23	3.41	Moderate_good	55	269222	6126330
VNI_DR102	23	3.41	Moderate_good	55	268926	6126358
VNIOZ_18	23	3.41	Moderate_good	55	266851	6126696

Plot number	PCT ID	Area (ha)	Condition class	Zone	Easting	Northing
VNI_DR36	24	7.02	Moderate_good	55	301854	6113670
VNI_DR90	24	7.02	Moderate_good	55	289033	6115617
VNI_DR98	24	7.02	Moderate_good	55	297242	6114114
VNIOZ_03	24	7.02	Moderate_good	55	288578	6115650
VNIOZ_13	24	7.02	Moderate_good	55	301051	6113751
VNI_DR01	26	138.90	Derived	55	376139	6123574
VNI_DR05	26	138.90	Derived	55	370125	6122584
VNI_DR28	26	138.90	Derived	55	360894	6119109
VNI_DR57	26	138.90	Derived	55	382000	6124183
VNI_MP02	26	138.90	Derived	55	376517	6123085
VNI_MP20	26	138.90	Derived	55	358656	6118456
VNI_MP21	26	1.29	Derived_LCV	55	358775	6118594
VNI_DR02	26	91.32	Moderate_good	55	376139	6123574
VNI_DR07	26	91.32	Moderate_good	55	363968	6120787
VNI_DR08	26	91.32	Moderate_good	55	363993	6120712
VNI_DR62	26	91.32	Moderate_good	55	346674	6114558
VNI_DR73	26	91.32	Moderate_good	55	368087	6121369
VNI_DR82	26	91.32	Moderate_good	55	365990	6120976
VNI_DR85	26	91.32	Moderate_good	55	374315	6123358
VNI_DR29	26	84.09	Thinned	55	361679	6119448
VNI_DR30	26	84.09	Thinned	55	359970	6118763
VNI_DR61	26	84.09	Thinned	55	347370	6114813
VNI_DR83	26	84.09	Thinned	55	369488	6121499
VNI_DR84	26	84.09	Thinned	55	371524	6122481
VNI_MP19	26	84.09	Thinned	55	356007	6118174
VNI_DR42	28	19.63	Derived	55	293858	6114652
VNI_DR44	28	19.63	Derived	55	291109	6115580
VNI_DR91	28	19.63	Derived	55	291249	6115116
VNI_NM08	28	19.63	Derived	54	218008	6117028
VNIOZ_12	28	19.63	Derived	55	292396	6114844
VNI_MP01	28	0.64	Derived_TS	55	364690	6120588
VNI_DR41	28	0.64	Derived_TS	55	293944	6114695
VNI_DR92	28	0.64	Derived_TS	55	292505	6114742

Plot number	PCT ID	Area (ha)	Condition class	Zone	Easting	Northing
VNI_DR55	28	5.03	Derived_LCV	55	364852	6120581
VNI_DR58	28	5.03	Derived_LCV	55	348152	6115195
VNI_DR60	28	5.03	Derived_LCV	55	347604	6114923
VNIOZ_01	28	5.03	Derived_LCV	55	293008	6114667
VNI_DR27	28	5.03	Derived_LCV	55	769417	6119756
VNI_DR43	28	5.65	Thinned	55	292685	6115084
VNI_DR59	28	5.65	Thinned	55	347759	6114941
VNIOZ_07	28	5.65	Thinned	55	364974	6120597
Q195E	44	14.77	Moderate_good	55	383800	6123224
VNI_DR100	44	14.77	Moderate_good	55	307850	6113883
VNI_DR14	44	14.77	Moderate_good	55	325943	6112105
VNI_DR32	44	14.77	Moderate_good	55	314004	6114080
VNI_DR34	44	14.77	Moderate_good	55	316718	6114191
VNI_DR63	44	14.77	Moderate_good	55	343236	6113453
VNI_DR89	44	14.77	Moderate_good	55	324274	6112395
VNI_DR99	44	14.77	Moderate_good	55	298635	6113906
Q193E	45	3.58	Moderate_good	55	383092	6124002
Q196E	45	3.58	Moderate_good	55	384603	6122142
VNI_DR10	46	39.35	Moderate_good	55	335973	6111071
VNI_DR64	46	39.35	Moderate_good	55	341338	6112700
VNI_DR88	46	39.35	Moderate_good	55	337730	6111463
VNIOZ_11	46	39.35	Moderate_good	55	340269	6112367
Q194E	47	0.17	Moderate_good	55	383602	6123437
VNI_NM21	58	0.70	Thinned	54	222343	6119149
VNI_DR24	58	0.70	Thinned	55	768816	6119450
VNI_DR09	157	94.00	Moderate_good	55	295989	6114185
VNI_DR26	157	94.00	Moderate_good	55	230078	6120647
VNI_DR40	157	94.00	Moderate_good	55	294740	6114330
VNI_DR49	157	94.00	Moderate_good	55	300103	6113777
VNI_DR52	157	94.00	Moderate_good	55	234061	6121375
VNI_MP23	157	94.00	Moderate_good	55	276976	6120140
VNI_NM06	157	94.00	Moderate_good	54	218269	6117141
VNI_DR12	160	15.32	Moderate_good	55	333611	6111386

Plot number	PCT ID	Area (ha)	Condition class	Zone	Easting	Northing
VNI_DR35	160	15.32	Moderate_good	55	304631	6113814
VNI_DR38	160	15.32	Moderate_good	55	299607	6113870
VNI_MP17	160	15.32	Moderate_good	54	352716	6116971
VNIOZ_15	160	15.32	Moderate_good	55	299015	6113968
VNI_NM07	163	51.98	Moderate_good	54	218360	6117181
VNI_DR106	163	51.98	Moderate_good	55	264589	6126864
VNI_DR13	163	51.98	Moderate_good	55	332184	6111447
VNI_DR39	163	51.98	Moderate_good	55	296576	6114123
VNI_DR50	163	51.98	Moderate_good	55	236282	6121816
VNI_DR51	163	51.98	Moderate_good	55	235188	6121642
VNIOZ_14	163	51.98	Moderate_good	55	297692	6113986
VNI_DR25	163	51.98	Moderate_good	54	770585	6119900
VNI_DR11	164	253.05	Moderate_good	55	334390	6111299
VNI_DR31	164	253.05	Moderate_good	55	313445	6114111
VNI_DR33	164	253.05	Moderate_good	55	319405	6113443
VNI_DR37	164	253.05	Moderate_good	55	301346	6113782
VNI_MP03	164	253.05	Moderate_good	55	309819	6113911
VNI_MP04	164	253.05	Moderate_good	55	286367	6116259
VNIOZ_02	164	253.05	Moderate_good	55	291636	6115030
VNIOZ_04	164	253.05	Moderate_good	55	233735	6121769
VNI_MP30	170	1.42	Derived	54	222114	6119016
VNI_MP28	170	1.42	Derived	54	769234	6119126
VNI_MP29	170	1.42	Derived	54	769307	6119317
VNI_NM19	170	4.17	Thinned	54	221927	6118906
VNI_NM20	170	4.17	Thinned	54	222126	6118965
Inland Slopes						
VNI_DR112	76	0.30	Thinned	55	544038	6097414
VNI_DR108	266	0.16	Moderate-good	55	536616	6102765
VNI_DR110	266	0.02	Thinned	55	536930	6102731
VNI_DR107	277	40.86	Derived_LCV	55	537355	6104131
VNI_DR109	277	40.86	Derived_LCV	55	536805	6102788
VNI_DR111	277	40.86	Derived_LCV	55	543141	6097627

Plot number	PCT ID	Area (ha)	Condition class	Zone	Easting	Northing
VNI_OZ23	277	40.86	Derived_LCV	55	539333	6100286
VNI_DR113	277	3.01	Thinned	55	539777	6099976
VNI_OZ19	277	3.01	Thinned	55	536696	6102909
VNI_DR114	319	11.66	Derived_LCV	55	540250	6099596
VNI_DR116_PL	319	11.66	Derived_LCV	55	538554	6100765
VNI_OZ20	319	11.66	Derived_LCV	55	538247	6101322
WM013E61	319	11.66	Derived_LCV	55	538444	6100831
WM01613A	319	11.66	Derived_LCV	55	540397	6099397
VNI_DR116	319	0.83	Thinned	55	538514	6100757
VNI_DR117	343	3.79	Derived_LCV	55	540686	6099205
VNI_DR118	343	3.79	Derived_LCV	55	541237	6098997
VNI_OZ22	343	3.79	Derived_LCV	55	540959	6099147

4.5.2 *Vegetation Integrity Scores*

The vegetation integrity score (VI score) is defined in the BAM (DCEEW, 2020) as 'the quantitative measure of vegetation condition calculated in accordance with Equation 23 or Equation 24'. Vegetation integrity scores are assessed against the functional traits of a sampled patch of vegetation such as stem classes, presence of fallen logs, litter and tree hollows. The score is used to inform and justify the condition class of the sampled vegetation zone. The VI score for each vegetation zone subject to field survey within the subject land can be found in Table 4.83.

Table 4.83 Vegetation integrity scores

Vegetation zone ID	Vegetation zone name	Composition condition score	Structure condition score	Function condition score (where relevant)	Vegetation integrity score	Hollow bearing trees present?
Murray Fans						
22	2_SVTM	100	100	100	100	0
1	7_Moderate-good	81.6	61.5	83	74.7	14
3	10_Moderate-good	25.2	28.2	42.9	31.3	11
4	10_Thinned	48.8	17.3	26.1	28	2
23	10_SVTM	100	100	100	100	0
2	10_Derived	40.6	3.6	4.4	8.7	0
33	10_Derived_LCV	55.8	13	0	9	0
5	11_Moderate-good	95.1	13.2	60	42.3	3
7	13_Moderate-good	78	49.6	45.8	56.2	7
8	13_Thinned	69.5	48.6	42.8	52.5	0

Vegetation zone ID	Vegetation zone name	Composition condition score	Structure condition score	Function condition score (where relevant)	Vegetation integrity score	Hollow bearing trees present?
24	13_SVTM	100	100	100	100	0
34	13_Planted_NatVeg	56	77.1	80.1	70.2	0
31	13_Derived	59.9	11.1	0	8.7	0
6	13_Derived_LCV	43.4	45.9	0	12.6	0
10	15_Moderate-good	81.4	78.2	59.5	72.3	1
11	15_Thinned	68.1	33.3	23.4	37.5	0
25	15_SVTM	100	100	100	100	0
32	15_Derived	41	42	0	12	0
9	15_Derived_LCV	31	9.6	0	6.7	0
12	17_Moderate-good	65	64.6	0	64.8	0
26	19_SVTM	100	100	100	100	0
13	28_Derived	16.9	13.3	0	6.1	0
14	28_Derived_TS	78.6	40	16.7	37.5	0
27	44_SVTM	100	100	100	100	0
35	86_Moderate-good	100	100	100	100	0
15	160_Moderate-good	26.4	80.8	0	46.2	0
28	160_SVTM	100	100	100	100	0
17	163_Moderate-good	69.2	100	0	83.2	0
20	163_SVTM	100	100	100	100	0
16	163_Derived_LCV	55.3	71.1	0	62.7	0
19	164_Moderate-good	85.5	89.7	0	87.6	0
30	164_SVTM	100	100	100	100	0
18	164_Derived_LCV	44.9	76.6	0	58.7	0
20	216_ Moderate-good	65.5	86.4	0	75.3	0
21	237_ Moderate-good	69.6	43.3	87.2	64	4
Murrumbidgee						
1	13_Moderate_good	78.5	71.8	32.8	57	2
31	13_SVTM	100	100	100	100	0
3	15_Moderate_good	84.3	93.8	44.5	70.6	13
46	15_Thinned	100	100	100	100	0

Vegetation zone ID	Vegetation zone name	Composition condition score	Structure condition score	Function condition score (where relevant)	Vegetation integrity score	Hollow bearing trees present?
32	15_SVTM	100	100	100	100	0
2	15_Derived	42.3	56.3	10.5	29.2	0
4	17_Moderate_good	69.2	84.1	0	76.8	0
33	17_SVTM	100	100	0	100	0
6	20_Thinned	95.1	23.3	19.3	34.9	0
5	20_Dervied	100	100	100	100	0
47	20_Derived_LCV	16	8.6	0	5.2	0
9	23_Moderate_good	100	99.9	38	72.4	0
49	23_Thinned	100	100	100	100	0
7	23_Derived	92.9	93.1	0	20.5	0
8	23_Derived_LCV	61.5	73.9	0	16.6	0
10	24_Moderate_good	79.7	65.1	0	72	0
13	26_Moderate_good	97.2	87.7	53	76.7	0
14	26_Thinned	75.3	81.9	22.3	51.6	0
34	26_SVTM	100	100	100	100	0
11	26_Derived	71.8	46.8	0.8	15	0
12	26_Derived_LCV	43.5	33.9	0	11.4	0
48	28_Moderate-good	100	100	100	100	-
18	28_Thinned	74.8	82.1	2.2	23.9	0
35	28_SVTM	100	100	100	100	0
15	28_Derived	93.5	98.4	0	21	0
16	28_Derived_TS	64.5	71.8	19.7	45	0
17	28_Derived_LCV	61.9	93.3	0	17.9	0
19	44_Moderate_good	96	96.6	0	96.3	0
36	44_SVTM	100	100	100	100	0
20	45_Moderate_good	75.3	95.5	0	84.3	0
37	45_SVTM	100	100	100	100	0
21	46_Moderate_good	96.6	89	0	92.7	0
44	46_SVTM	100	100	100	100	0
22	47_Moderate_good	82.2	93.1	0	87.5	0

Vegetation zone ID	Vegetation zone name	Composition condition score	Structure condition score	Function condition score (where relevant)	Vegetation integrity score	Hollow bearing trees present?
23	58_Moderate_good	65.6	77.8	57.2	66.3	0
24	58_Thinned	39.7	99.6	25.1	46.3	2
38	70_SVTM	100	100	100	100	0
25	157_Moderate_good	73.6	98.9	0	85.3	0
39	157_SVTM	100	100	100	100	0
40	159_SVTM	100	100	100	100	0
26	160_Moderate_good	92.5	85	0	88.7	0
45	160_SVTM	100	100	100	100	0
27	163_Moderate_good	95.9	99.6	0	97.7	0
41	163_SVTM	100	100	100	100	0
28	164_Moderate_good	76.2	99.2	0	86.9	0
43	164_SVTM	100	100	100	100	0
30	170_Thinned	39.4	84	30.7	46.6	3
29	170_Derived	25.1	74.7	0	12.3	0
42	216_Moderate-good	100	100	100	100	0
Inland Slopes						
1	76_Thinned	30.8	35.4	45.6	36.8	No
2	266_Moderate-good	55.9	75.6	94.2	73.6	No
3	266_Thinned	55.9	63.5	5.2	26.4	Yes
9	277_Moderate-good	100	100	100	100	No
5	277_Thinned	52.7	88.4	54.6	63.4	No
4	277_Derived_LCV	42.4	64.5	0	14	No
7	319_Thinned	23.5	28.2	44.9	31	No
6	319_Derived_LCV	36.9	18.7	0	8.8	Yes
10	343_Moderate-good	100	100	100	100	No
8	343_Derived_LCV	22.6	27.3	0	8.5	No

4.5.3 Use of benchmark data

Where parts of the subject land were inaccessible due to restricted access, or the required VI plots were unable to be recorded, benchmark data was used as a conservative approach to assume vegetation condition. In areas where restricted access was the limiting factor, STVM was used to identify the vegetation type present. Areas where benchmark data has been applied are subject to change following future field verification survey. Vegetation zones within the subject land where the benchmark has been applied are outlined in Table 4.84.

Table 4.84 Use of benchmark data

PCT or vegetation class	Vegetation Zone ID	PCT	Methods
Murray Fans			
2_SVTM	22	River Red Gum-sedge dominated very tall open forest in frequently flooded forest wetland along major rivers and floodplains in south-western NSW	Use of benchmark data in the absence of a vegetation condition category as the area is based on SVTM
10_SVTM	23	River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Use of benchmark data in the absence of a vegetation condition category as the area is based on SVTM
13_SVTM	24	Black Box - Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Use of benchmark data in the absence of a vegetation condition category as the area is based on SVTM
15_SVTM	25	Black Box open woodland wetland with chenopod understorey mainly on the outer floodplains in south-western NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Use of benchmark data in the absence of a vegetation condition category as the area is based on SVTM
19_SVTM	26	Cypress Pine woodland of source-bordering dunes mainly on the Murray and Murrumbidgee River floodplains	Use of benchmark data in the absence of a vegetation condition category as the area is based on SVTM
44_SVTM	27	Forb–rich Spear grass – Windmill Grass – White Top grassland of the Riverina Bioregion	Use of benchmark data in the absence of a vegetation condition category as the area is based on SVTM
86_Moderate-good	35	White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone	Use of benchmark data in the absence of a vegetation condition category as the area is based on SVTM
160_SVTM	28	Nitre Goosefoot shrubland wetland on clays of the inland floodplains	Use of benchmark data in the absence of a vegetation condition category as the area is based on SVTM
163_SVTM	29	Dillon Bush (Nitre Bush) shrubland of the semi-arid and arid zones	Use of benchmark data in the absence of a vegetation condition category as the area is based on SVTM

PCT or vegetation class	Vegetation Zone ID	PCT	Methods
164_SVTM	30	Cotton Bush open shrubland of the semi-arid (warm) zone	Use of benchmark data in the absence of a vegetation condition category as the area is based on SVTM
Murrumbidgee			
13_SVTM	31	Black Box - Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Use of benchmark data in the absence of a vegetation condition category as the area is based on SVTM
15_SVTM	32	Black Box open woodland wetland with chenopod understorey mainly on the outer floodplains in south-western NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Use of benchmark data in the absence of a vegetation condition category as the area is based on SVTM
15_Thinned	46	Black Box open woodland wetland with chenopod understorey mainly on the outer floodplains in south-western NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Use of benchmark data in the absence of a vegetation condition category as the area is based on SVTM
17_SVTM	33	Lignum shrubland wetland of the semi-arid (warm) plains (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Use of benchmark data in the absence of a vegetation condition category as the area is based on SVTM
20_Derived	5	Buloke – Moonah – Black Box open woodland on sandy rises of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Use of benchmark data in the absence of vegetation integrity plots where function data has been removed to better reflect derived condition state vegetation. Function data was not included in the assessment due to its derived condition (absence of trees, hollows etc).
23_Thinned	49	Yarran tall open shrubland of the sandplains and plains of the semi-arid (warm) and arid climate zones	Use of benchmark data in the absence of a vegetation integrity plot.
26_SVTM	34	Weeping Myall open woodland of the Riverina Bioregion and NSW South Western Slopes Bioregion	Use of benchmark data in the absence of a vegetation condition category as the area is based on SVTM
28_SVTM	35	White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone	Use of benchmark data in the absence of a vegetation condition category as the area is based on SVTM
28_Moderate-good	48	28 - White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone	Use of benchmark data in the absence of a vegetation integrity plots.

PCT or vegetation class	Vegetation Zone ID	PCT	Methods
44_SVTM	36	Forb–rich Spear grass – Windmill Grass – White Top grassland of the Riverina Bioregion	Use of benchmark data in the absence of a vegetation condition category as the area is based on SVTM
45_SVTM	37	Plains Grass grassland on alluvial mainly clay soils in the Riverina Bioregion and NSW South Western Slopes Bioregion	Use of benchmark data in the absence of a vegetation condition category as the area is based on SVTM
46_SVTM	44	Curly Windmill Grass - speargrass - wallaby grass grassland on alluvial clay and loam on the Hay Plain, Riverina Bioregion	Use of benchmark data in the absence of a vegetation condition category as the area is based on SVTM
70_SVTM	38	White Cypress Pine woodland on sandy loams in central NSW wheatbelt	Use of benchmark data in the absence of a vegetation condition category as the area is based on SVTM
157_SVTM	39	Bladder Saltbush shrubland on alluvial plains in the semi-arid (warm) zone including Riverina Bioregion	Use of benchmark data in the absence of a vegetation condition category as the area is based on SVTM
159_SVTM	40	Old Man Saltbush shrubland mainly of the semi-arid (warm) climate zone (south western NSW)	Use of benchmark data in the absence of a vegetation condition category as the area is based on SVTM
160_SVTM	45	Nitre Goosefoot shrubland wetland on clays of the inland floodplains	Use of benchmark data in the absence of a vegetation condition category as the area is based on SVTM
163_SVTM	41	Dillon Bush (Nitre Bush) shrubland of the semi-arid and arid zones	Use of benchmark data in the absence of a vegetation condition category as the area is based on SVTM
164_SVTM	43	Cotton Bush open shrubland of the semi-arid (warm) zone	Use of benchmark data in the absence of a vegetation condition category as the area is based on SVTM
216_Moderate-good	42	Black Roly Poly low open shrubland of the Riverina Bioregion and Murray Darling Depression Bioregion	Use of benchmark data in the absence of a vegetation condition in Murrumbidgee.
Inland Slopes			
277_Moderate-good	9	PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	Use of benchmark data in the absence of a vegetation condition category as the area is based on SVTM
343_Moderate-good	10	343 - Mugga Ironbark - Red Box - Red Stringybark - Western Grey Box grass/shrub woodland on metamorphic substrates in the Tarcutta - Gundagai region, NSW South Western Slopes Bioregion	Use of benchmark data in the absence of a vegetation condition in the Inland Slopes

4.6 Scattered tree assessment

A total of 16 scattered trees were recorded within the subject land. A breakdown, per IBRA subregion, of each scattered tree type, class and associated PCT is provided in Table 4.85, Table 4.87 and Table 4.89.

The location of each recorded scattered tree is shown in Figure 15.15.

In respect to Appendix B.4 of the BAM, no candidate threatened species (including SAII species) are considered likely to use any recorded scattered trees for habitat. The reasons for removal of threatened species from the Scattered Tree assessments is outlined in Table 4.86, Table 4.88 and Table 4.90. No SAII species would be impacted by the proposed clearing of scattered trees. As no threatened species at risk of an SAII are present (nor are likely to be present), the scattered tree module can be applied.

Table 4.85 Assessment of scattered trees in the Murray Fans IBRA subregion

Class	Species	Number of trees	Contain hollows	DBH Category
13 - Black Box - Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)				
3	*Eucalyptus largiflorens*	5	Yes (estimated)	>50 cm DBH
3	*Eucalyptus largiflorens*	4	No (visual assessment)	>50 cm DBH
3	*Alectryon oleifolius*	2	Yes (visual assessment)	>50 cm DBH
3	*Alectryon oleifolius*	3	No (visual assessment)	>50 cm DBH

Table 4.86 Scattered tree threatened species assessment for the Murray Fans IBRA subregion

Species type	Species	Habitat constraint	Assessment
Habitat suitability: Predicted species	*Grantiella picta* (Painted Honeyeater)	Mistletoes present at a density of greater than five mistletoes per hectare.	Retained. All scattered trees were not inspected in the field, so it is unknown whether the trees contain Mistletoes present at a density of greater than five mistletoes per hectare. Mistletoes are assumed present in the absence of data.
	Haliaeetus leucogaster White-bellied Sea-Eagle (Foraging)	Waterbodies; Within 1 km of a rivers, lakes, large dams or creeks, wetlands and coastlines.	Retained. Tress located within 1 km of a rivers, lakes, large dams or creeks, wetlands.
	Polytelis anthopeplus monarchoides Regent Parrot (eastern subspecies) (Foraging)	Along Wakool River west of Kyalite	Removed. The scattered trees are not located along the Wakool River west of Kyalite

Species type	Species	Habitat constraint	Assessment
	All other ecosystem credit species without identified habitat constraints	N/A	Retained
Habitat suitability: Candidate species	*Anthochaera phrygia* Regent Honeyeater (Breeding)	As per Important Habitat Map	Removed. The subject land is not included on the Regent Honeyeater Important Habitat Map.

Table 4.87 Assessment of scattered trees in the Murrumbidgee IBRA subregion

Class	Species	Number of trees	Contain hollows	DBH Category
58 - Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion				
3	*Casuarina pauper*	1	No (visual assessment)	>30 cm DBH

Table 4.88 Scattered tree threatened species assessment for the Murrumbidgee IBRA subregion

Species type	Species	Habitat constraint	Assessment
Habitat suitability: Predicted species	*Grantiella picta* (Painted Honeyeater)	Mistletoes present at a density of greater than five mistletoes per hectare.	Removed. The scattered tree did not contain Mistletoes present at a density of greater than five mistletoes per hectare.
	Haliaeetus leucogaster White-bellied Sea-Eagle (Foraging)	Waterbodies; Within 1 km of a rivers, lakes, large dams or creeks, wetlands and coastlines.	Retained. Tress located within 1 km of a rivers, lakes, large dams or creeks, wetlands.
	Polytelis anthopeplus monarchoides Regent Parrot (eastern subspecies) (Foraging)	Within 10 km of the junction of the Murray River	Removed. The scattered tree are not located within 10 km of the junction of the Murray River
	All other ecosystem credit species without identified habitat constraints	N/A	Retained

Table 4.89 Assessment of scattered trees in the Inland Slopes IBRA subregion

Class	Species	Number of trees	Contain hollows	DBH Category
343 - Mugga Ironbark - Red Box - Red Stringybark - Western Grey Box grass/shrub woodland on metamorphic substrates in the Tarcutta - Gundagai region, NSW South Western Slopes Bioregion				
3	*Eucalyptus sideroxylon*	1	No (visual assessment)	>50 cm DBH

Table 4.90 Scattered tree threatened species assessment for the Inland Slopes IBRA subregion

Species type	Species	Habitat constraint	Assessment
Habitat suitability: Predicted species	*Calyptorhynchus lathami lathami* South-eastern Glossy Black-Cockatoo (Foraging)	Presence of *Allocasuarina* and *casuarina* species	Removed. The scattered tree was not observed growing in or near the presence of *Allocasuarina* and *casuarina* species
	Grantiella picta (Painted Honeyeater)	Mistletoes present at a density of greater than five mistletoes per hectare.	Removed. The scattered tree did not contain Mistletoes present at a density of greater than five mistletoes per hectare.
	Haliaeetus leucogaster White-bellied Sea-Eagle (Foraging)	Waterbodies; Within 1 km of a rivers, lakes, large dams or creeks, wetlands and coastlines.	Retained. Tress located within 1 km of a rivers, lakes, large dams or creeks, wetlands.
	All other ecosystem credit species without identified habitat constraints	N/A	Retained
Habitat suitability: Candidate species	*Anthochaera phrygia* Regent Honeyeater (Breeding)	As per Important Habitat Map	Removed. The subject land is not included on the Regent Honeyeater Important Habitat Map.
	Lathamus discolor Swift Parrot (Breeding)	As per Important Habitat Map	Removed. The subject land is not included on the Swift Parrot Important Habitat Map.

4.7 Planted native vegetation

Within the subject land, several areas of planted native vegetation have been identified being:

- planted windrows comprised of native canopy species,
- supplemental plantings of shrub species within native vegetation, and
- plantings incorporated in restoration works.

Of the native plantings recorded within the subject land, both the areas of supplemental plantings of shrub species and restoration works have been associated with a PCT and have been considered as native vegetation within this BDAR. As such, these patches are not considered under the streamlined assessment module for planted native vegetation and are not discussed further in this section.

However, where desktop assessment and ground-truthing has identified areas of planted native vegetation within the subject land that were planted primarily for the functional agricultural purpose of wind breaks, this is evident in the linear nature of plantings and their situation bordering paddocks and category 1 cropped lands, the streamlined assessment module for planted native vegetation has been applied. These patches of vegetation have been identified as PCT 0 – Ornamental plantings (Windbreaks) or as Miscellaneous ecosystems – Native plantings where vegetation mapping has been adopted from the approved Project EnergyConnect BDAR (WSP, 2022).

The planted native vegetation module was deemed appropriate to use for planted native vegetation where a native PCT was not applied following the decision-making key contained in BAM Appendix D, notably Step 5 (the native vegetation was planted for functional, aesthetic, horticultural or plantation forestry purposes (i.e. windbreaks in agricultural landscapes and roadside plantings)) (Table 4.91).

BAM Appendix D.2 Assessment of planted native vegetation for threatened species habitat was used to assess impacts to areas of planted native vegetation (Sections 4 and 5 of the BAM are not required to be applied), in which the assessor must assess the suitability of the planted native vegetation for use by threatened species and record any incidental sightings or evidence (e.g. scats, stick nests) of threatened species credit species (flora and fauna) using, inhabiting or being part of the planted native vegetation. No hollows, stick nests or other indication of threatened fauna habitat (rock outcrops, aquatic environments, significant leaf litter or fallen log accumulations) were observed during field survey within native planted vegetation zones. Planted vegetation not subject to field verification is considered consistent with surveyed areas of planted native vegetation within the subject land and is not considered to support habitat for threatened species.

Table 4.91 D.1 Decision making key

Decision making key		Response	
1	Does the planted native vegetation occur within an area that contains a mosaic of planted and remnant native vegetation and which can be reasonably assigned to a PCT known to occur in the same IBRA subregion as the project?	No Rows of planted native vegetation generally occur as distinct windbreaks bordering paddocks or Category 1 cropped lands. Tree species compositions does not represent that of local PCTs therefore cannot be reasonably assigned. The understorey was often lacking or highly disturbed/exotic.	If yes – apply the BAM
2	Is the planted native vegetation planted for the purpose of environmental rehabilitation or restoration under an existing conservation obligation listed in BAM Section 11.9(2), and the primary objective was to replace or regenerate a plant community type or a threatened plant species population or its habitat?	No After review of arial desktop assessment and field verification, planted native vegetation seems to mostly function as windbreaks amongst an agricultural landscape. They mostly do not form components of surrounding PCTs and therefore it is unlikely that they have been planted for environmental restoration or rehabilitation under existing conservation agreements, or to regenerate a PCT.	If yes – apply the BAM
3	Is the planted or translocated native vegetation for the purpose of providing threatened species habitat under a project listed in Q3 of the Planted Native Vegetation Streamlined Assessment Module?	No It is unlikely that planted native vegetation was intended to provide threatened species habitat. As stated above, their primary function is as windbreaks within an agricultural landscape.	If yes – apply the BAM
4	Was the planted native vegetation undertaken voluntarily for revegetation, environmental rehabilitation or restoration without legal obligation to secure or provide for management of the native vegetation.	No It is unlikely that planted native vegetation was intended as voluntary revegetation or environmental restoration. As stated above, their primary function is as windbreaks within an agricultural landscape.	If yes – apply D.2 Assessment
5	Is the native vegetation planted for functional, aesthetic, horticultural or plantation forestry purposes?	Yes Due to the linear nature of planted vegetation with trees of approximately the same age, it is very likely that native vegetation was planted for functional, aesthetic or horticultural purposes. This is further justified by its position encompassed by category 1 or low conservation value lands.	If yes – apply D.2 Assessment

Table 4.92 D.2 Assessment of planted native vegetation for threatened species habitat

IBRA subregion	Description / survey effort / outcome	Images (Note: black boundary = project footprint, blue polygon = mapped planted native vegetation).
Murray Fans	A mix of native and exotic species planted as a windbreak surrounded by Category 1 cropped lands. Trees were young with no hollows or stick nests observed. Random meanders and Rapid Data Point Assessments were used. Patches of vegetation may provide marginal habitat connectivity for highly mobile threatened fauna species which is discussed further as a prescribed impact in Chapter 7.	 
Murrumbidgee	A mix of native and exotic species planted as a windbreak surrounded by Category 1 cropped lands. Trees were young with no hollows or stick nests observed. Random meanders and Rapid Data Point Assessments were used. Patches of vegetation not considered to provide habitat or habitat connectivity for fauna species and patches are not considered further.	 
Inland Slopes	Existing Wagga 330 kV substation surveyed previously by WSP on EnergyConnect (NSW – Eastern section) project (WSP, 2022). Desktop assessment to confirm previous mapping of planted native vegetation. Patches of vegetation may provide marginal habitat connectivity for highly mobile threatened fauna species which is discussed further as a prescribed impact in Chapter 7.	

IBRA subregion	Description / survey effort / outcome	Images (Note: black boundary = project footprint, blue polygon = mapped planted native vegetation).
	Ornamental windrow plantings. Image to the left represents south-eastern polygon showing plantings of *Corymbia citridora*. No hollow bearing trees or stick nests were recorded. Random meanders and Rapid Data Point Assessments were used. Patches of vegetation may provide marginal habitat connectivity for highly mobile threatened fauna species which is discussed further as a prescribed impact in Chapter 7.	 
	A mix of native and exotic species planted as windrows within agricultural land. Trees were relatively young with no hollows or stick nests observed. Random meanders and Rapid Data Point Assessments were used to field verify native plantings. Patches of vegetation may provide marginal habitat connectivity for highly mobile threatened fauna species which is discussed further as a prescribed impact in Chapter 7.	 
	This vegetation was previously mapped by Niche Pty Ltd for HumeLink. Desktop assessment was used to confirm previous mapping of a planted windbreak surrounded by category 1 lands. Patches of vegetation not considered to provide habitat or habitat connectivity for fauna species and patches are not considered further.	

IBRA subregion	Description / survey effort / outcome	Images (Note: black boundary = project footprint, blue polygon = mapped planted native vegetation).
	Distinctly planted native windbreaks running parallel through cropped category 1 lands. The plantings included mature Yellow Box (*Eucalyptus melliodora*), Blakelys Red Gum (*Eucalyptus blakelyi*) and Apple Box (*Eucalyptus bridgesiana*) which are locally native species however together, are not characteristic of a listed PCT. Trees were too young to form hollows, and no threatened species habitat was observed. Random meanders and Rapid Data Point Assessments were used to field verify native plantings. Patches of vegetation may provide marginal habitat connectivity for highly mobile threatened fauna species which is discussed further as a prescribed impact in Chapter 7.	 

4.8 Groundwater dependent ecosystems

Groundwater dependent ecosystems (GDEs) are communities of plants, animals, and other organisms whose extent and life processes are dependent on groundwater. When considering GDEs, groundwater is generally defined as the saturated zone of the regolith (the layer of loose rock resting on bedrock, constituting the surface of most land) and its associated capillary fringe, but it exclude soil water held under tension in soil pore spaces (the unsaturated zone or vadose zone) (Eamus et al. 2006).

GDEs include a diverse range of ecosystems, from those entirely dependent on groundwater to those that may use groundwater while not having a dependency on it for survival (i.e., ecosystems or organisms that use groundwater opportunistically or as a supplementary source of water) (Hatton and Evans 1998). Broad classes of GDEs that have the potential to be present within or near the subject land include:

- Ecosystems dependent on the surface expression of groundwater may be present in the subject land. This category of GDE includes base-flow rivers and watercourses, wetlands, some floodplains and mound springs and estuarine seagrass beds. Although plant roots are generally below ground, this class of groundwater dependent ecosystems requires a surface expression of groundwater, which may, in many cases, then soak below the soil surface and thereby become available to plant roots.
- Ecosystems dependent on the subsurface presence of groundwater, often accessed via the capillary fringe (non-saturated zone above the saturated zone of the water table) when roots penetrate this zone, are likely to be present in the subject land. No surface expression of groundwater is required in this class of groundwater dependent ecosystems.

In the context of the project, GDEs are considered sensitive receptors, as they are particularly susceptible to potential changes in groundwater levels and quality as a result of construction and operational activities.

Impacts to groundwater and GDEs have been assessed as part of the *Technical Paper 10 – Groundwater impact assessment* (WSP, 2025). This report undertook a GDE search by reviewing the relevant water sharing plan documents and accessing the Bureau of Meteorology's Groundwater Dependent Ecosystems Atlas (GDE Atlas). The GDE Atlas was developed as a national dataset of Australian GDEs to inform groundwater planning and management. This database search identified five unique high priority terrestrial GDEs, across the subject land and are predominately located between the Murray River at the NSW/Victorian border and Moulamein. Despite 17 crossed watercourses in the subject land being identified as containing aquatic GDE, no high priority aquatic GDEs were identified. Terrestrial native vegetation high priority GDEs are generally comprised of Semi-arid Woodland and Forested Wetland vegetation formation. A summary of these high priority GDEs within the subject land are provided in Table 4.93.

Table 4.93 High priority GDEs within the subject land

GDE type	GDE name
Terrestrial	Black Box - Lignum woodland wetland
Terrestrial	Black Box - open woodland wetland
Terrestrial	River Red Gum - Black Box woodland wetland
Terrestrial	River Red Gum - Warrego Grass - herbaceous riparian tall open forest wetland
Terrestrial	River Red Gum - sedge dominated very tall open forest in frequently flooded forest wetland

5 Habitat suitability for threatened species

5.1 Identification of threatened species for assessment

Section 5.1 identifies threatened species habitat constraints in association within the subject land based on the criteria detailed in Subsections 5.2.1 – 5.2.6 of the BAM.

5.1.1 Geographic and habitat constraints assessment

In accordance with section 5.2.2 of the BAM (2020), threatened species that do not have habitat constraints listed in the TBDC, but have been identified as having potential to occur in the subject land, require further assessment.
The following threatened species with geographic and/or habitat constraints were assessed (see Table 5.1 and Table 5.2).

Table 5.1 Geographic limitations and habitat constraints assessed for candidate threatened flora species

Species name	Subregion (IBRA)			Geographic limitation/habitat constraint assessed	Presence in the subject land
	MF	MUR	IS		
Acacia ausfeldii Ausfeld's Wattle	-	-	x	Habitat constraint being footslopes and low rises on sandstone.	GIS software was utilised to identify the subject land in relation to the NSW 1500k Simplified Surface Geology Map (SG NSW 2025). Within the subject land, soil surface geology has been identified to be dominated by Quaternary alluvial deposits with intrusions of Silurian IS transitional-type granite and Ordovician sedimentary rocks. As Quaternary alluvial deposits and Silurian IS transitional-type granite are not a type of sandstone, areas identified within these lithology types have been removed from further consideration. Areas of Ordovician sedimentary rocks are associated with quartz-rich sandstone and would be considered suitable habitat. However, a review of aerial imagery, Category 1 mapping (Figure 15.6) and vegetation mapping (Figure 15.8) has indicated this area is predominantly cleared land subject to intensive agriculture with one area of treed vegetation where ornamental plantings form a windbreak. Given the pressures of intensive agriculture and general lack of native vegetation within the subject land where the NSW 1500k Simplified Surface Geology Map has identified sandstone lithology, *Acacia ausfeldii* has not been retained for further assessment.
Ammobium craspedioides Yass Daisy	-	-	x	Geographic limitation being south of Cowra.	The subject land was located in reference to Cowra utilising GIS software. The subject land is south of Cowra. *Ammobium craspedioides* has been retained for further assessment.
Amphibromus fluitans Floating Swamp Wallaby-grass	x	-	-	Habitat constraint being: — semi-permanent and ephemeral wetlands. Periodically inundated sites (including table drains and farm dams), notably wetlands on riverine floodplain	On-site field validation surveys undertaken within the subject land has confirmed the presence of semi-permanent and ephemeral wetlands. *Amphibromus fluitans* has been retained for further assessment.

Species name	Subregion (IBRA)			Geographic limitation/habitat constraint assessed	Presence in the subject land
	MF	MUR	IS		
Austrostipa wakoolica A spear-grass	x	x	x	Habitat constraint being Alluvial plains and plains. Geographic limitation being: — no listed geographic limitations for the Murray Fans subregion. — south of the Murrumbidgee River (Murrumbidgee subregion) — west of Cowra (Inland Slopes subregion).	On-site field validation surveys undertaken within the subject land have confirmed the presence of alluvial plains within all IBRA subregions. As there is no listed geographic constraint for the Murray Fans IBRA subregion and the habitat constraint has been met, *Austrostipa wakoolica* has been retained for further assessment within the Murray Fans subregion. GIS software was utilised to locate the subject land in relation to the Murrumbidgee River within the Murrumbidgee IBRA subregion. The subject land is south of the Murrumbidgee River. As both the habitat and geographic constraints have been met, *Austrostipa wakoolica* has been retained for further assessment within the Murrumbidgee subregion. GIS software was utilised to locate the subject land in relation to Cowra. The subject land is west of Cowra within the Inland Slopes IBRA subregion. As both the habitat and geographic constraints have been met, *Austrostipa wakoolica* has been retained for further assessment within the Inland Slopes subregion.
Austrostipa metatoris A spear-grass	x	-	-	Geographic limitation being west of Deniliquin.	GIS software was utilised to locate the subject land in relation to the town of Deniliquin. The project site is west of Deniliquin within the Murray Fans IBRA subregion. *Austrostipa metatoris* has been retained for further assessment.

Species name	Subregion (IBRA)			Geographic limitation/habitat constraint assessed	Presence in the subject land
	MF	MUR	IS		
Brachyscome muelleroides Mueller Daisy	x	x	-	Habitat constraints being: — floodplains on grey-brown or red-brown clays and claypans — semi-permanent/ephemeral wet areas — wetland-grassland communities on grey-brown or red-brown clays and claypans — geographic limitations being: — east of the Cobb highway and south of Griffith (Murrumbidgee subregion) — east of the Cobb highway (Murray Fans subregion).	On-site field validation surveys undertaken within the subject land have confirmed the presence of floodplains on grey-brown and red-brown clays and clay pans, semi-permanent /ephemeral wet areas, wetland-grassland communities on grey-brown and red-brown clays and claypans. GIS software was utilised to locate the subject land in relation to the Cobb highway and Griffith. Within the Murrumbidgee IBRA subregion the subject land is partially east of the Cobb Highway and entirely south of Griffith therefore *Brachyscome muelleroides* has been retained for further assessment in all areas east of the Cobb Highway. Within the Murray Fans IBRA subregion, the subject land is not east of the Cobb Highway so *Brachyscome muelleroides* was excluded from further assessment within the Murray Fans IBRA subregion.
Caladenia arenaria Sand-hill Spider Orchid	-	x	x	Geographic limitation being East of Jerilderie for the Murrumbidgee subregion.	GIS software was utilised to locate the subject land in relation to the town of Jerilderie NSW. Within the Murrumbidgee IBRA subregion, the subject land is west of the town of Jerilderie. For the Murrumbidgee subregion, *Caladenia arenaria* was removed from further consideration as a candidate species based on this geographic limitation not being met. As there are no listed geographic or habitat constraints listed for *Caladenia arenaria* within the Inland Slopes subregion, the species was retained for assessment for assessment.

Species name	Subregion (IBRA)			Geographic limitation/habitat constraint assessed	Presence in the subject land
	MF	MUR	IS		
Cullen parvum Small scurf-pea	x	x	x	Geographic limitation being: — Hay plains and to the east (Murrumbidgee subregion) — East of Barham (Murray Fans subregion) — No geographic limitation for the Inland Slopes subregion	GIS software was utilized to confirm the location of the subject land to be on the Hay Plain in the Murrumbidgee IBRA subregion. *Cullen parvum* would be retained for further assessment within the Murrumbidgee. Within the Murray Fans subregion, the subject land lies to the West of Barham. Seeing as this does not meet the geographic criteria, *Cullen parvum* would be excluded from further assessment within the Murray Fans. As there are no geographic or habitat constraints, the species would be assessed further in the Inland Slopes IBRA subregion.
Eleocharis obicis A Spike-rush	x	x	-	Habitat constraint being semi-permanent/ephemeral wet areas.	On-site field validation surveys undertaken within the subject land has confirmed the presence of semi-permanent/ephemeral wet areas and periodically waterlogged sites in the form of gilgais, table drains and farm dams. Whilst the TBDC does not list any of these IBRA subregions being associated with *Eleocharis obicis,* the species has been recorded on site. Therefore, would be retained for further assessment as a candidate species in the Murray Fans and Murrumbidgee subregions.
Eucalyptus leucoxylon subsp. pruinosa Yellow Gum	X	X	-	Habitat constraint being sandy rises and loamy clay flats on the floodplains of the Murray River and its tributaries in the Riverina IBRA bioregion.	On-site field validation surveys undertaken within the subject land has confirmed the presence of loamy clay flats within the Riverina IBRA bioregion. Furthermore, *Eucalyptus leucoxylon subsp. pruinosa* has been retained for further assessment.

Species name	Subregion (IBRA)			Geographic limitation/habitat constraint assessed	Presence in the subject land
	MF	MUR	IS		
Maireana cheelii Chariot Wheels	x	x	-	Habitat constraint being heavy grey clay soils and claypans or shallow depressions. Geographic limitation being: — west of Darlington Point, west of Jerilderie (Murrumbidgee subregion) — west of Finley (Murray Fans subregion).	On-site field validation surveys undertaken within the subject land has confirmed the presence of heavy grey clay soils and claypans or shallow depressions. IS software was utilised to locate the subject land in relation to the towns of Darlington Point, Jerilderie and Finley. The subject land is west of all three towns. The subject land is considered to meet the geographic constraints of this species. As both the habitat and geographic constraints have been met, *Maireana cheelii* has been retained for further assessment.
Pilularia novae-hollandiae Austral Pillwort	x	x	-	Geographic limitation being: — east of Deniliquin (Murrumbidgee subregion) — no geographic limitation for the Murray Fans subregion.	GIS software was utilised to locate the subject land in relation to the town of Deniliquin for areas that fall within the Murrumbidgee IBRA subregion. The subject land partially lies to the east of Deniliquin and the species is only retained for these areas. No geographic constraints are listed for the Murray Fans IBRA subregion and the species has been retained in its entirety.
Sclerolaena napiformis Turnip Copperburr	x	x	-	Geographic limitation of Hay Plain (Murrumbidgee and Murray Fans subregion).	GIS software was utilised to locate the Hay Plain in both the Murrumbidgee and Murray Fans IBRA subregions. For the Murrumbidgee subregion, the subject land falls within the Hay Plain in its entirety. For the Murray Fans IBRA subregion, the subject land is generally considered to fall outside of the definition of the Hay Plain as outlined in Marianne Portners "The natural vegetation of the Hay Plain" (Cunninghamia 1993). *Sclerolaena napiformis* has been retained for further assessment in the Murrumbidgee IBRA subregion but not the Murray Fans.

Species name	Subregion (IBRA)			Geographic limitation/habitat constraint assessed	Presence in the subject land
	MF	MUR	IS		
Solanum karsense Menindee Nightshade	-	x	-	Habitat constraint being semi-permanent/ephemeral wet areas. Geographic limitation of west of Maude.	On-site field validation surveys undertaken within the subject land have confirmed the presence of semi-permanent/ephemeral wet areas. GIS software was utilised to locate the subject land in relation to the town of Maude. The western end of the corridor sits directly south of the town of Maude, and areas to the west of this point would be considered to meet the geographical constraint for this species. As such, areas to the west of the town of Maude are considered to meet both the habitat and geographic constraint for this species, and *Solanum karsense* has been retained for further assessment in these areas.
Swainsona murrayana Slender Darling Pea	x	x	-	Geographic limitation being: — Hay Plain (Murray Fans subregion) — no geographic limitation for the Murrumbidgee subregion.	GIS software was utilised to locate the Hay Plain in the Murray Fans IBRA subregion. The subject land is generally considered to fall outside of the definition of the Hay Plain as outlined in Marianne Portners "The natural vegetation of the Hay Plain" (Cunninghamia 1993). As such, the species has been excluded from further assessment in the Murray Fans IBRA subregion. As *Swainsona murrayana* has no listed habitat or geographic constraints for the Murrumbidgee IBRA subregion, the species has been retained for assessment within this subregion.
Swainsona plagiotropis Red Darling Pea	x	x	-	Geographic limitation being Hay Plain (Murrumbidgee & Murray Fans subregion).	GIS software was utilised to locate the Hay Plain in both the Murrumbidgee and Murray Fans IBRA subregions. For the Murrumbidgee subregion, the subject land falls within the Hay Plain in its entirety. For the Murray Fans IBRA subregion, the subject land is generally considered to fall outside of the definition of the Hay Plain as outlined in Marianne Portners "The natural vegetation of the Hay Plain" (Cunninghamia 1993). *Swainsona plagiotropis* has been retained for further assessment in the Murrumbidgee IBRA subregion but not the Murray Fans.

Table 5.2 Geographic limitations and habitat constraints assessed for candidate and predicted threatened fauna species

Species name	Subregion (IBRA)			Credit type	Geographic limitation/habitat constraints assessed	Presence in the subject land
	MF	MUR	IS			
Amphibians						
Sloane's Froglet *Crinia sloanei*	x	-	x	Candidate	Habitat constraint being: — semi-permanent / ephemeral wet areas containing relatively shallow sections with submergent and emergent vegetation, or — within 500 m of wet area / swamps, or — within 500 m of waterbodies.	Habitat constraints met within the Murray Fans IBRA subregion as the subject land contains semi-permanent/ephemeral areas containing relatively shallow sections with submergent and emergent vegetation and waterbodies. Habitat constraints have not been met within the Inland Slopes IBRA subregion as the subject land does not contain semi-permanent / ephemeral wet areas containing relatively shallow sections with submergent and emergent vegetation within suitable PCTs, nor does a suitable PCT occur within 500m of a wet area / swamp or waterbody. The species has been retained for the Murray Fans subregion but not the Inland Slopes.
Avifauna						
Regent Honeyeater *Anthochaera phygia*	x	-	x	Candidate	Habitat constraint being per Important Habitat map.	Habitat constraints for breeding habitat are not met as the subject land has no important habitat mapped areas. The species was therefore removed from further consideration as a candidate species for both the Murray Fans and Inland Slopes IBRA subregion.

Species name	Subregion (IBRA)			Credit type	Geographic limitation/habitat constraints assessed	Presence in the subject land
	MF	MUR	IS			
Australasian Bittern *Botaurus poiciloptilus*	x	X	-	Predicted	Habitat constraint being waterbodies and brackish or freshwater wetlands	Habitat constraints met. The subject land contains waterbodies and freshwater wetlands. The species was therefore retained as a predicted species for the following subregions: — Murray Fans — Murrumbidgee.
Bush Stone-curlew *Burhinus grallarius*	x	X	x	Candidate	Habitat constraint being fallen / standing dead timber including logs.	Habitat constraints met. The subject land contains fallen/standing dead timber including logs. The species was therefore retained as a candidate species based on habitat constraints being met for the following subregions: — Murray Fans — Murrumbidgee — Inland Slopes.
Curlew Sandpiper *Calidris ferruginea*	-	X	-	Candidate	Habitat constraint being as per Important Habitat map.	Habitat constraints not met. There is no mapped important habitat in the subject land. The species was therefore removed from further consideration as a candidate species based on this limitation not being met for the Murrumbidgee subregion.

Species name	Subregion (IBRA)			Credit type	Geographic limitation/habitat constraints assessed	Presence in the subject land
	MF	MUR	IS			
Gang-gang Cockatoo *Callocephalon fimbriatum*	-	-	x	Candidate	Habitat constraint being: — Hollow bearing trees — Eucalypt tree species with hollows at least 3 m above the ground and with hollow diameter of 7 cm or larger.	Habitat constraints met. Eucalypt tree species with hollows at least 3 m above the ground and with hollow diameter of 7 cm or larger are present in the subject land. The species was therefore retained as a candidate species based on habitat constraints being met for the following subregion: — Inland Slopes Within the Inland Slopes, the species is excluded from associated PCTs recorded in Derived and Derived low conservation value condition as these vegetation zones are characteristically treeless and therefore do not meet the habitat constraint of hollow bearing trees.
South-eastern Glossy Black-cockatoo *Calyptorhynchus lathami lathami*	-	-	x	Predicted	Habitat constraint being the presence of *Allocasuarina* and *Casuarina* species.	Habitat constraints have not been met. Survey effort failed to identify *Allocasuarina* or *Casuarina* species within the subject land. However candidate species requirements are considered below.
	-	-	x	Candidate	Habitat constraint being living or dead tree with hollows greater than 15 cm diameter and higher than 8 m above ground.	Habitat constraints have not been met. Living or dead trees with hollows greater than 15 cm diameter and higher than 8 m above ground have not been identified within suitable habitat types within the Inland Slopes IBRA subregion. Therefore the species has not been retained for further assessment.

Species name	Subregion (IBRA)			Credit type	Geographic limitation/habitat constraints assessed	Presence in the subject land
	MF	MUR	IS			
White-browed Treecreeper (Carrathool area population) *Climacteris affinis – endangered population*	-	X	-	Candidate	Geographic limitation being Carrathool local government area south of the Lachlan River and Griffith local government area.	Geographic limitations not met. The subject land is not located in the Carrathool or Griffith local government areas. The species was therefore removed from further consideration as a candidate species based on this limitation not being met for the following subregion: — Murrumbidgee
Painted Honeyeater *Grantiella picta*	x	X	x	Predicted	Habitat constraint being mistletoes present at a density of greater than five mistletoes per hectare.	The subject land contains mistletoe in associated PCTs therefore the species is retained for further assessment. However, the species has been excluded from derived and derived TS condition classes as vegetation associated with these areas would not be able to support mistletoes at a great enough density to support the species.
White-bellied Sea-eagle *Haliaeetus leucogaster*	x	X	x	Predicted	Habitat constraint being waterbodies or within 1km of a rivers, lakes, large dams or creeks, wetlands and coastlines.	Habitat constraints met. The subject land contains waterbodies and is within 1km of rivers, large dams, and creeks. The species was therefore retained as a predicted species based on habitat constraints being met for the following subregions: — Murray Fans — Murrumbidgee — Inland Slopes

Species name	Subregion (IBRA)			Credit type	Geographic limitation/habitat constraints assessed	Presence in the subject land
	MF	MUR	IS			
	x	x	x	Candidate	Habitat constraint being living or dead mature trees within suitable vegetation, within 1 km of a river, lake, large dam or creek, wetland or coastline.	Habitat constraints met. Living or dead mature trees within suitable vegetation, within 1 km of a river, lake, large dam or creek, wetland or coastline are present in the subject land. The species was therefore retained as a candidate species based on habitat constraints being met for the following subregions: — Murray Fans — Murrumbidgee — Inland Slopes. However, the species has been excluded from several areas due to the lack of suitable living or dead mature trees including: — Derived condition class vegetation — Chenopod shrublands.
Black-breasted Buzzard *Hamirostra melanosternon*	x	-	-	Candidate	Habitat constraint being land within 40 m of riparian woodland on inland watercourses / waterholes containing dead or dying eucalypts.	Habitat constraints met. Subject land contains land within 40 m of riparian woodland on inland watercourses / waterholes containing dead or dying eucalypts. The species was therefore retained as a candidate species based on habitat constraints being met for the following subregions: — Murray Fans. However, the species has been excluded from several areas due to the lack of suitable dead of dying eucalypts including: — Derived condition class vegetation — Chenopod shrublands.

Species name	Subregion (IBRA)			Credit type	Geographic limitation/habitat constraints assessed	Presence in the subject land
	MF	MUR	IS			
Little Eagle *Hieraaetus morphnoides*	x	x	x	Candidate	Habitat constraint being nest trees, live (occasionally dead) large old trees within vegetation.	Habitat constraints met. Subject land contains live (occasionally dead) large old trees within vegetation. The species was therefore retained as a candidate species based on habitat constraints being met for the following subregions: — Murray Fans — Murrumbidgee — Inland Slopes. However, the species has been excluded from several areas due to the lack of suitable live (occasionally dead) large old trees within vegetation including: — Derived condition class vegetation — Chenopod shrublands.
Swift Parrot *Lathamus discolor*	x	x	x	Candidate	Habitat constraint being as per Important Habitat map.	Habitat constraints not met. There is no mapped important habitat in the subject land. The species was therefore removed from further consideration as a candidate species based on this limitation not being met for the following subregions: — Murray Fans — Murrumbidgee — Inland Slopes.

Species name	Subregion (IBRA)			Credit type	Geographic limitation/habitat constraints assessed	Presence in the subject land
	MF	MUR	IS			
Malleefowl *Leipoa ocellata*	-	-	x	Predicted	Habitat constraint being inhabits mallee communities, preferring the tall, dense and floristically rich mallee found in higher rainfall (300 - 450 millimetres mean annual rainfall) areas.	Habitat constraints not met. The species is limited to mallee communities which have not been identified in the Inland Slopes IBRA subregion. The species was therefore removed from further consideration as a candidate species based on this limitation not being for the following subregions: — Inland Slopes.
Pink Cockatoo *Lophochroa leadbeateri*	x	x	x	Candidate	Habitat constraint being: — hollow bearing trees — living or dead tree with hollows greater than 10 cm diameter.	Habitat constraints met. Hollow bearing trees and living or dead trees with hollows greater than 10 cm diameter are present in the subject land. The species was therefore retained as a candidate species based on habitat constraints being met for the following subregions: — Murray Fans — Murrumbidgee — Inland Slopes. However, the species has been excluded from several areas due to the lack of suitable hollow bearing trees including: — Derived condition class vegetation — Chenopod shrublands.

Species name	Subregion (IBRA)			Credit type	Geographic limitation/habitat constraints assessed	Presence in the subject land
	MF	MUR	IS			
Square-tailed Kite *Lophoictinia isura*	x	x	x	Candidate	Habitat constraint being nest trees.	Habitat constraints potentially met. This species was therefore retained as a candidate species based on habitat constraints being met for the following subregions: — Murray Fans — Murrumbidgee — Inland Slopes. However, the species has been excluded from several areas due to the lack of suitable vegetation for potential nest trees including: — Derived condition class vegetation — Chenopod shrublands.
Barking Owl *Ninox connivens*	x	x	x	Candidate	Habitat constraint being a living or dead tree with a hollow equal to or greater than 20 cm in diameter, which is greater than 4 m from the ground.	Habitat constraints met. Living or dead trees with a hollow equal to or greater than 20 cm in diameter, which is greater than 4 m from the ground, are present in the subject land. The species was therefore retained as a candidate species based on habitat constraints being met for the following subregions: — Murray Fans — Murrumbidgee — Inland Slopes. However, the species has been excluded from several areas due to the lack of suitable hollow bearing trees including: — Derived condition class vegetation.

Species name	Subregion (IBRA)			Credit type	Geographic limitation/habitat constraints assessed	Presence in the subject land
	MF	MUR	IS			
Plains-wanderer *Pedionomus torquatus*	x	x	-	Candidate	Habitat constraint being as per Important Habitat map	Important mapped habitat areas are located within the Murrumbidgee subregion subject land. The species was therefore retained as a candidate species based on habitat constraints being met for the following subregion: — Murrumbidgee. The species was therefore removed from further consideration as a candidate species based on habitat constraints not being met for the following subregion: — Murray Fans.
Regent Parrot (eastern)	x	x	-	Predicted	Geographic constraint being along the Wakool River west of Kyalite.	The subject land is located east of the geographical limitations and therefore this species is not considered for further assessment as a predicted species.

Species name	Subregion (IBRA)			Credit type	Geographic limitation/habitat constraints assessed	Presence in the subject land
	MF	MUR	IS			
Polytelis anthopeplus monarchoides	x	x	-	Candidate	Habitat constraints being living or dead *E. camaldulensis* with hollows greater than 5 cm diameter, greater than 5 m above the ground OR trees with DBH of greater than 40 cm, within 1 km of watercourses, or billabongs. Trees can be isolated but within 20 km of mallee. Geographic limitation being: — within 10 km of the junction of the Murray River (Murrumbidgee subregion) — along Wakool River west of Kyalite (Murray Fans subregion).	Habitat constraints are met. The subject land contains living or dead *E. camaldulensis* with hollows greater than 5 cm diameter, greater than 5 m above the ground and trees with DBH of greater than 40 cm within 1 km of watercourses or billabongs. These trees are within 20 km of mallee. Geographic constraints are not met for Murray Fans subregion. The subject land is east of Kyalite. Geographic constraints not met for Murrumbidgee subregion. The subject land is greater than 10 km from the junction of the Murray River. The species was therefore removed from further consideration as a candidate species based on geographic constraints not being met for the following subregions: — Murray Fans — Murrumbidgee. Within the Murrumbidgee and Murray Fans, the species is excluded from associated PCTs recorded in Derived and Derived low conservation value condition as these vegetation zones are characteristically treeless and therefore do not meet the habitat constraint of hollow bearing trees.

Species name	Subregion (IBRA)			Credit type	Geographic limitation/habitat constraints assessed	Presence in the subject land
	MF	MUR	IS			
Superb Parrot *Polytelis swainsonii*	x	x	x	Candidate	Habitat constraints being living or dead *E. blakelyi*, *E. melliodora, E. albens, E. camaldulensis, E. microcarpa, E. polyanthemos, E. mannifera, E. intertexta, E. bridgesiana* with hollows greater than 5 cm diameter that are greater than 4 m above ground or trees with a DBH of greater than 30 cm.	Habitat constraints are met. Hollow bearing trees, including *E. camaldulensis, E. blakelyi, E. melliodora* and *E. microcarpa* that meet the hollow specifications required for Superb Parrot are present in the subject land. The species is therefore retained as a candidate species based on habitat constraints being met for the following subregions: — Murray Fans — Murrumbidgee — Inland Slopes. However, the species has been excluded from several areas where the vegetation does not meet the listed habitat constraint being: — Derived condition class vegetation — Sandhill Pine communities not know to contain E. blakelyi, E. melliodora, E. albens, E. camaldulensis, E. microcarpa, E. polyanthemos, E. mannifera, E. intertexta or E. bridgesiana — Areas of Weeping Myall where *E. camaldulensis* have not been recorded.

Species name	Subregion (IBRA)			Credit type	Geographic limitation/habitat constraints assessed	Presence in the subject land
	MF	MUR	IS			
Masked Owl *Tyto novaehollandiae*	x	x	x	Candidate	Habitat constraint being a living or dead tree with a hollow greater than 20 cm diameter that occurs greater than 4 m above the ground.	Habitat constraints met. Living or dead trees with a hollow equal to or greater than 20 cm in diameter, which is greater than 4 m from the ground, are present in the subject land. The species was therefore retained as a candidate species based on habitat constraints being met for the following subregions: — Murray Fans — Murrumbidgee — Inland Slopes. However, the species has been excluded from several areas due to the lack of suitable vegetation for potential nest trees including: — Derived condition class vegetation — Chenopod shrublands.
Mammals						
Large-eared Pied Bat *Chalinolobus dwyeri*	-	-	x	Candidate	Habitat constraint being within 2 km of rocky areas containing caves, overhangs, escarpments, outcrops, or crevices, or within 2 km of old mines or tunnels.	Habitat constraints are not met. Rocky areas containing caves, overhangs, escarpments, outcrops, or crevices, or old mines or tunnels, are not present within 2 km of the subject land. The species was therefore removed from further consideration as a candidate species based on habitat constraints not being met for the following subregion: — Inland Slopes.

Species name	Subregion (IBRA)			Credit type	Geographic limitation/habitat constraints assessed	Presence in the subject land
	MF	MUR	IS			
Large Bent-winged Bat *Miniopterus orianae oceanensis*	-	-	x	Candidate	Habitat constraint being cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding including species records with microhabitat code "IC – in cave" observation type code "E nest-roost" with numbers of individuals greater than 500.	Habitat constraints are not met. The subject land itself does not contain caves, tunnels, mines, culverts or other structures known or suspected to be used for breeding by this species. The species was therefore removed from further consideration as a candidate species based on habitat constraints not being met in the following subregion: — Inland Slopes.
Southern Myotis *Myotis macropus*	x	x	x	Candidate	Habitat constraint being waterbodies with permanent pools / stretches 3m or wider, including rivers, large creeks, billabongs, lagoons, estuaries, dams and other waterbodies on or within 200 m of the site.	Habitat constraints have been partially met. Waterbodies with permanent pools / stretches 3 m or wider, including rivers, large creeks, billabongs, lagoons, estuaries, dams and other waterbodies are on or within 200 m of areas of the subject land have been identified in the Murray Fans IBRA subregion. Therefore, the species has been retained for assessment in Murray Fans IBRA subregion. Waterbodies with permanent stretches of pools 3 m or wider have not been identified in the Murrumbidgee or the Inland Slopes IBRA subregion. Therefore, the species has been excluded from the Murrumbidgee and Inland Slopes IBRA subregion. Additionally, the species has been excluded from PCTs where permanent pools are typically not recorded, being PCT 17 & 160.

Species name	Subregion (IBRA)			Credit type	Geographic limitation/habitat constraints assessed	Presence in the subject land
	MF	MUR	IS			
Squirrel Glider in the Wagga Wagga LGA *Petaurus norfolcensis – endangered population*	-	-	x	Candidate	Geographic limitation being Wagga Wagga LGA.	Geographic limitations are met. Part of the subject land is within Wagga Wagga LGA. The species was therefore retained as a candidate species based on geographic constraints being met for the following subregions: — Inland Slopes.
Brush-tailed Rock-wallaby *Petrogale penicillata*	-	-	x	Candidate	Habitat constraint being land within 1 km of rocky escarpments, gorges, steep slopes, boulder piles, rock outcrops or clifflines.	Habitat constraints are not met. There are no rocky escarpments, gorges, steep slopes, boulder, rocky outcrops, or clifflines within 1 km of the subject land. The species was therefore removed from further consideration as a candidate species based on habitat constraints not being met in the following subregion: — Inland Slopes.
Koala *Phascolarctos cinereus*	x	x	x	Candidate	Habitat constraint being presence of koala use and feed trees.	Habitat constraints are met. Koala use trees are common throughout most of the subject land. The species was therefore retained as a candidate species based on habitat constraints being met for the following subregions: — Murray Fans — Murrumbidgee — Inland Slopes. However, the species has been excluded from PCTs where koala use and feed trees are not typically recorded being, PCT 19, 28, 86, 160 & 216.

Species name	Subregion (IBRA)			Credit type	Geographic limitation/habitat constraints assessed	Presence in the subject land
	MF	MUR	IS			
Grey-headed Flying-fox *Pteropus poliocephalus*	-	-	x	Candidate	Habitat constraint being breeding camps.	Habitat constraints are not met as there are no breeding camps in the subject land. A small (category 1: 1-499 animals) Grey-headed Flying-fox camp was recorded in the Wagga Wagga region in 2015. However, no breeding camps are known to occur within the subject land. The species was therefore removed as a candidate species based on habitat constraints not being met for the following subregion: — Inland Slopes.
Reptiles						
Pink-tailed Legless Lizard *Aprasia parapulchella*	-	x	x	Candidate	Habitat constraint being within 50 m of rocky areas.	Habitat constraints partially met. There are very few rocky areas within the Murrumbidgee IBRA subregion. The areas in the subject land are characterised by heavy grey clays in the floodplains and red-brown, saline clays in the Hay Plains This species was therefore removed from further consideration as a candidate species based on this habitat constraint not being met for the following subregion: — Murrumbidgee. There are limited rocky areas in some eastern part of the subject land in the Inland Slopes IBRA subregion. The species was therefore retained as a candidate species based on this habitat constraint being met for the following subregion: — Inland Slopes.

Species name	Subregion (IBRA)			Credit type	Geographic limitation/habitat constraints assessed	Presence in the subject land
	MF	MUR	IS			
Striped Legless Lizard *Delma impar*	-	-	x	Candidate	Geographic limitations being south of the Mid-western highway.	Geographic constraints met. Part of the subject land is south of the Mid-western Highway. The species was therefore retained as a candidate species based on this geographic constraint being met for the following subregion: — Inland Slopes.
Invertebrates						
Golden Sun Moth *Synemon plana*	-	-	x	Candidate	Habitat constraints being Wallaby grass (*Rytidosperma sp*.), Speargrass (*Austrostipa sp.),* or Chilean needlegrass (*Nassella neesiana*). Geographic limitations being South of Mid-Western Highway.	Habitat constraints are met. Geographic constraints met. Part of the subject land is south of the Mid-western Highway. The species was therefore retained as a candidate species based on this geographic constraint being met for the following subregion: — Inland Slopes.

5.1.2 Further assessment of candidate species credit species

BAM subsection 5.2.3 (Step 3) outlines further options for removing a species credit species from the list auto-generated in the BAM-C. According to BAM section 5.2.3, a candidate species credit species is considered unlikely to occur on the subject land (or specific vegetation zones) if one of the following applies:

a) After carrying out a field assessment:

i. the assessor determines that microhabitats required by a species are absent from the subject land (or specific vegetation zone). The assessor must include a description of the microhabitats assessed as being required by the species in the BAR. This must be based on evidence such as published literature, or

ii. the assessor determines that the habitat constraints or microhabitats are degraded to the point that the species is unlikely to use the subject land (or specific vegetation zones).

b) An expert report states that the species is unlikely to be present on the subject land or specific vegetation zones.

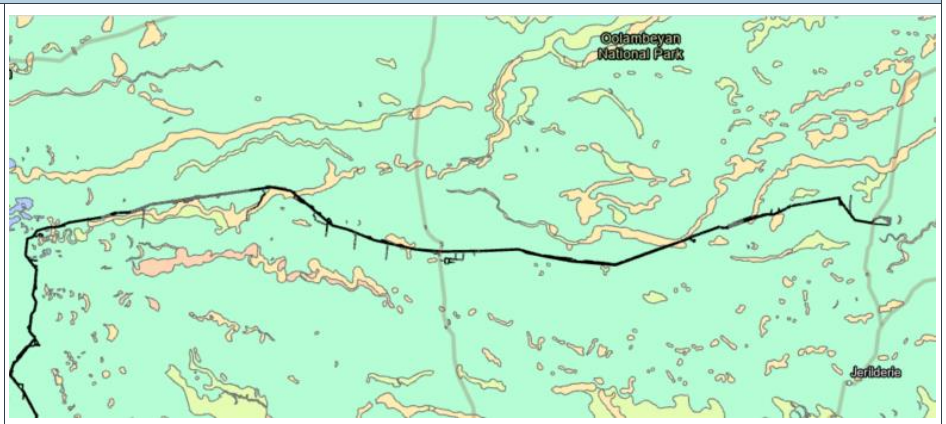
A candidate species credit species that does not have suitable habitat as defined above does not require further assessment.

Table 5.3 provides the further assessment for candidate species credit species according to BAM subsection 5.2.3 (Step 3). Table 5.3 provides the following:

- a description of microhabitats required by the species, supported by evidence such as published literature
- details of the habitat constraints listed in the TBDC for the species (where relevant)
- details of the field assessment conducted to determine if microhabitats are absent, or if present, whether microhabitats and/or habitat constraints identified within the TBDC are degraded to the point that the species is unlikely to use the subject land (or specific vegetation zones).

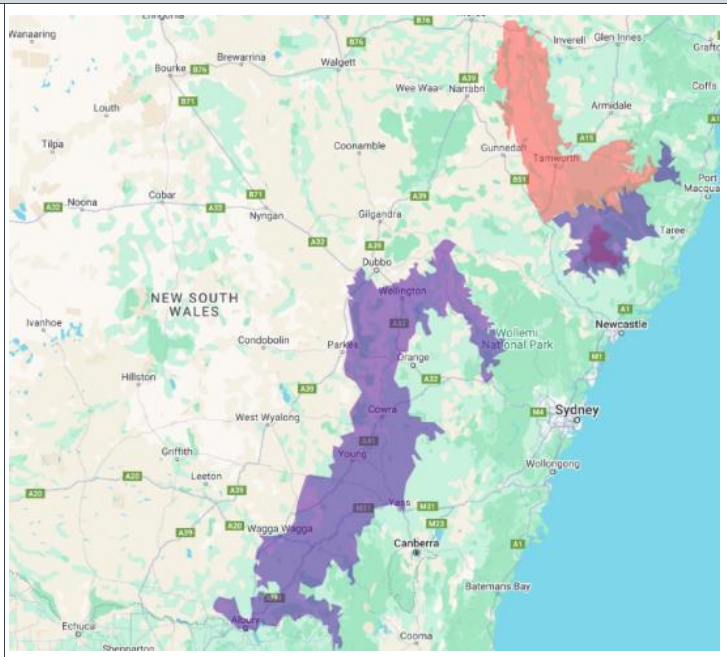
This assessment has been made based on the latest scientific evidence provided in the TBDC, BioNet, and other databases including the Commonwealth Species Profile and Threats Database and Birdlife International.

Table 5.3 Further assessment of candidate species credit species returned by the BAM-C

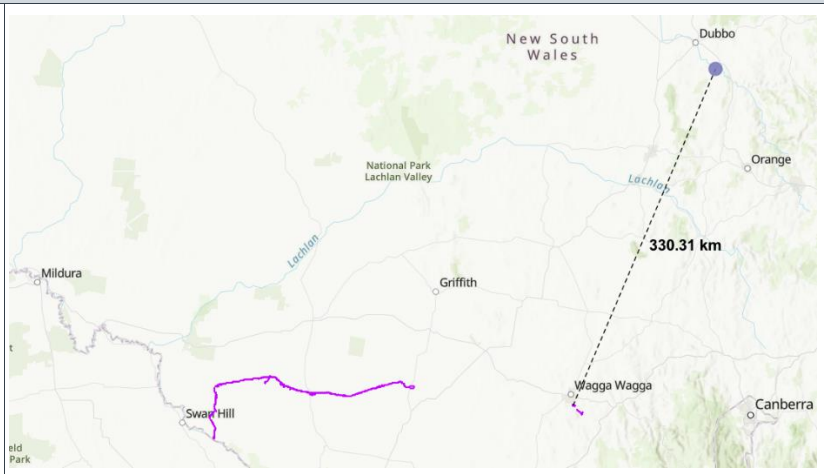
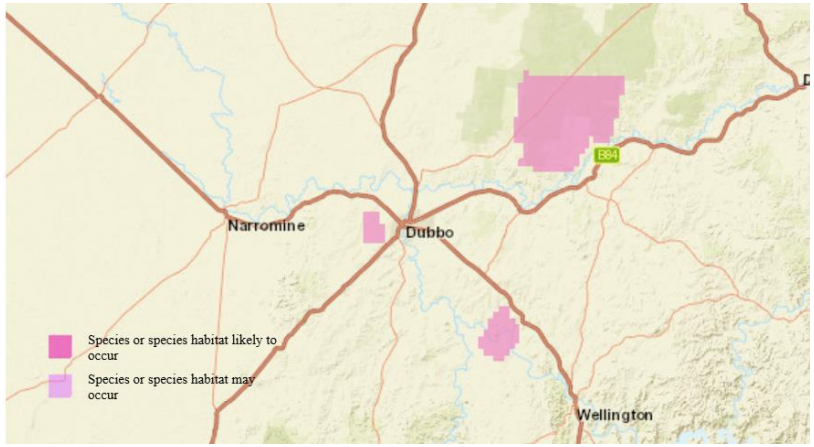
Species name	Habitat suitability	
Flora		
Convolvulus tedmoorei	Habitat descriptions for *Convolvulus tedmoorei* have been reviewed from multiple sources and have consistently been identified as being self-mulching grey clays (TBDC, TSSC 2022 & Johnson, R.W 2001). Self-mulching grey clays form part of the vertisol soil order which is the dominant soil order of the Hay Plains. A review of the Australian Soil Classification (ASC) soil type map of NSW was undertaken utilising GIS software (DPIE 2021). The ASC soil type map identified calcarosols, chromosols, rudosols, sodosols and vertisols to occur within the subject land (DPIE 2021). Where the soil order has not been identified to be vertisol, habitat for the species is not considered to occur due to the lack of suitable soil type. An additional review of habitat suitability was undertaken for each TBDC listed PCT for the species and compared to PCT descriptions from BioNet Vegetation Classification System and on-ground field verification surveys including BAM VI plots from within the subject land. PCTs that failed to identify self-mulching grey clays within the soil type descriptions from BioNet Vegetation Classification System and / or were not recorded from self-mulching grey clays during field verification surveys are considered unsuitable habitat for the species and have been removed from further consideration. Under a precautionary principle, PCTs that were indicated to occur on grey cracking clays in BioNet or from field verification surveys have been retained as self-mulching clays are a type of cracking clay.	 Distrubution of soil types from the ASC soil type map in relation to the subject land where green represents vertisols (DPIE 2021).

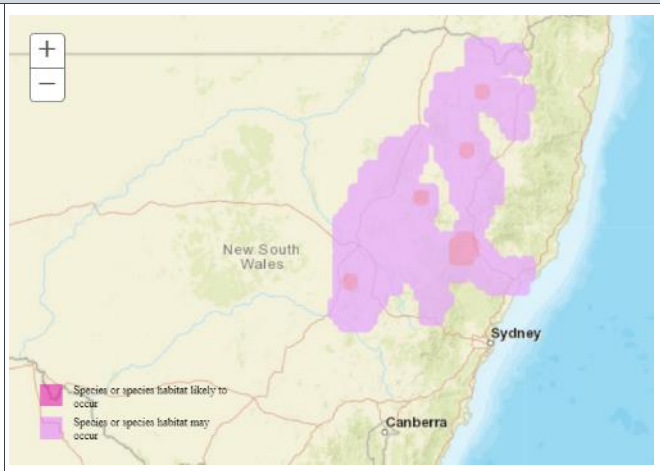
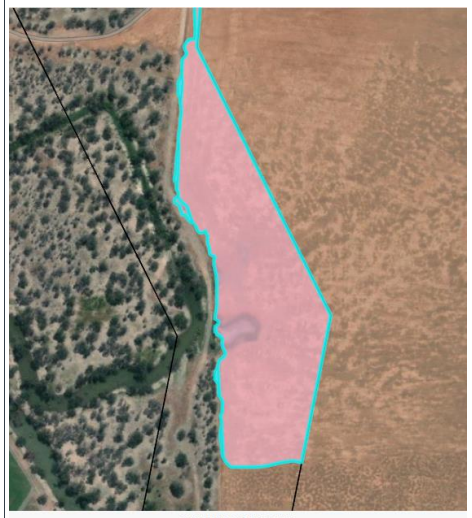
Species name	Habitat suitability	
	Of the potential PCTs identified by the TBDC within the subject land, the following PCTs are considered to not be habitat for the species due to unsuitable soil type: — PCT 24 - Occurs on heavy non-cracking clay and silty clay soils in periodically flooded depressions on floodplains, alluvial plains, claypans in sand dune and sandplain areas, and flood outs of watercourses. Soils are red-grey compact clay or sandy clay that crack very little (NSW DCCEEW 2024b). Confirmed by field verification surveys to occur on light grey to grey clays. — PCT 26 - Occurs on brown clays or loam soils on alluvial plains (NSW DCCEEW 2024b). Confirmed by field verification surveys to occur on red-brown, light brown and light grey clay loams, brown-grey, red-brown and light grey or brown clays, and red-brown or brown sandy clay loams. — PCT 46 - Occurs on medium brown to grey clays and loams on level alluvial plains (NSW DCCEEW 2024b). Confirmed by field verification surveys to occur on brown and grey clay or clay-loam soils. — PCT 163 - Occurs light grey to brown clay and loam soils that may be saline on alluvial plains and dry lake beds (NSW DCCEEW 2024b). Confirmed by field verification surveys to occur on light grey to grey or light brown clays. — PCT 164 - Occurs on grey to grey-brown clays or clay-loam soils on depressed alluvial plains (NSW DCCEEW 2024b). Confirmed by field verification surveys to occur on light brown, red-brown or light grey to grey clay and clay loams. — PCT 216 - Occurs on grey and brown clays on alluvial plains (NSW DCCEEW 2024b). Confirmed by field verification surveys to occur on light grey to grey or light brown clay and clay loams.	

Species name	Habitat suitability	
	The following PCTs have been retained for further assessment: — PCT 17 – Occurs on black, brown and grey-cracking clay soils and clay loam soils in river channels and depressions on floodplains subject to regular flooding (NSW DCCEEW 2024b). Confirmed by field verification surveys to occur on grey clays. — PCT 44 - Occurs on grey-cracking clays and red-brown clays often including scalds on the plains (NSW DCCEEW 2024b). Confirmed by field verification surveys to occur on grey-brown, red, red-brown and light brown clay, clay loam or sandy clay loams. — PCT 45 - Occurs on dark grey, self-mulching clays and clay loam soils in slightly low lying areas of the floodplains and alluvial plains (NSW DCCEEW 2024b). Field verification of this PCT has not been undertaken and is limited to areas subject to SVTM or the approved Project EnergyConnect BDAR (WSP 2022). — PCT 157 - Occurs on grey and brown cracking clays and red-brown clay loam soils on alluvial plains including the Hay Plain. Confirmed by field verification surveys to occur on light grey, grey and red-brown cracking clay, clay and sandy clay loams. — PCT 159 - Occurs on cracking grey and brown clay or brown loam soils that are sometimes gilgaied on floodplains in drainage depressions (NSW DCCEEW 2024b). Field verification of this PCT has not been undertaken and is limited to areas subject to SVTM. — PCT 160 - Occurs on cracking clay or sandy clay soils in lake beds, low lying plains, drainage depressions and alluvial plains subject to flooding (NSW DCCEEW 2024b). Confirmed by field verification surveys to occur on grey clay and cracking clays.	

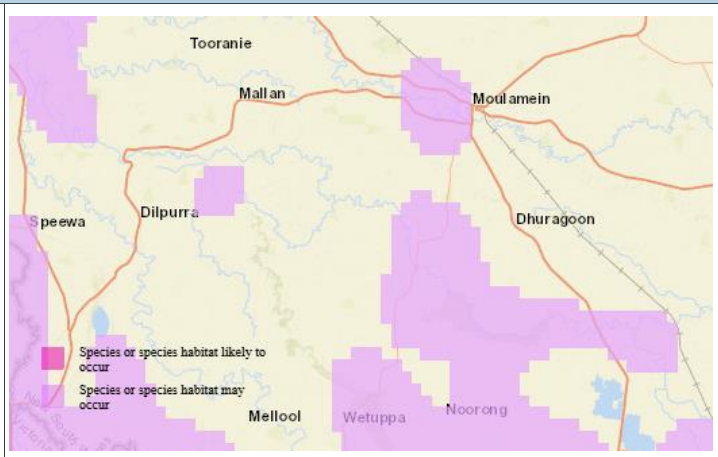
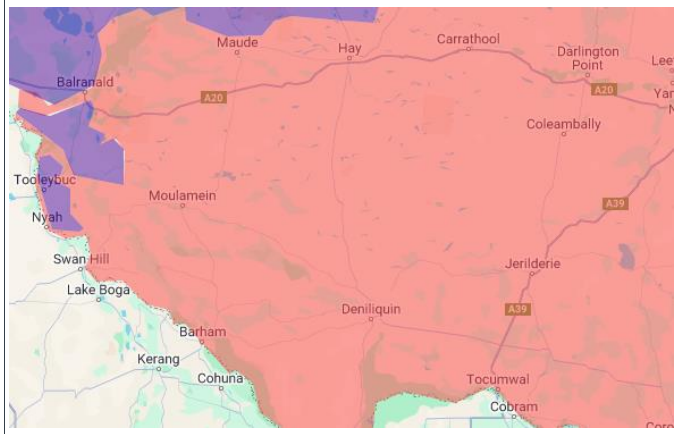
Species name	Habitat suitability	
Euphrasia arguta	*Euphrasia arguta* is an annual herb reaching a height of 20-35 cm and considered semi-parasitic. The species grows near rivers. Most of the known records include Nundle NSW in the north western slopes and tablelands. Another record in Barrington Tops in 2012. Both location are >500kms from the subject land. The species prefers Eucalypt Forest with a shrub/grassy understorey. While PCTs 266 and 277 provide potentially suitable habitat, the species is excluded based on the distance between known populations and the subject land.	 Distribution map of the species as provided on SPRAT profile where known distribution is shown as red and predicted distribution is shown as purple (DCCEEW 2025).

Species name	Habitat suitability	
Diuris tricolor Pine Donkey Orchid	*Diuris tricolor* is a terrestrial species (it grows from the ground rather than from rocks or vegetation). Within the Inland Slopes subregion, the species is associated with PCT 76 and has been assumed present where targeted surveys were not possible due to restricted access. Within the Murrumbidgee IBRA subregion, the species is associated with PCT 70 which has only been identified within the SVTM in one location along Mabins Well Road in the east of the subject land. Vegetation mapped as PCT 70 is restricted to a linear strip that has been cleared and made into a formed road (screenshot right). Potential habitat associated with this polygon is considered extremely limited and the species has been excluded for the Murrumbidgee IBRA subregion.	 Area of excluded potential habitat along Mabins Well Road where the subject land is shown by black outline and area of excluded habitat is shown as a blue polygon.

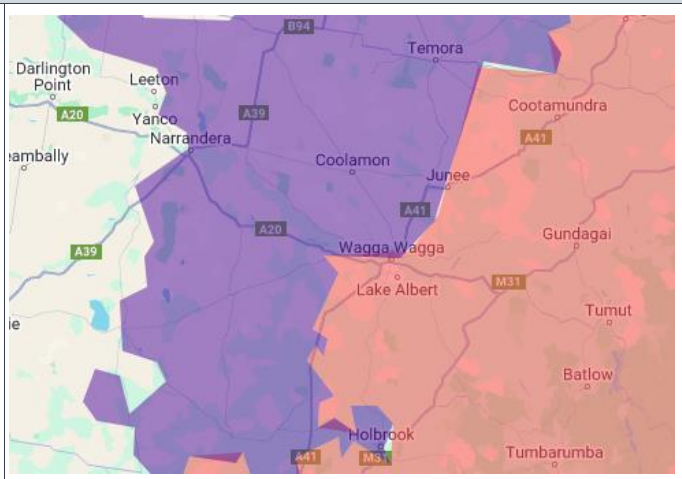
Species name	Habitat suitability	
Indigofera efoliata Leafless Indigo	*Indigofera efoliata* has only been recorded from central western slopes of NSW, from Dubbo to Guerie (DCCEEW, 2008)). The most recent recording of the species was in spring 2021, where it was rediscovered in Guerie (TBDC). Currently, the distribution of *Indigofer efoliata* is indicated to be exclusively within the locality of Dubbo and Guerie (DCCEEW, 2025). The subject land falls approximately 330 km south west of Dubbo and Guerie. *Indigofera efoliata* is associated with PCT 76, of which approximately 0.30 ha occurs within the subject land in the form of a narrow linear strip of road-side vegetation in an area largely subject to intensive agriculture. Further, no previous records of the species occur on the subject land. Given the distance from the subject land to the nearest *Indigofera erafoliata* record and the lack of suitable habitat available within the subject land, this species is considered highly unlikely to occur within the subject land. As such the species is excluded from further assessment.	 Above: Distance between the subject land and nearest known record of the species, where the purple line represents the project footprint and the blue dot represents the closest record of *Indigofera efoliata*.  Above: Distribution map where the current known distribution of the species is represented, as provided on SPRAT profile (DCCEEW 2025).

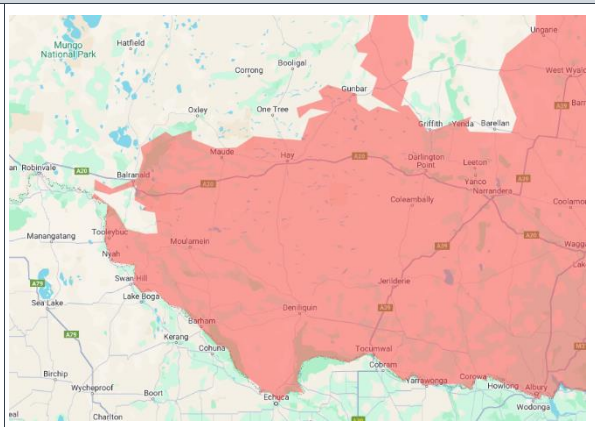
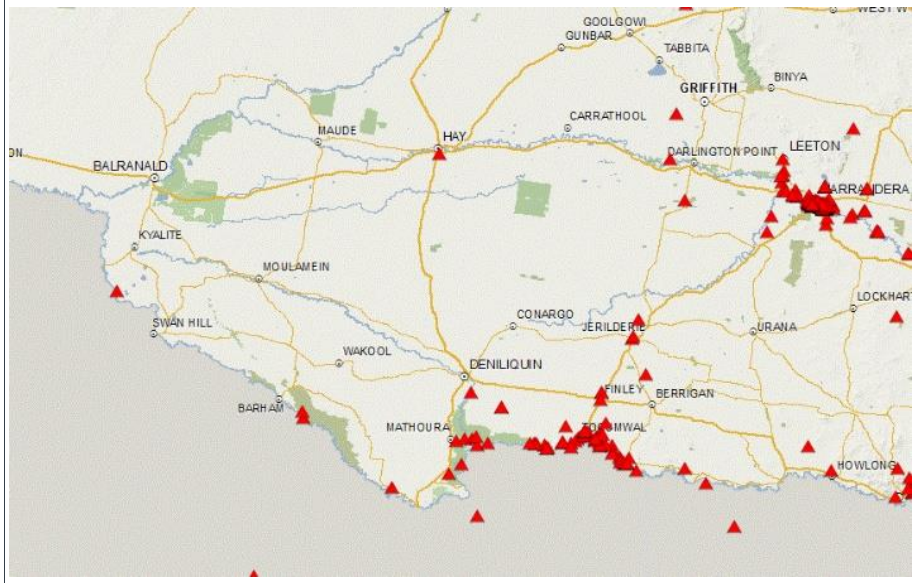
Species name	Habitat suitability	
Prasophyllum sp. Wybong	This species is considered to be synonymous with *Prasophyllum petilum* and is currently undergoing a taxonomic review. However, for the purposes of this BDAR, *Prasophyllum* sp. *Wybong* has been assessed as a separate species given information for the species is readily available in the form of Commonwealth published listing and conservation advice (TSSC 2009 & DEWHA 2009). Whilst *Prasophyllum* sp. *Wybong* is predicted to occur within the subregion, there are no previous records in the Inland Slopes IBRA subregion. The current known distribution for *P.* sp *Wybong* has been identified by DCCEEW to occur north of Sydney. As such, the species has been excluded from further consideration. This approach is consistent with the approved HumeLink BDAR (Niche, 2024).	 Distribution map of the species as provided on SPRAT profile where known distribution is shown as red and predicted distribution is shown as purple (DCCEEW 2025).
Swainsona sericea Silky Swainson-pea	*Swainsona sericea* has been recorded from the Northern Tablelands to the Southern Tablelands, and further inland on the slopes and plains. Habitat for the species has been listed by the TBDC as natural temperate grasslands, Snow Gum Woodland, Box-Gum Woodland and occasionally in association with cypress-pines (*Callitris* sp.). Within the subject land, no natural temperate grasslands and Snow Gum Woodlands occur and with Box-Gum Woodlands and Cypress-Pine communities largely being restricted compared to the overall extent of the subject land. *Swainsona sericea* is associated with multiple PCTs present within subject land, including PCTs 23, 26, 28, 44, 45, 46, 70, 76, 237, 266 and 277. Based on the extent of potential habitat and the proximity to known records within the Murrumbidgee and Inland Slopes IBRA subregion, the species has been retained for further assessment in these subregions.	 

Species name	Habitat suitability	
	However, within the Murray Fans IBRA subregion, habitat for the species is limited to field verified PCT 28 & 237 and areas of PCT 44 subject to SVTM (PCT 44_SVTM). Both PCT 28 & 237 have largely been subject to targeted threatened species surveys with the species not being recorded. Areas of PCT 44_SVTM have not been subject targeted threatened species surveys due to land access restrictions. However, a desktop review of areas of PCT 44_SVTM was undertaken with a large number of these areas being subject to intensive agriculture. Additionally, the species nearest known records to the area of the subject land that falls within the Murray Fans IBRA subregion is approximately 100kms to the east near the Cobb Highway and the town of Deniliquin. As such, due to degraded habitat and distance to nearest known records, *Swainsona sericea* has been excluded from further consideration in the Murray Fans IBRA subregion.	 Examples of PCT 44_SVTM where the species has been excluded where PCT 44_SVTM is identified by pink polygons. Clear evidence of intensive agriculture can be seen in the aerial imagery.

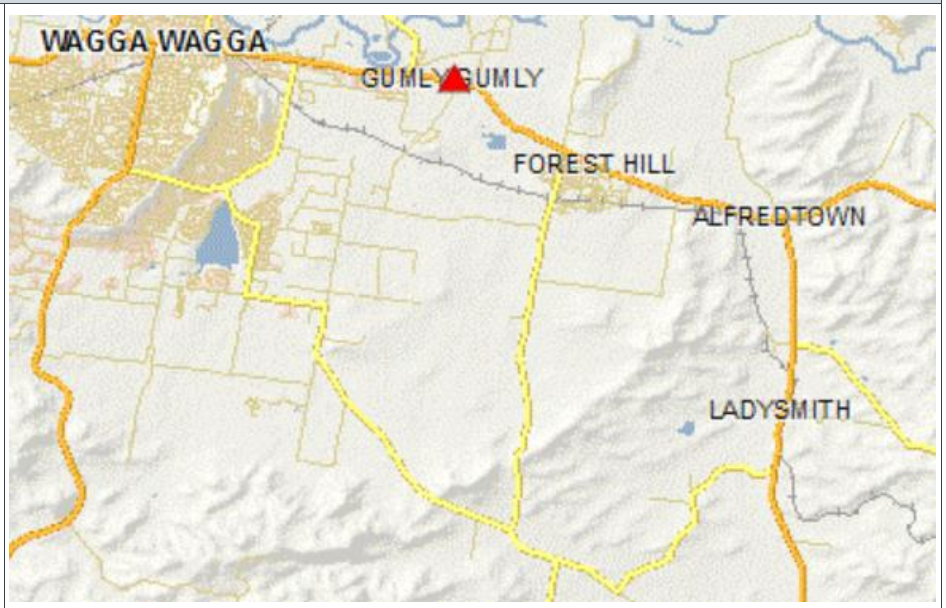
Species name	Habitat suitability	
Fauna		
Sloane's Froglet *Crinia sloanei*	While the species is considered endemic to the Murray-Darling Basin from north central Victoria to central western NSW, it has disappeared from much of its former distribution. It is now known predominantly from the Corowa – Albury region of NSW, with 95 per cent of records since 2000 coming from this area. The species also occurs in isolated populations in Wangaratta, Chiltern, Little Lake Charm, and Moodies Swamp in Victoria (TSSC 2019). Species distribution modelling for Sloane's Froglet shows fragmented areas of potential habitat for the species around the Edward and Wakool Rivers within the subject land (right). The species relies on permanent and ephemeral waterbodies containing riparian and aquatic vegetation, typically grasses and reeds, for breeding. Habitat loss and degradation, namely through clearing, trampling, and fragmentation, are listed as key threats in the species' Conservation Advice under the EPBC Act. Following an assessment of potential habitat for Sloane's Froglet in associated PCTs (PCT 237) in the subject land, waterbodies were found to be of low quality, with evidence of extensive grazing by livestock and feral herbivores, disturbance by the public (e.g. adjoining public campgrounds), and poor connectivity to nearby waterbodies. Specifically, aquatic vegetation was not present in any shallow depression that may hold water during rain events and was absent from larger permanent watercourses and waterbodies nearby. Potential habitat at Edward River was dominated by regenerating Black Box *Eucalyptus largiflorens* and Nitre Goosefoot *Chenopodium nitrariaceum* such that bare ground for recruitment of aquatic vegetation was extremely limited (see image right). Potential habitat at Wakool River has been subject to intensive grazing by livestock such that no understorey was present at the time of habitat survey. Potential habitat at Merran Creek was lacking pooled water and suitable aquatic vegetation.	 Above: SPRAT species distribution modelling for Sloane's Froglet showing potential habitat around the Edward and Wakool Rivers.  Above: BioNet modelling showing known (red) and predicted (purple) habitat for Sloane's Froglet.

Species name	Habitat suitability	
	Limited targeted surveys were undertaken for two nights at the Edward River during which the species was not recorded. The habitat condition in the subject land is considered unsuitable due to a lack of connecting pools with suitable vegetation. It is unlikely the species occurs on the subject land due to geographical limitations and limited habitat available. Furthermore, the subject land is estimated to be approximately 400 km from the current stronghold populations of the species. As such, Sloane's Froglet has been excluded from further assessment.	 Above: PCT 237 from the subject land (Edward River north side). Photo: Emi Arnold

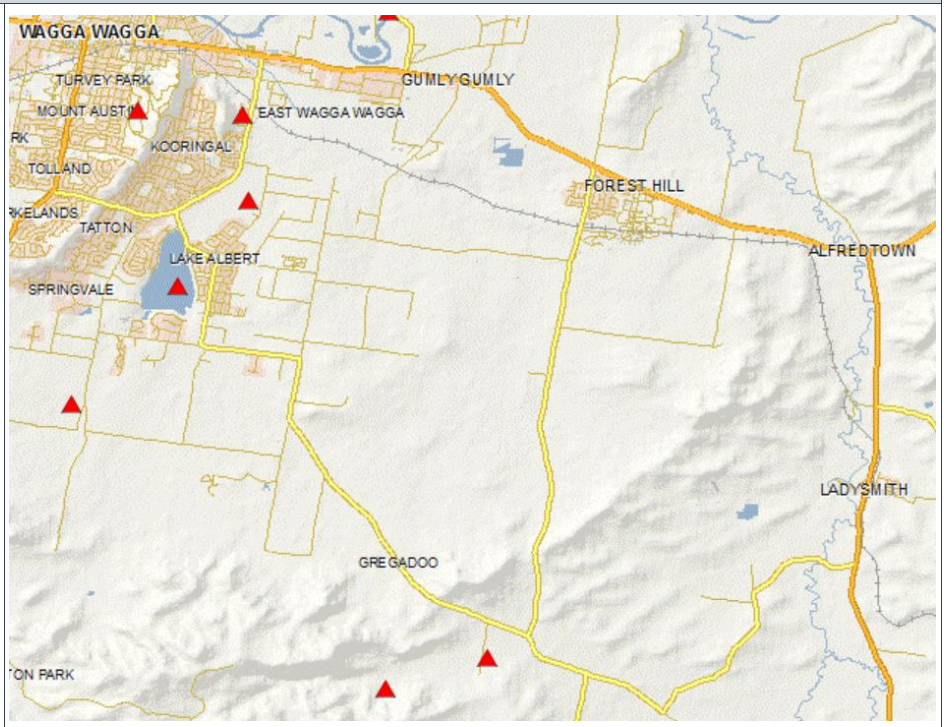
Species name	Habitat suitability	
Eastern Pygmy-possum *Cercartetus nanus*	The species' range extends from southern Queensland to eastern South Australia. Its distribution in NSW includes the Pilliga, central west, Parkes, and Wagga Wagga (OEH 2025), though it is predominantly found in coastal areas and at higher elevations in the south of its range. Extensive survey efforts in recent decades have found that its distribution within NSW is patchy and its overall abundance is low, with only a small percentage of surveys detecting the species (TSSC 2001). No surveys in the Wagga Wagga area detected more than 10 observations of Eastern Pygmy-possum, though the outcomes of subsequent surveys (if any) are unknown. While the species prefers habitat with a shrubby understorey, it is known to occupy fragmented patches of habitat, including grassy woodlands and areas of Eucalypts with no understorey. Surveys have found the greatest detection rates occur in areas with flowering *Banksia* spp, which is its preferred food source. Based on the highly fragmented and disturbed nature of the species' habitat for PCTs 277 (vegetation condition Moderate-good and thinned) and PCT 343 (vegetation condition Moderate-good) and the absence of *Banksia* spp within the subject land, it is unlikely that the subject land is suitable to sustain Eastern Pygmy-possum (Figure 15.8). Furthermore, given the species is predominantly found closer to the coast or at higher elevations it is considered unlikely to occur within the subject land and excluded from further assessment.	 Above: BioNet modelling showing known (red) and predicted (purple) habitat for Eastern Pygmy-possum. Note the majority of the subject land is to the west of the predicted area.

Species name	Habitat suitability	
Koala *Phascolarctos cinereus*	The Koala has a fragmented distribution throughout eastern Australia from north-east Queensland to the Eyre Peninsula in South Australia. In New South Wales, Koala populations are found on the central and north coasts, southern highlands, southern and northern tablelands, Blue Mountains, southern coastal forests, with some smaller populations on the plains west of the Great Dividing Range. Koalas inhabit eucalypt woodlands and forests. The feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area would select preferred browse species. Some preferred species include Forest Red Gum, Grey Gum. In inland areas White Box, Bimble Box and River Red Gum are favoured. Vegetation data from surveys carried out by WSP across the subject land shows that suitable PCTs with Koala feed trees were present in all three IBRA subregions. However, based on the Bionet records (refer to adjacent map) the Koala records are within the Murray Fans and Inland Slopes IBRA subregions. Within the Murrumbidgee IBRA subregion, PCTs 13 and 15 contain Koala feed trees however these trees are limited to creeklines and widely scattered across the subject land. Spotlighting in these areas over various surveys in 2024 and 2025 (see section 2.5 for details of methodology and section 5.3 for results) did not record any Koalas. The Murrumbidgee IBRA subregion is more arid with a dominance of chenopod shrublands. Eucalypt woodlands are connected through rivers and creek tributaries limiting a Koalas movement for feed trees and breeding. The BioNet records also show Koala persistence in the western arid part of the state remains in the large patches of remnant vegetation along major watercourses therefore Koala have been excluded from the Murrumbidgee IBRA subregion and retained in the Murray Fans and Inland Slopes IBRA subregions.	 Known Koala habitat as shown by BioNet threatened species profile  Koala records as shown by BioNet Atlas mapping

Species name	Habitat suitability	
Booroolong Frog *Litoria booroolongensis*	The Booroolong Frog is restricted to NSW and north-eastern Victoria, predominantly along the western-flowing streams of the Great Dividing Range. It has disappeared from much of the Northern Tablelands; however, several populations have recently been recorded in the Namoi catchment. The species is rare throughout most of the remainder of its range. The Booroolong Frog lives along permanent rocky streams that only ever dry to pools. Adults are found within stream margins on or near banks of cobble stones and bedrock that provide crevices. The Booroolong Frog is associated with PCT 343 and 346 which is present within the subject land within the network augmentation works footprint. However, habitat assessments carried out by WSP in February 2025 indicated that suitable habitat for Booroolong Frog was not present within the subject land. Within suitable vegetation types in the subject land, a singular inundated waterbody was identified to occur in PCT 343_derivedLCV in the form of a farm dam (screenshot right). This waterbody was subject to high levels of weed incursion, agricultural degradation and lacks connectivity to more suitable larger aquatic habitats. A second potential waterbody was identified directly adjacent to the subject land in PCT 346_Mod-good in the form of an ephemeral creek that was dry at time of inspection. Considering the lack of suitable habitat present, it is considered highly unlikely this species would be present and as such is excluded from further assessment.	 Singular inundated waterbody within habitat type (PCT) associated with the Booroolong Frog.

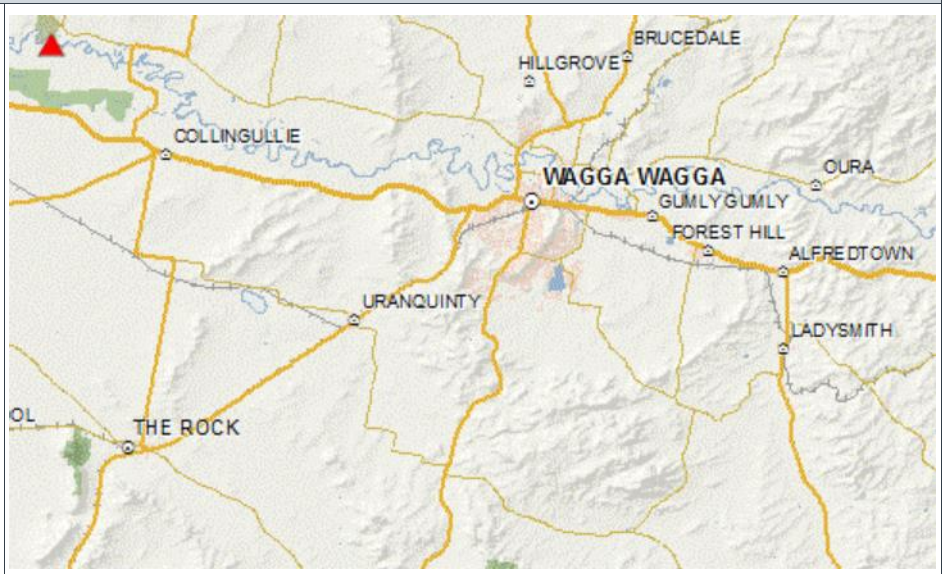
Species name	Habitat suitability	
White-bellied Sea-Eagle *Haliaeetus leucogaster*	Habitat for White-bellied Sea-eagle is characterised by the presence of large areas of open water including larger rivers, swamps, lakes, and the sea. Breeding habitat consists of mature tall open forest, open forest, tall woodland, and swamp sclerophyll forest close to foraging habitat. Nest trees are typically large emergent eucalypts and often have emergent dead branches or large dead trees nearby which are used as 'guard roosts'. There is one record of White-bellied Sea-eagle within 4 kilometres of the subject land, consisting of two individuals seen at 3711 Wanganella Moulamein Road. No BioNet records are located in the subject land, within the Inland Slopes IBRA subregion. The nearest BioNet record is located about 9 kilometres north of the subject land in Gumly Gumly. White-bellied Sea-Eagle has been excluded in the Inland Slopes IBRA subregion based on the Humelink BDAR species expert report (Niche, 2024). The species expert report provides more realistic patch size thresholds to reduce the extent of mapped habitat for this species, and concludes that this approach is suitable for calculating species and ecosystem credits for White-bellied Sea-Eagle.	 White-bellied Sea-eagle BioNet records (TBDC, 2025)

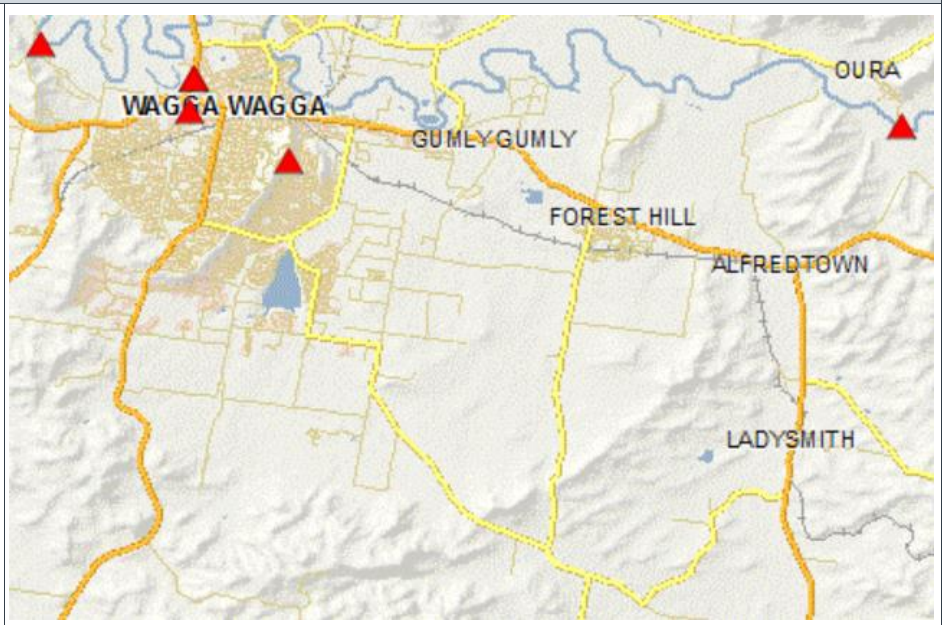
Species name	Habitat suitability	
Grey Snake *Hemiaspis damelii*	The Grey Snake typically resides in floodplains and ephemeral wetlands associated with heavy clay soils. In NSW, the Grey Snake's habitat includes the margins of ephemeral wetlands within River Red Gum *(Eucalyptus camaldulensis)* and Black Box *(E. largiflorens)* vegetation communities and Tangled Lignum *(Duma florulenta)*. The species shelters in soil cracks, rocks, logs, flood debris, and abandoned burrows within these habitats (TBDC, 2025). The Grey Snake has been reclassified as Endangered under the EPBC Act and reflects the significant threats to an already fragmented population. A primary threat to the Grey Snake is listed to be continued landscape modification through the loss of primary habitat in the form of ephemeral wetlands and the degradation of critical soil structure, where the cracked clay substrate the Grey Snake occupies is destroyed by heavy machinery (Michael et al., 2020). Within the Murray Fans and Murrumbidgee IBRA subregion, the species has been identified as a candidate species within several PCTs associated with cracking clays, floodplains and ephemeral wetlands. Several areas of identified potential habitat occur within a largely modified landscape subject to large scale intensive agriculture. As stated by Michael et al. (2020) areas where the soil structure has been destroyed by heavy machinery the species is not able to persist due to a lack of habitat. As such, areas of small isolated patches in an otherwise modified landscape have been excluded from consideration.	 Example of a highly modified landscape considered unsuitable for the species within the Murray Fans IBRA subregion.

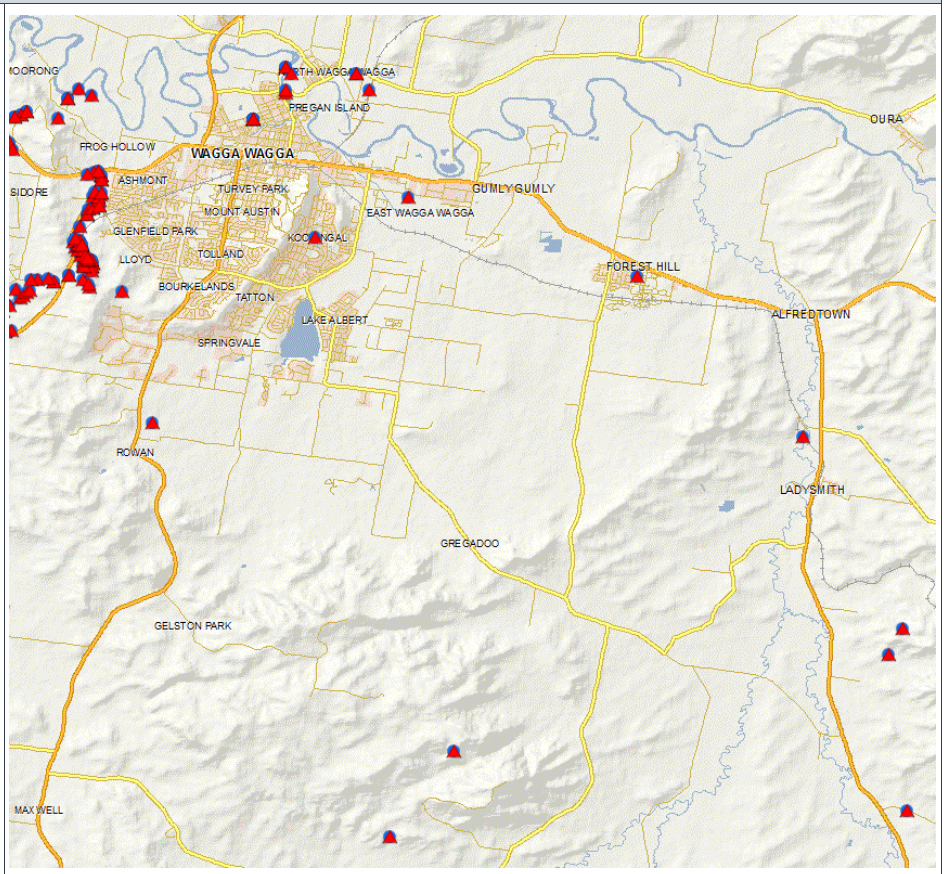
Species name	Habitat suitability	
Little Eagle *Hieraaetus morphnoides*	Habitat for Little Eagle includes open eucalypt forests, woodlands or open woodlands and pastures. They have been observed utilising Sheoak or Acacia woodland and riparian woodlands of inland NSW, with a strong association to Yellow Box – Red Gum Grassy Woodland and Derived Native Grassland. There is one record of Little Eagle located just outside of the subject land on H354. There is one record located nearby the subject land in Gregadoo. However, no BioNet records are located in the subject land, within the Inland Slopes IBRA subregion. Little Eagle has been excluded in the Inland Slopes IBRA subregion based on the Humelink BDAR species expert report (Niche, 2024). The species expert report provides more realistic patch size thresholds to reduce the extent of mapped habitat for this species, and concludes that this approach is suitable for calculating species and ecosystem credits for Little Eagle.	 Little Eagle BioNet records (TBDC, 2025)

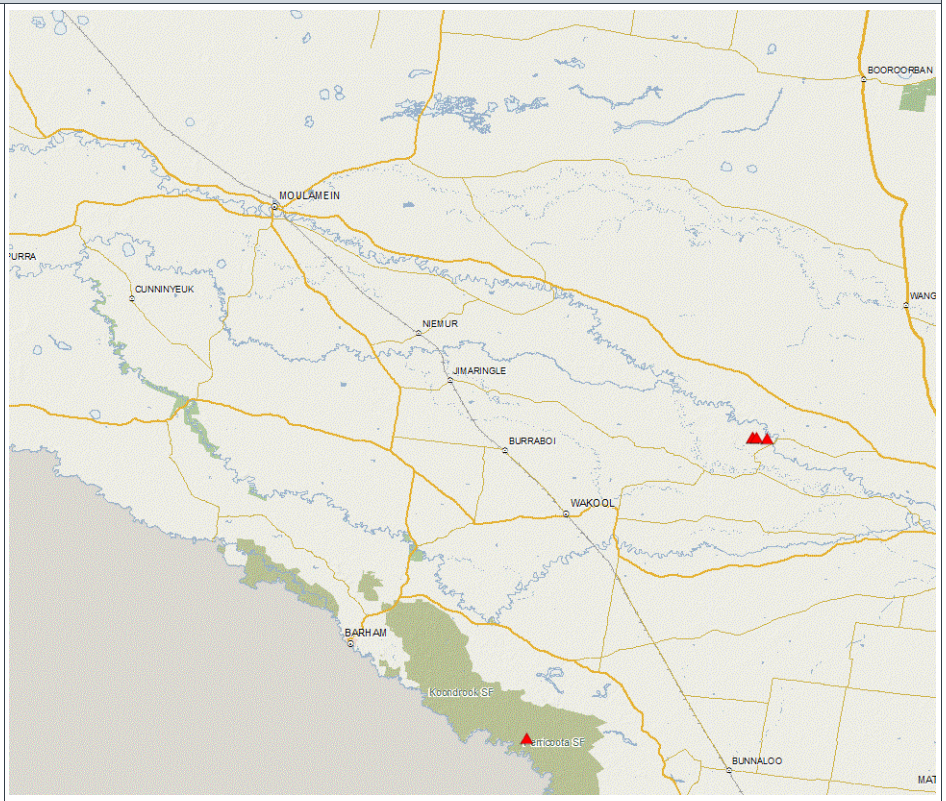
Species name	Habitat suitability	
Pink Cockatoo *Lophochroa leadbeateri*	The Pink Cockatoo inhabits a wide range of treed and treeless inland habitats, often within close reach of water (OEH 2024). Habitat for Pink Cockatoo is associated with multiple PCTs throughout the subject land within the Murrumbidgee and Murray Fans subregions, including PCTs 2, 7, 10, 11, 13, 15, 19, 23, 26, 28, 45, 58, 70, 76, 163, 170 and 346. Only one PCT, being PCT 76, is present in the subject land within the Inland Slopes subregion. There are multiple occurrence records for Pink Cockatoo within the Murrumbidgee and Murray Fans subregions, and two occurrence records located within the Inland Slopes subregion (see adjacent ALA map). Based on the available evidence, Pink Cockatoo has been retained for further assessment within the Murrumbidgee and Murray Fans subregions. Given the lack of potential habitat and limited occurrence records within the Inland Slopes subregion, this species is considered a vagrant and highly unlikely to occur in the subject land within this subregion. As such, the species has been removed from consideration in the Inland Slopes IBRA subregion.	 Above: Modelled distribution of Pink Cockatoo habitat known or likely to occur (pink) and where habitat may occur (purple).

Species name	Habitat suitability	
		 Above: Pink Cockatoo occurrence records within the Inland Slopes subregion orange dots with red circles) (ALA 2025).

Species name	Habitat suitability	
Square-tailed Kite *Lophoictinia isura*	Square-tailed Kite is found in timbered habitats, including dry woodlands and open forests, shows a particular preference for timbered watercourses. There are no BioNet records located in the subject land, within the Inland Slopes IBRA subregion. The nearest record is located about 30 kilometres north-west of the subject land, outside of Collungullie (refer to adjacent map). Square-tailed Kite has been excluded in the Inland Slopes IBRA subregion based on the Humelink BDAR species expert report (Niche, 2024). The species expert report provides more realistic patch size thresholds to reduce the extent of mapped habitat for this species, and concludes that this approach is suitable for calculating species and ecosystem credits for Square-tailed Kite.	 Square-tailed Kite BioNet records (TBDC, 2025)

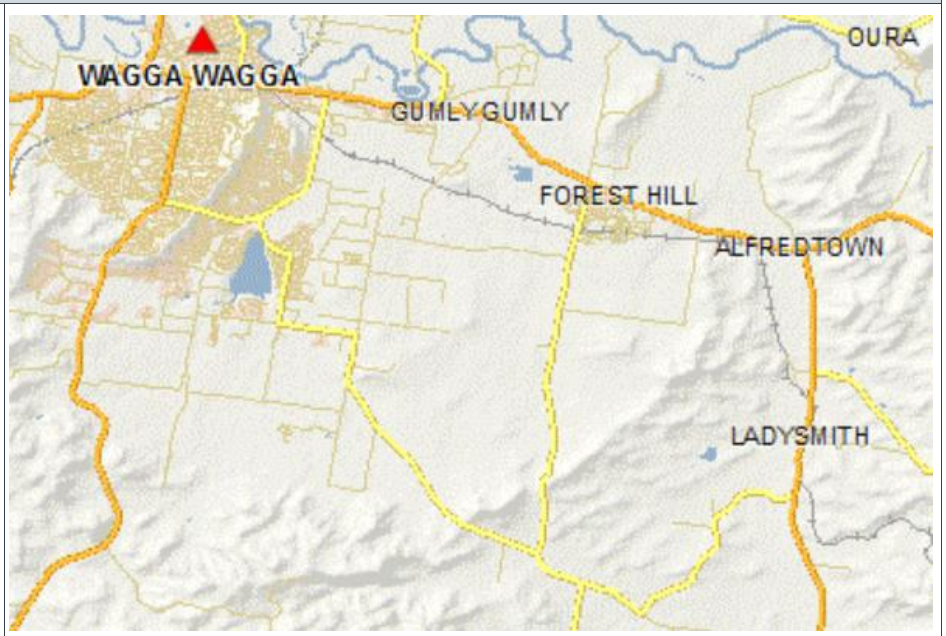
Species name	Habitat suitability	
Barking Owl *Ninox connivens*	The Barking Owl prefers woodland and open forest habitat, including forest remnant patches, but requires a large permanent territory – with breeding pairs requiring areas of up to 2000 hectares for foraging and permanent home ranges of up to 6000 hectares. The species roost in shaded portions of tree canopies, including tall mid-storey trees. They prefer living eucalypts, but dead trees are also used as nest sites. There are no BioNet records located in the subject land, within the Inland Slopes IBRA subregion. The nearest record is located about 8 kilometres north of the subject land, near Wagga Wagga (refer to adjacent map). Barking Owl has been excluded in the Inland Slopes IBRA subregion based on the Humelink BDAR species expert report (Niche, 2024). The species expert report provides more realistic patch size thresholds to reduce the extent of mapped habitat for this species, and concludes that this approach is suitable for calculating species and ecosystem credits for Barking Owl.	 Barking Owl BioNet records (TBDC, 2025)

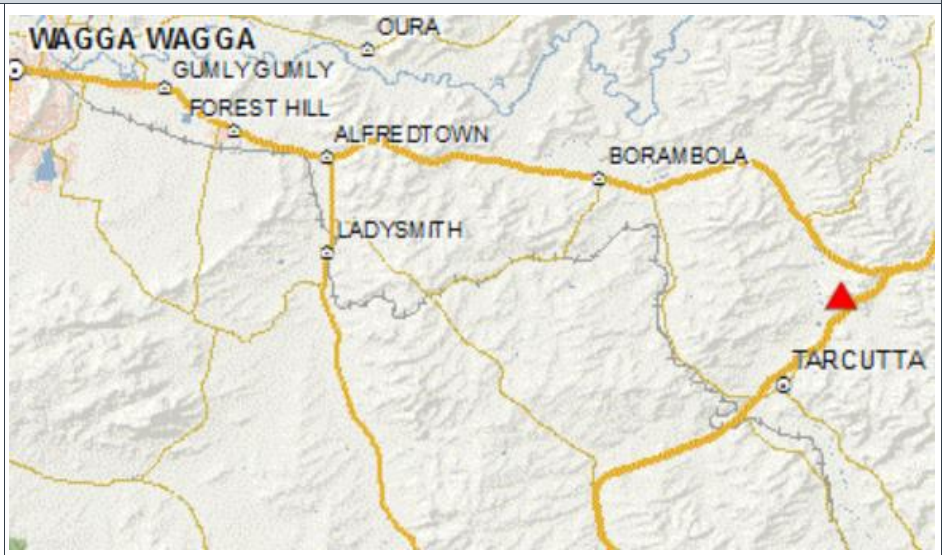
Species name	Habitat suitability	
Squirrel Glider *Petaurus norfolcensis*	The Squirrel Glider is a medium sized (approximately 190–300 grams) arboreal gliding marsupial that occurs in dry sclerophyll forests and woodlands in eastern mainland Australia, typically up to 300 metres above sea level (van der Ree and Suckling 2023). The species distribution extends along the Great Dividing Range from central Cape York in Queensland, south to central Victoria with some isolated occurrences in eastern South Australia (van der Ree and Suckling 2023). In northern NSW and Queensland, Squirrel Gliders extend into coastal forests and wetter swamp forests (Rowston et al. 2002, Smith and Murray 2003). The Squirrel Glider has been identified as a candidate species within both the Murray Fans and Inland Slopes IBRA subregions. Within the Inland Slopes IBRA subregion, the species has been regularly recorded within proximity to the subject land. While in the Murray Fans IBRA subregion, records are sparse, and the species is not recorded in proximity to the subject land. A species expert report has been prepared by species expert Dr. Rodney van der Ree in accordance with Box 3 of the BAM and has been provided as Appendix I of this report. The outcome of the species expert assessment has indicated no suitable habitat for the species in the Murray Fans IBRA subregion and limited habitat within the Inland Slopes IBRA subregion. Species polygons have been created in accordance with species expert guidance and impact calculations for the species have been provided in section 5.5. However, as the subject land falls within the boundaries of the Wagga Wagga Local Government Area, impacts to the species are considered under the Endangered population listing.	 Squirrel Glider BioNet records (TBDC, 2025) within the Inland Slopes IBRA subregion.

Species name	Habitat suitability	
		 Squirrel Glider BioNet records (TBDC, 2025) within the Murray Fans IBRA subregion.

Species name	Habitat suitability	
Brush-tailed Phascogale *Phascogale tapoatafa*	The Brush-tailed Phascogale *Phascogale tapoatafa* is a small (~110–310 grams), semi-arboreal marsupial carnivore with a broad but highly fragmented distribution around the periphery of Australia (Aplin et al. 2015). The Brush-tailed Phascogale has been identified as a candidate species within both the Murray Fans and Inland Slopes IBRA subregions. BioNet records for both the Murray Fans and Inland Slopes indicate a general lack of records of this species in proximity to the subject land. A species expert report has been prepared by species expert Dr. Rodney van der Ree in accordance with Box 3 of the BAM and has been provided as Appendix I of this report. The outcome of the species expert assessment has indicated no suitable habitat for the species within the Murray Fans and Inland Slopes IBRA subregion. As such, this species has been excluded and is not considered further.	 Brush-tailed Phascogale BioNet records (TBDC, 2025) within the Inland Slopes IBRA subregion.

Species name	Habitat suitability	
		 Brush-tailed Phascogale BioNet records (TBDC, 2025) within the Murray Fans IBRA subregion.

Species name	Habitat suitability	
Masked Owl *Tyto novaehollandiae*	Masked Owl utilises dry Eucalypt Forest and woodlands greater than 60 years old, with optimal habitat featuring a mosaic understorey of dense shrubby and sparse grassy ground cover ideal for hunting their preferred prey species which includes ground dwelling mammals, especially rats. There are no BioNet records located in the subject land, within the Inland Slopes IBRA subregion. The nearest record is located about 9 kilometres north of the subject land, near Wagga Wagga (refer to adjacent map). Masked Owl has been excluded in the Inland Slopes IBRA subregion based on the Humelink BDAR species expert report (Niche, 2024). The species expert report provides more realistic patch size thresholds to reduce the extent of mapped habitat for this species, and concludes that this approach is suitable for calculating species and ecosystem credits for Masked Owl.	 Masked Owl BioNet records (TBDC, 2025)

Species name	Habitat suitability	
Striped Legless Lizard *Delmar impar*	Striped Legless Lizard occurs in Natural Temperate Grassland, but has been captured in grasslands that have a high exotic component. It is also found in secondary grassland near Natural Temperate Grassland, and occasionally in open Box-Gum Woodland. Habitat is where grassland is dominated by perennial, tussock-forming grasses such as Kangaro Grass (*Themeda australis*), spear-grasses (*Austrostipa spp.*) and poa tussocks (*Poa spp.*) and occasionally wallaby grasses (*Austrodanthonia spp.*) (DEH, 2025). There are no BioNet records located in the subject land, within the Inland Slopes IBRA subregion. The nearest record is located about 24 kilometres east of the subject land, outside of Tarcutta (refer to adjacent map). Striped Legless Lizard has been excluded in the Inland Slopes IBRA subregion based on the Humelink BDAR species expert report (Niche, 2024). The species expert report provides more realistic patch size thresholds to reduce the extent of mapped habitat for this species, and concludes that this approach is suitable for calculating species and ecosystem credits for Striped Legless Lizard.	 Striped Legless Lizard BioNet records (TBDC, 2025)

Species name	Habitat suitability	
Keys Matchstick Grasshopper *Keyacris scurra*	Keys Matchstick Grasshopper is found in native grasslands and grassy woodlands, but has also been recorded in other vegetation associations often containing a native grass understorey (particularly Kangaroo Grass (*Themeda triandra*) and known food plants such as *Asteraceae* spp. There are no BioNet records located in the subject land, within the Inland Slopes IBRA subregion. The nearest record is located about 60 kilometres north-east of the subject land, near Gundagai (refer to adjacent map). Keys Matchstick Grasshopper has been excluded in the Inland Slopes IBRA subregion based on the Humelink BDAR species expert report (Niche, 2024). The species expert report provides more realistic patch size thresholds to reduce the extent of mapped habitat for this species, and concludes that this approach is suitable for calculating species and ecosystem credits for Keys Matchstick Grasshopper.	 Keys Matchstick Grasshopper BioNet records (TBDC, 2025)
Golden Sun Moth *Synemon plana*	Golden Sun Moth occurs in Natural Temperate Grasslands and grassy Box Gum Woodlands where the ground layer is dominated by wallaby grasses (Austrodanthonia spp.). Habitat contains several wallaby grass species, which are typically associated with other grasses, particularly spear grasses (*Austrostipa* spp) or Kangaroo Grass (*Themeda australis*). There are no BioNet records located in the subject land, within the Inland Slopes IBRA subregion. The nearest record is located about 67 kilometres east of the subject land, near Tumut (refer to adjacent map). Golden Sun Moth has been excluded in the Inland Slopes IBRA subregion based on the Humelink BDAR species expert report (Niche, 2024). The species expert report provides more realistic patch size thresholds to reduce the extent of mapped habitat for this species, and concludes that this approach is suitable for calculating species and ecosystem credits Golden Sun Moth.	 Golden Sun Moth BioNet records (TBDC, 2025)

5.1.3 Predicted species

Predicted species are generated from the BAM Calculator for each species in each IBRA Sub-region. These species are associated with the PCTs and the credits generated as part of the ecosystem credits. Some species are dual species where the predicted component includes species foraging habitat. Targeted surveys are not undertaken for predicted species unless the species is a dual species. Table 5.4 lists the predicted species auto-populated from BAM-C and whether the species are retained for further assessment (in accordance with BAM subsections 5.2.1 and 5.2.2), their PCT and sensitivity to gain.

Table 5.4 Predicted fauna species

Common name	Scientific name	Listing status		Subregion (IBRA)			Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID	Sensitivity to gain class
		BC Act[1]	EPBC Act[2]	Murray Fans	Murrumbidgee	Inland Slopes						
Magpie Goose	*Anseranas semipalmata*	V	–	x	x	-	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained for further assessment.	PCTs 15, 24, 45, 47, 160 & 163	Moderate
Regent Honeyeater (foraging)	*Anthochaera phrygia*	CE	CE	x	-	x	Yes	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained for further assessment.	PCTs 2, 7, 266, 277, 319 & 343.	High
Brolga	*Antigone rubicunda*	V	–	x	x	-	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained for further assessment.	PCTs 7, 10, 11, 13, 15, 17, 24, 26, 45, 47, 160, 163.	Moderate

Common name	Scientific name	Listing status		Subregion (IBRA)			Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID	Sensitivity to gain class
		BC Act[1]	EPBC Act[2]	Murray Fans	Murrumbidgee	Inland Slopes						
Southern Whiteface	*Aphelocephala leucopsis*	V	V	x	x	x	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☒Current survey	Yes	Species retained for further assessment. Recorded in corridor during survey.	PCTs 7, 10, 11, 13, 15, 17, 20, 23, 24, 26, 28, 44, 45, 46, 58, 70, 76, 157, 159, 160, 163, 164, 170, 216, 237, 266 & 277.	Low
Dusky Woodswallow	*Artamus cyanopterus cyanopterus*	V	–	x	x	x	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained for further assessment. Recorded in corridor (Bionet record)	PCTs 2, 7, 10, 11, 13, 15, 17, 19, 20, 23, 24, 26, 28, 44, 45, 46, 47, 58, 70, 86, 76, 157, 159, 160, 163, 164, 170, 216, 237, 266, 277, 319 & 343.	Moderate
Australasian Bittern	*Botaurus poiciloptilus*	E	E	x	x	-	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained for further assessment.	PCTs 10, 11, 13, 17, 24 & 160.	Moderate

Common name	Scientific name	Listing status		Subregion (IBRA)			Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID	Sensitivity to gain class
		BC Act[1]	EPBC Act[2]	Murray Fans	Murrumbidgee	Inland Slopes						
Curlew Sandpiper	*Calidris ferruginea*	E	CE, M	-	x	-	Yes	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained for further assessment.	PCTs 24 & 47.	High
Gang-gang Cockatoo (foraging)	*Callocephalon fimbriatum*	E	E	-	-	x	Yes	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained for further assessment.	PCT 266, 277 & 343.	Moderate
South-eastern Glossy Black-Cockatoo (foraging)	*Calyptorhynchus lathami lathami*	V	V	-	-	x	Yes	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	No	Species excluded. Habitat constraints not met. Refer to section 5.1.1.	Species has been excluded.	High
Pied Honeyeater	*Certhionyx variegatus*	V	–	x	x	-	No	☒ BAM-C ☒ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained for further assessment.	PCTs 10, 11, 13, 15, 20, 22, 23, 24, 26, 28, 58, 70, 86, 163, 170.	Moderate

Common name	Scientific name	Listing status		Subregion (IBRA)			Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID	Sensitivity to gain class
		BC Act[1]	EPBC Act[2]	Murray Fans	Murrumbidgee	Inland Slopes						
Spotted Harrier	*Circus assimilis*	V	–	x	x	x	No	☒ BAM-C ☒ TBDC ☐ Previous survey ☒ Current survey	Yes	Species retained for further assessment. Recorded in corridor (Bionet record, recorded during survey)	PCTs 2, 7, 10, 11, 13, 15, 17, 20, 23, 24, 26, 28, 44, 45, 46, 47, 58, 70, 86, 157, 159, 160, 163, 164, 170, 216, 237, 266 & 277.	Moderate
Brown Treecreeper (south-eastern)	*Climacteris picumnus victoriae*	V	V	x	-	x	No	☒ BAM-C ☒ TBDC ☐ Previous survey ☒ Current survey	Yes	Species retained for further assessment. Recorded in corridor (Bionet record, recorded during survey)	PCTs 76, 237, 266, 277 & 343.	High
Varied Sittella	*Daphoenositta chrysoptera*	V	–	x	x	x	No	☒ BAM-C ☒ TBDC ☐ Previous survey ☒ Current survey	Yes	Species retained for further assessment. Recorded in corridor (recorded during survey)	PCTs 2, 7, 10, 11, 13, 15, 20, 23, 26, 28, 58, 70, 86, 170, 237, 266, 277, 319 & 343.	Moderate

Common name	Scientific name	Listing status		Subregion (IBRA)			Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID	Sensitivity to gain class
		BC Act[1]	EPBC Act[2]	Murray Fans	Murrumbidgee	Inland Slopes						
White-fronted Chat	*Epthianura albifrons*	V	–	x	x	-	No	☒ BAM-C ☒ TBDC ☐ Previous survey ☒ Current survey	Yes	Species retained for further assessment. Recorded in corridor (Bionet record, recorded during survey)	PCTs 17, 24, 44, 45, 46, 47, 157, 159, 160, 163, 164, 216.	Moderate
Grey Falcon	*Falco hypoleucos*	V	V	x	x	-	No	☒ BAM-C ☒ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained for further assessment. Recorded in corridor (Bionet record)	PCTs 10, 11, 13, 15, 17, 19, 20, 22, 23, 24, 26, 28, 44, 45, 46, 47, 58, 70, 76, 157, 159, 160, 163, 164, 166, 170, 216, 237	Moderate

Common name	Scientific name	Listing status		Subregion (IBRA)			Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID	Sensitivity to gain class
		BC Act[1]	EPBC Act[2]	Murray Fans	Murrumbidgee	Inland Slopes						
Black Falcon	*Falco subniger*	V	–	x	x	x	No	☒ BAM-C ☒ TBDC ☐ Previous survey ☒ Current survey	Yes	Species retained for further assessment. Recorded in corridor (recorded during survey)	PCTs 2, 7, 10, 11, 13, 15, 17, 20, 23, 24, 26, 28, 44, 45, 46, 47, 58, 70, 76, 157, 159, 160, 163, 164, 170, 216, 237, 266 & 277.	Moderate
Painted Honeyeater	*Grantiella picta*	V	V	x	x	x	No	☒ BAM-C ☒ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained for further assessment.	PCTs 2, 7, 10, 11, 13, 15, 20, 23, 26, 28, 58, 70, 76, 86, 237, 266, 277, 319 & 343.	Moderate

Common name	Scientific name	Listing status		Subregion (IBRA)			Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID	Sensitivity to gain class
		BC Act[1]	EPBC Act[2]	Murray Fans	Murrumbidgee	Inland Slopes						
White-bellied Sea-Eagle	*Haliaeetus leucogaster*	V	–	x	x	x	Yes	☒ BAM-C ☒ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained for further assessment.	PCTs 2, 7, 10, 11, 13, 15, 17, 19, 20, 23, 24, 26, 28, 44, 45, 46, 47, 58, 70, 76, 157, 159, 160, 163, 164, 170, 216, 237, 266, 277, 319 & 343.	High
Black-breasted Buzzard	*Hamirostra melanosternon*	V	–	x	-	-	Yes	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Partial	Species retained for further assessment in the Murray Fans IBRA subregion.	PCTs 7, 10, 11, 13, 15, 17, 28, 46, 58, 160, 163, 216.	Moderate

Common name	Scientific name	Listing status		Subregion (IBRA)			Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID	Sensitivity to gain class
		BC Act[1]	EPBC Act[2]	Murray Fans	Murrumbidgee	Inland Slopes						
Little Eagle	*Hieraaetus morphnoides*	V	–	x	x	x	Yes	☒ BAM-C ☒ TBDC ☐ Previous survey ☒ Current survey	Yes	Species retained for further assessment.	PCTs 2, 7, 10, 11, 13, 15, 17, 19, 20, 23, 24, 26, 28, 44, 45, 46, 47, 58, 70, 76, 86, 157, 159, 160, 163, 164, 170, 216, 266, 277, 237, 319 & 343.	Moderate
White-throated Needletail	*Hirundapus caudacutus*	–	V, M	x	x	x	No	☒ BAM-C ☒ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained for further assessment. Recorded in corridor (Bionet record).	PCTs 2, 7, 10, 11, 13, 15, 17, 24, 26, 44, 45, 46, 47, 76, 157, 160, 216, 237, 266, 277, 319 & 343.	High
Swift Parrot	*Lathamus discolor*	E	CE	x	x	x	Yes	☒ BAM-C ☒ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained for further assessment.	PCTs 2, 7, 10, 11, 13, 15, 24, 26, 70, 76, 86, 237, 266, 277, 319 & 343.	Moderate

Common name	Scientific name	Listing status		Subregion (IBRA)			Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID	Sensitivity to gain class
		BC Act[1]	EPBC Act[2]	Murray Fans	Murrumbidgee	Inland Slopes						
Malleefowl	*Leipoa ocellata*	E	V	-	-	x	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	No	Species excluded based on habitat constraints (refer to section 5.1.1).	Species excluded from further assessment.	High
Pink Cockatoo	*Lophochroa leadbeateri*	V	E	x	x	x	Yes	☒ BAM-C ☒ TBDC ☐ Previous survey ☐ Current survey	Partial	Species retained for further assessment in the Murray Fans and Murrumbidgee IBRA subregions. Recorded in corridor (Bionet record). Species excluded in the Inland Slopes IBRA subregion based on vagrancy (refer to section 5.1.2).	PCTs 2, 7, 10, 11, 13, 15, 19, 20, 23, 26, 28, 45, 58, 70, 76, 159, 163, 170 & 237.	Moderate

Common name	Scientific name	Listing status		Subregion (IBRA)			Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID	Sensitivity to gain class
		BC Act[1]	EPBC Act[2]	Murray Fans	Murrumbidgee	Inland Slopes						
Square-tailed Kite	*Lophoictinia isura*	V	–	x	x	x	Yes	☒ BAM-C ☒ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained for further assessment.	PCTs 2, 7, 10, 11, 13, 15, 20, 23, 26, 28, 45, 58, 70, 76, 237, 266 & 277.	Moderate
South-eastern Hooded Robin	*Melanodryas cucullata cucullata*	E	E	x	x	x	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current	Yes	Species retained for further assessment.	PCTs 2, 7, 10, 11, 13, 15, 19, 20, 23, 26, 28, 58, 70, 76, 86, 170 237, 266, 277, 319 & 343.	Moderate
Black-chinned Honeyeater (eastern subspecies)	*Melithreptus gularis gularis*	V	–	x	x	x	No	☒ BAM-C ☒ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained for further assessment.	PCTs 2, 7, 11, 70, 76, 86, 237, 266, 277, 319 & 343.	Moderate

Common name	Scientific name	Listing status		Subregion (IBRA)			Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID	Sensitivity to gain class
		BC Act[1]	EPBC Act[2]	Murray Fans	Murrumbidgee	Inland Slopes						
Blue-winged Parrot	*Neophema chrysostoma*	V	V	x	x	-	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained for further assessment.	PCTs 2, 7, 11, 13, 15, 17, 24, 26, 28, 44, 45, 46, 58, 157, 159, 160, 163, 164, 170, 216	Low
Turquoise Parrot	*Neophema pulchella*	V	–	x	x	x	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained for further assessment.	PCTs 70, 76, 237, 266, 277, 319 & 343.	High
Blue-billed Duck	*Oxyura australis*	V	–	x	x	-	No	☒ BAM-C ☒ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained for further assessment.	PCTs 17, 24 & 160.	Moderate
Purple-crowned Lorikeet	*Parvipsitta porphyrocephala*	V	–	x	-	x	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained for further assessment.	PCTs 2, 7, 10, 11, 86 & 266.	High

Common name	Scientific name	Listing status		Subregion (IBRA)			Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID	Sensitivity to gain class
		BC Act[1]	EPBC Act[2]	Murray Fans	Murrumbidgee	Inland Slopes						
Little Lorikeet	*Parvipsitta pusilla*	V	–	x	-	x	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained for further assessment.	PCTs 2, 7, 266, 277, 319 & 343.	High
Gilbert's Whistler	*Pachycephala inornata*	V	–	x	x	-	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained for further assessment.	PCTs 10, 11, 13, 17, 19, 22, 28, 58, 170	Moderate
Plains-wanderer	*Pedionomus torquatus*	E	CE	x	x	-	Yes	☒ BAM-C ☒ TBDC ☐ Previous survey ☒Current survey	Yes	Species retained for further assessment.	PCTs 44 & 46.	High
Scarlet Robin	*Petroica boodang*	V	–	x	x	x	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained for further assessment.	PCTs 7, 11, 26, 70, 76, 266, 277 & 343.	Moderate

Common name	Scientific name	Listing status		Subregion (IBRA)			Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID	Sensitivity to gain class
		BC Act[1]	EPBC Act[2]	Murray Fans	Murrumbidgee	Inland Slopes						
Flame Robin	*Petroica phoenicea*	V	–	x	-	x	No	☒ BAM-C ☒ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained for further assessment. Recorded in corridor (Bionet record).	PCTs 7, 76, 266, 277 & 343.	Moderate
Regent Parrot (eastern)	*Polytelis anthopeplus monarchoides*	E	V	x	x	-	–	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	No	Species excluded. Geographic constraints not met. Refer to section 5.1.1.	Species has been excluded.	Moderate
Superb Parrot	*Polytelis swainsonii*	V	V	x	x	x	Yes	☒ BAM-C ☒ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained for further assessment. Recorded in corridor (Bionet record).	PCTs 7, 10, 11, 13, 23, 28, 70, 76, 237, 266, 277 & 343.	Moderate

Common name	Scientific name	Listing status		Subregion (IBRA)			Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID	Sensitivity to gain class
		BC Act[1]	EPBC Act[2]	Murray Fans	Murrumbidgee	Inland Slopes						
Grey-crowned Babbler (eastern subspecies)	*Pomatostomus temporalis temporalis*	V	–	x	x	x	No	☒ BAM-C ☒ TBDC ☐ Previous survey ☒ Current survey	Yes	Species retained for further assessment. Recorded in corridor (Bionet record, recorded during surveys).	PCTs 10, 13, 15, 19, 20, 23, 26, 28, 58, 70, 76, 86, 237, 266, 277, 319.	Moderate
Redthroat	*Pyrrholaemus brunneus*	V	-	-	x	-	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained for further assessment.	PCTs 17, 24, 159 & 163.	Moderate
Speckled Warbler	*Pyrrholaemus sagittatus*	V	–	x	x	x	No	☒ BAM-C ☒ TBDC ☐ Previous survey ☒ Current survey	Yes	Species retained for further assessment.	PCTs 70, 76, 237, 266, 277, 319 & 343.	High
Australian Painted Snipe	*Rostratula australia*	E	E	x	x	-	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained for further assessment.	PCTs 2, 7, 10, 11, 13, 17, 24, 47, 160.	Moderate

Common name	Scientific name	Listing status		Subregion (IBRA)			Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID	Sensitivity to gain class
		BC Act[1]	EPBC Act[2]	Murray Fans	Murrumbidgee	Inland Slopes						
Diamond Firetail	*Stagonopleura guttata*	V	V	x	x	x	No	☒ BAM-C ☒ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained for further assessment. Recorded in corridor (Bionet record).	PCTs 2, 7, 10, 11, 13, 19, 20, 23, 26, 28, 44, 45, 46, 58, 70, 76, 86, 170, 237, 266, 277, 319 & 343.	Moderate
Freckled Duck	*Stictonetta naevosa*	V	–	x	x	-	No	☒ BAM-C ☒ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained for further assessment.	PCTs 2, 7, 10, 11, 13, 17, 24, 160.	Moderate
Mammals												
Little Pied Bat	*Chalinolobus picatus*	V	-	x	x	x	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained for further assessment.	PCTs 2, 7, 10, 11, 13, 15, 17, 20, 23, 26, 28, 58, 70, 76, 157, 159, 160, 163, 164, 170, 216.	High

Common name	Scientific name	Listing status		Subregion (IBRA)			Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID	Sensitivity to gain class
		BC Act[1]	EPBC Act[2]	Murray Fans	Murrumbidgee	Inland Slopes						
Spotted-tailed Quoll	*Dasyurus maculatus*	V	E	x	-	x	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained for further assessment.	PCTs 2, 266, 277, 343.	High
Eastern False Pipistrelle	*Falsistrellus tasmaniensis*	V	-	-	-	x	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained for further assessment.	PCTs 266, 277 & 343	High
Large Bent-winged Bat	*Miniopterus orianae oceanensis*	V	-	-	-	x	Yes	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained for further assessment.	PCTs 266 & 277	High
Corben's Long-eared Bat	*Nyctophilus corbeni*	V	V	x	-	x	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained for further assessment.	PCTs 2, 10, 28, 86 & 266.	High

Common name	Scientific name	Listing status		Subregion (IBRA)			Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID	Sensitivity to gain class
		BC Act[1]	EPBC Act[2]	Murray Fans	Murrumbidgee	Inland Slopes						
Yellow-bellied Glider	*Petaurus australis*	V	V	-	-	x	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained for further assessment.	PCTs 76, 266 & 277.	High
Grey-headed Flying-fox	*Pteropus poliocephalus*	V	V	-	-	x	Yes	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained for further assessment.	PCTs 76, 266 & 277.	High
Yellow-bellied Sheathtail-bat	*Saccolaimus flaviventris*	V	-	x	x	x	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained for further assessment.	PCTs 2, 7, 10, 11, 13, 15, 17, 19, 20, 23, 24, 26, 28, 45, 58, 70, 76, 160, 170, 237, 266 & 277.	High
Inland Forest Bat	*Vespadelus baverstocki*	V	-	-	x	-	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☒Current survey	Yes	Species retained for further assessment.	PCTs 13, 15, 20, 28, 58, 170	High

Common name	Scientific name	Listing status		Subregion (IBRA)			Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID	Sensitivity to gain class
		BC Act[1]	EPBC Act[2]	Murray Fans	Murrumbidgee	Inland Slopes						
Reptiles												
Western Blue-tongued Lizard	*Tiliqua occipitalis*	V	-	-	x	-	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained for further assessment.	PCT 170	High

(1) Indicates a species is listed V = Vulnerable, E = Endangered, or CE = Critically Endangered under the Biodiversity Conservation Act 2016.

(2) Indicates a species is listed V = Vulnerable, E = Endangered, CE = Critically Endangered, and/or M = Migratory under the Environmental Protection and Biodiversity Conservation Act 1999.

5.1.4 Species credit species

Candidate species are generated from the BAM Calculator for each species in each IBRA Sub-region. Whilst associated with certain PCTs, candidate species credit species require targeted surveys in order to determine presence within the subject land and the credits are generated as part of the species credits. The candidate species for threatened flora and fauna are summarised in

Table 5.5 and Table 5.6 outlining which species are to be retained for further assessment and species which are subject to exclusion based on habitat or geographical constraints (as seen in section 5.1.1).

Table 5.5 Candidate flora species credit species

Common name	Scientific name	Listing status			Subregion (IBRA)			Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
		BC Act[1]	SAII[2]	EPBC Act[3]	Murray Fans	Murrumbidgee	Inland slopes				
Ausfeld's Wattle	*Acacia ausfeldii*	V	No	-	-	-	x	☒ BAM-C ☐ TBDC ☐ PMST ☐ Previous survey ☐ Current survey	No	Species excluded based on habitat constraints (see section 5.1.1).	Species excluded from further assessment.
Yass Daisy	*Ammobium craspedioides*	V	No	V	-	-	x	☒ BAM-C ☐ TBDC ☐ PMST ☐ Previous survey ☐ Current survey	Yes	Species included for further assessment.	Potentially suitable habitat within PCTs 266, 277 & 343.

Common name	Scientific name	Listing status			Subregion (IBRA)			Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
		BC Act[1]	SAII[2]	EPBC Act[3]	Murray Fans	Murrumbidgee	Inland slopes				
River Swamp Wallaby-grass, Floating Swamp Wallaby-grass	*Amphibromus fluitans*	V	No	V	x	-	-	☒ BAM-C ☐ TBDC ☒ PMST ☐ Previous survey ☐ Current survey	Yes	Species included for further assessment.	Potentially suitable habitat within PCTs 2, 11, 17, 47 & 160.
Nil	*Austrostipa metatoris*	V	No	V	x	-	-	☒ BAM-C ☒ TBDC ☒ PMST ☐ Previous survey ☐ Current survey	Yes	Species included for further assessment.	Potentially suitable habitat within PCTs 7, 19 & 28.
Nil	*Austrostipa wakoolica*	E	No	E	x	x	x	☒ BAM-C ☒ TBDC ☒ PMST ☐ Previous survey ☐ Current survey	Yes	Species included for further assessment.	Potentially suitable habitat within PCTs 17, 26, 28, 70 & 237.

Common name	Scientific name	Listing status			Subregion (IBRA)			Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
		BC Act[1]	SAII[2]	EPBC Act[3]	Murray Fans	Murrumbidgee	Inland slopes				
Mueller Daisy	*Brachyscome muelleroides*	V	Yes	V	x	x	-	☒ BAM-C ☐ TBDC ☒ PMST ☐ Previous survey ☐ Current survey	Partial	Species included for further assessment in the Murrumbidgee IBRA subregion for areas that meet the geographic constraint outlined in section 5.1.1. Species not retained for the Murray Fans IBRA subregion as the subject land does not meet the listed geographic constraint outlined in section 5.1.1.	Potentially suitable habitat within PCTs 44, 45, 46 & 47 within the Murrumbidgee IBRA subregion.
Mossgiel Daisy	*Brachyscome papillosa*	V	No	V	-	x	-	☒ BAM-C ☒ TBDC ☒ PMST ☐ Previous survey ☐ Current survey	Yes	Species included for further assessment.	Potentially suitable habitat within PCTs 13, 15, 24, 44, 45, 46, 157, 159, 160, 163, 164 & 216.

Common name	Scientific name	Listing status			Subregion (IBRA)			Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
		BC Act[1]	SAII[2]	EPBC Act[3]	Murray Fans	Murrumbidgee	Inland slopes				
Sand-hill Spider Orchid	*Caladenia arenaria*	E	Yes	E	-	x	x	☒ BAM-C ☐ TBDC ☐ PMST ☐ Previous survey ☐ Current survey	Partial	Species included for further assessment in the Inland Slopes IBRA subregion. Species not retained for the Murrumbidgee IBRA subregion as the subject land does not meet the listed geographic constraint outlined in section 5.1.1.	Potential suitable habitat within PCT 76 within the Inland Slopes subregion.
Burr-daisy	*Calotis moorei*	E	Yes	E	-	x	-	☒ BAM-C ☐ TBDC ☐ PMST ☐ Previous survey ☐ Current survey	Yes	Species included for further assessment.	Potentially suitable habitat within PCTs 23, 157 & 170.

Common name	Scientific name	Listing status			Subregion (IBRA)			Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
		BC Act[1]	SAII[2]	EPBC Act[3]	Murray Fans	Murrumbidgee	Inland slopes				
Bindweed	*Convolvulus tedmoorei*	E	Yes	-	-	x	-	☒ BAM-C ☐ TBDC ☐ PMST ☐ Previous survey ☐ Current survey	Yes	Species included for further assessment.	Potentially suitable habitat within PCTs 17, 44, 45, 46, 157, 159 & 160.
Small Scurf-pea	*Cullen parvum*	E	No	-	x	x	x	☒ BAM-C ☒ TBDC ☐ PMST ☐ Previous survey ☐ Current survey	Partial	Species included for further assessment in the Inland Slopes and Murrumbidgee IBRA subregion. Species not retained for the Murray Fans IBRA subregion as the subject land does not meet the listed geographic constraint outlined in section 5.1.1.	Potentially suitable habitat within PCTs 5, 44 & 277.

Common name	Scientific name	Listing status			Subregion (IBRA)			Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
		BC Act[1]	SAII[2]	EPBC Act[3]	Murray Fans	Murrumbidgee	Inland slopes				
Pine Donkey Orchid	*Diuris tricolor*	V	No	-	-	x	x	☒ BAM-C ☐ TBDC ☐ PMST ☐ Previous survey ☐ Current survey	Partial	Species included for further assessment in the Inland Slopes IBRA subregion. Species not retained for the Murrumbidgee IBRA subregion as habitat associated with the species is extremely limited (see section 5.1.2 for further discussion).	Potentially suitable habitat within PCT 76.
Spike rush	*Eleocharis obicis*	V	No	V	x	x	-	☐ BAM-C ☐ TBDC ☒ PMST ☐ Previous survey ☒ Current survey	Yes	Species included for further assessment.	Potentially suitable habitat within PCTs 10, 11, 13, 17, 24, 47, 53, 157, 159, 160, 163, 164, 216 & 237.

Common name	Scientific name	Listing status			Subregion (IBRA)			Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
		BC Act[1]	SAII[2]	EPBC Act[3]	Murray Fans	Murrumbidgee	Inland slopes				
Yellow Gum	*Eucalyptus leucoxylon subsp. pruinosa*	V	No	-	x	x	-	☒ BAM-C ☒ TBDC ☐ PMST ☐ Previous survey ☒ Current survey	Partial	Species included for further assessment in areas of treed vegetation. As the species is a tree, areas identified to be in derived condition state are considered unsuitable habitat.	Potentially suitable habitat within PCTs 11, 13, 15, 19, 20, 86 & 237.
Nil	*Euphrasia arguta*	CE	Yes	CE	-	-	x	☒ BAM-C ☐ TBDC ☐ PMST ☐ Previous survey ☐ Current survey	No	Excluded. Species is considered vagrant (see section 5.1.2).	Species excluded from assessment.

Common name	Scientific name	Listing status			Subregion (IBRA)			Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
		BC Act[1]	SAII[2]	EPBC Act[3]	Murray Fans	Murrumbidgee	Inland slopes				
Tumut Grevillea	*Grevillea wilkinsonii*	CE	Yes	CE	-	-	x	☒ BAM-C ☐ TBDC ☐ PMST ☐ Previous survey ☐ Current survey	Partial	Species included for further assessment in areas of treed vegetation. As the species is a shrub, areas identified to be in derived condition state are considered unsuitable habitat.	Potentially suitable habitat within PCT 266.
Leafless Indigo	*Indigofera efoliata*	E	Yes	E	-	-	x	☒ BAM-C ☐ TBDC ☐ PMST ☐ Previous survey ☐ Current survey	No	Excluded. Species is considered vagrant (see section 5.1.2).	Species excluded from assessment.
Winged Peppercress	*Lepidium monoplocoides*	E	No	E	x	x	-	☒ BAM-C ☒ TBDC ☒ PMST ☐ Previous survey ☐ Current survey	Yes	Species included for further assessment.	Potentially suitable habitat within PCTs 13, 15, 24, 26, 45, 46, 47, 159, 160, 163, 170, 216 & 237.

Common name	Scientific name	Listing status			Subregion (IBRA)			Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
		BC Act[1]	SAII[2]	EPBC Act[3]	Murray Fans	Murrumbidgee	Inland slopes				
Lanky Buttons	*Leptorhynchos orientalis*	E	No	-	-	x	-	☒ BAM-C ☒ TBDC ☐ PMST ☐ Previous survey ☐ Current survey	Yes	Species included for further assessment.	Potentially suitable habitat within PCTs 24, 26, 44, 45, 46 & 47.
Chariot Wheels	*Maireana cheelii*	V	No	V	x	x	-	☒ BAM-C ☒ TBDC ☒ PMST ☐ Previous survey ☒ Current survey	Yes	Species included for further assessment.	Potentially suitable habitat within PCTs 26, 44, 46, 157 & 164.
Austral Pillwort	*Pilularia novae-hollandiae*	E	No	-	x	x	-	☒ BAM-C ☒ TBDC ☐ PMST ☐ Previous survey ☐ Current survey	Partial	Species included for further assessment in the Murray Fans IBRA subregion. Species partially retained for the Murrumbidgee IBRA subregion (see section 5.1.1).	Potentially suitable habitat within PCTs 2, 13, 15, 26, 44, 45, 46, 47, 53, 159 & 237.

Common name	Scientific name	Listing status			Subregion (IBRA)			Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
		BC Act[1]	SAII[2]	EPBC Act[3]	Murray Fans	Murrumbidgee	Inland slopes				
Tarengo Leek Orchid	*Prasophyllum petilum*	E	No	-	-	-	x	☒ BAM-C ☐ TBDC ☐ PMST ☐ Previous survey ☐ Current survey	Yes	Species included for further assessment.	Potentially suitable habitat within PCT 277.
Nil	*Prasophyllum sp. Moama*	CE	Yes	-	x	-	-	☒ BAM-C ☐ TBDC ☐ PMST ☐ Previous survey ☐ Current survey	Yes	Species included for further assessment.	Potentially suitable habitat within PCTs 44 & 237.
Nil	*Prasophyllum* sp. *Wybong*	-	No	E	-	-	x	☒ BAM-C ☐ TBDC ☐ PMST ☐ Previous survey ☐ Current survey	No	Excluded. Species is considered vagrant (see section 5.1.2).	Species excluded from assessment.

Common name	Scientific name	Listing status			Subregion (IBRA)			Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
		BC Act[1]	SAII[2]	EPBC Act[3]	Murray Fans	Murrumbidgee	Inland slopes				
Dwarf Bush-pea	*Pultenaea humilis*	V	No	-	-	-	x	☒ BAM-C ☐ TBDC ☐ PMST ☐ Previous survey ☐ Current survey	Partial	Species included for further assessment in areas of treed vegetation. As the species is a shrub, areas identified to be in derived condition state are considered unsuitable habitat.	Species excluded from assessment.
Lowly Greenhood	*Pterostylis despectans*	CE	Yes	E	x	-	-	☒ BAM-C ☐ TBDC ☐ PMST ☐ Previous survey ☐ Current survey	Yes	Species included for further assessment.	Potentially suitable habitat within PCTs 44 & 86.

Common name	Scientific name	Listing status			Subregion (IBRA)			Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
		BC Act[1]	SAII[2]	EPBC Act[3]	Murray Fans	Murrumbidgee	Inland slopes				
Turnip Copperburr	*Sclerolaena napiformis*	E	No	E	x	x	-	☒ BAM-C ☒ TBDC ☒ PMST ☐ Previous survey ☐ Current survey	Partial	Species included for further assessment in the Murrumbidgee subregion. Species excluded in Murray Fans subregion based on listed geographic constraints outlined in section 5.1.1.	Potentially suitable habitat within PCTs 26, 44 & 46.
Woolly Ragwort	*Senecio garlandii*	V	No	-	-	-	x	☒ BAM-C ☐ TBDC ☐ PMST ☐ Previous survey ☐ Current survey	Partial	Species included for further assessment in areas of treed vegetation. As the species is a shrub, areas identified to be in derived condition state are considered unsuitable habitat.	Potentially suitable habitat within PCT 343.

Common name	Scientific name	Listing status			Subregion (IBRA)			Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
		BC Act[1]	SAII[2]	EPBC Act[3]	Murray Fans	Murrumbidgee	Inland slopes				
Menindee Nightshade	*Solanum karsense*	V	No	V	-	x	-	☒ BAM-C ☐ TBDC ☐ PMST ☐ Previous survey ☐ Current survey	Partial	Species partially included for further assessment in the Murrumbidgee IBRA subregion (section 5.1.1).	Potentially suitable habitat within PCTs 13, 15, 17, 24, 159, 160 & 166.
Slender Darling-pea, Slender Swainson, Murray Swainson-pea	*Swainsona murrayana*	V	No	V	x	x	-	☒ BAM-C ☒ TBDC ☒ PMST ☐ Previous survey ☐ Current survey	Partial	Species included for further assessment in the Murrumbidgee subregion. Species excluded in Murray Fans subregion based on listed geographic constraints outlined in section 5.1.1.	Potentially suitable habitat within PCTs 15, 23, 26, 28, 44, 45, 46, 157, 163, 164 & 216.

Common name	Scientific name	Listing status			Subregion (IBRA)			Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
		BC Act[1]	SAII[2]	EPBC Act[3]	Murray Fans	Murrumbidgee	Inland slopes				
Red Darling-pea, Red Swainson-pea	*Swainsona plagiotropis*	V	No	V	x	x	-	☒ BAM-C ☒ TBDC ☒ PMST ☐ Previous survey ☐ Current survey	Partial	Species included for further assessment in the Murrumbidgee subregion. Species excluded in Murray Fans subregion based on listed geographic constraints outlined in section 5.1.1.	Potentially suitable habitat within PCTs 26, 44, 45 & 46.
Small Purple-pea	*Swainsona recta*	E	No	E	-	-	x	☒ BAM-C ☐ TBDC ☐ PMST ☐ Previous survey ☐ Current survey	Yes	Species included for further assessment.	Potentially suitable habitat within PCT 266 & 277.

Common name	Scientific name	Listing status			Subregion (IBRA)			Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
		BC Act[1]	SAII[2]	EPBC Act[3]	Murray Fans	Murrumbidgee	Inland slopes				
Silky Swainson-pea	*Swainsona sericea*	V	No	-	x	x	x	☒ BAM-C ☒ TBDC ☐ PMST ☐ Previous survey ☐ Current survey	Partially.	Species included for further assessment in the Murrumbidgee and Inland Slopes IBRA subregions Species excluded from the Murray Fans IBRA subregion based on vagrancy (section 5.1.2).	Potentially suitable habitat within PCT 23, 26, 28, 44, 45, 46, 266 & 277.

(1) Species is listed V= Vulnerable, E = Endangered or CE = Critically Endangered under the Biodiversity Conservation Act 2016

(2) Indicates SAII = Serious and Irreversible Impact

(3) Indicates a species is listed V= Vulnerable, E = Endangered or CE = Critically Endangered under the Environmental Protection and Biodiversity Conservation Act 1999

Table 5.6 Candidate fauna species credit species

Common name	Scientific name	Listing status			Subregion (IBRA)			Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
		BC Act[1]	SAII[2]	EPBC Act[3]	Murray Fans	Murrumbidgee	Inland Slopes					
Amphibians												
Sloane's Froglet	*Crinia sloanei*	V	No	E	x	-	x	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	No	Species has been excluded. See section 5.1.1 and 5.1.2 for further information.	N/a
Booroolong Frog	*Litoria booroolongensis*	E	No	E	-	-	x	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	No	Species has been excluded. See section 5.1.2 for further information.	Nil
Growling Grass Frog / Southern Bell Frog	*Litoria raniformis*	E	No	V	x	x	-	No	☒ BAM-C ☒ TBDC ☐ Previous survey ☒ Current survey	Yes	Species included for further assessment. Recorded in corridor (Bionet record)	PCTs 2, 7, 10, 11, 13, 17 & 24.

Common name	Scientific name	Listing status			Subregion (IBRA)			Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
		BC Act[1]	SAII[2]	EPBC Act[3]	Murray Fans	Murrumbidgee	Inland Slopes					
Birds												
Regent Honeyeater	*Anthochaera phrygia*	CE	Yes	CE	x	-	x	Yes	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	No	Species excluded as habitat constraints not met. There is no mapped important habitat in the subject land. Refer to section 5.1.1.	Nil.
Australian Bustard	*Ardeotis australis*	E	No	-	x	x	-	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Species included for further assessment.	PCTs 11, 15, 20, 23, 24, 26, 28, 44, 45, 46, 47, 58, 157, 159, 160, 163, 164 & 216.
Bush Stone-curlew	*Burhinus grallarius*	E	No	–	x	x	x	No	☒ BAM-C ☒ TBDC ☐ Previous survey ☐ Current survey	Yes	Species included for further assessment.	PCTs 2, 7, 10, 11, 13, 15, 20, 23, 26, 28, 58, 70, 76, 86, 237, 266, 277 & 343.

Common name	Scientific name	Listing status			Subregion (IBRA)			Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
		BC Act[1]	SAII[2]	EPBC Act[3]	Murray Fans	Murrumbidgee	Inland Slopes					
Curlew Sandpiper	*Calidris ferruginea*	E	Yes	CE, M	-	x	-	Yes	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	No	Species excluded as habitat constraints not met. There is no mapped important habitat in the subject land. Refer to section 5.1.1.	Nil
Gang-gang Cockatoo	*Callocephalon fimbriatum*	V	No	E	-	-	x	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Species included for further assessment.	PCTs 277 & 343.
South-eastern Glossy Black-Cockatoo	*Calyptorhynchus lathami lathami*	V	No	V	-	-	x	Yes	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	No	Species excluded as habitat constraints not met. Refer to section 5.1.1.	Nil
White-browed Treecreeper (endangered population)	*Climacteris affinis*	E	No	-	-	x	-	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	No	Species excluded as geographic limitations not met. Refer to section 5.1.1.	Nil

Common name	Scientific name	Listing status			Subregion (IBRA)			Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
		BC Act[1]	SAII[2]	EPBC Act[3]	Murray Fans	Murrumbidgee	Inland Slopes					
White-bellied Sea-Eagle	*Haliaeetus leucogaster*	V	No	–	x	x	x	Yes	☒ BAM-C ☒ TBDC ☐ Previous survey ☐ Current survey	Partial	Species included for further assessment. Recorded in corridor (Bionet record). Species excluded in the Inland Slopes IBRA subregion based on Humelink species expert report (Niche, 2024).	PCTs 2, 7, 10, 11, 13, 15, 17, 19, 24, 26, 28, 44, 45, 46, 47, 58, 70, 76, 157, 159, 160, 163, 164, 170, 216, 237, 277, 319 & 343.
Black-breasted Buzzard	*Hamirostra melanosternon*	V	No	–	x	-	-	Yes	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Partial	Species included for further assessment in the Murray Fans IBRA subregion.	PCTs 7, 10, 11, 13, 15, 17, 28, 160, 163 & 216.

Common name	Scientific name	Listing status			Subregion (IBRA)			Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
		BC Act[1]	SAII[2]	EPBC Act[3]	Murray Fans	Murrumbidgee	Inland Slopes					
Little Eagle	*Hieraaetus morphnoides*	V	No	–	x	x	x	Yes	☒ BAM-C ☒ TBDC ☐ Previous survey ☒Current survey	Partial	Species included for further assessment. Recorded in corridor during survey. Species excluded in the Inland Slopes IBRA subregion based on Humelink species expert report (Niche, 2024).	PCTs 2, 7, 10, 11, 13, 15, 17, 19, 20, 23, 24, 26, 28, 44, 45, 46, 47, 58, 70, 76, 86, 157, 159, 160, 163, 164, 170, 216, 237, 277, 319 & 343.
Swift Parrot	*Lathamus discolor*	E	Yes	CE	x	x	x	Yes	☒ BAM-C ☒ TBDC ☐ Previous survey ☐ Current survey	No	Species excluded as habitat constraints not met. There is no mapped important habitat in the subject land. Refer to section 5.1.1.	Nil

Common name	Scientific name	Listing status			Subregion (IBRA)			Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
		BC Act[1]	SAII[2]	EPBC Act[3]	Murray Fans	Murrumbidgee	Inland Slopes					
Pink Cockatoo	*Lophochroa leadbeateri*	V	No	E	x	x	x	Yes	☒ BAM-C ☒ TBDC ☐ Previous survey ☐ Current survey	Partial	Species included for further assessment in the Murray Fans and Murrumbidgee IBRA subregions. Recorded in corridor (Bionet record) Species excluded from the Inland Slopes IBRA subregion based on vagrancy (refer to section 5.1.1).	PCTs 1, 7, 10, 11, 13, 15, 19, 20, 23, 26, 28, 45, 58, 70, 76, 159, 163, 170 & 237.
Square-tailed Kite	*Lophoictinia isura*	V	No	–	x	x	x	Yes	☒ BAM-C ☒ TBDC ☐ Previous survey ☐ Current survey	Partial	Species included for further assessment in the Murray Fans and Murrumbidgee IBRA subregions. Species excluded in the Inland Slopes IBRA subregion, based on Humelink species expert report (Niche, 2024).	PCTs 2, 7, 10, 11, 13, 15, 20, 23, 26, 28, 45, 58, 70, 76, 237, 266 & 277.

Common name	Scientific name	Listing status			Subregion (IBRA)			Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
		BC Act[1]	SAII[2]	EPBC Act[3]	Murray Fans	Murrumbidgee	Inland Slopes					
Barking Owl	*Ninox connivens*	V	No	–	x	x	x	No	☒ BAM-C ☒ TBDC ☐ Previous survey ☐ Current survey	Partial	Species included for further assessment in the Murray Fans and Murrumbidgee IBRA subregions. Species excluded in the Inland Slopes IBRA subregion, based on Humelink species expert report (Niche, 2024).	PCTs 2, 7, 10, 11, 13, 15, 70, 76, 86, 237, 266, 277 319 & 343.
Plains-wanderer	*Pedionomus torquatus*	E	Yes	CE	x	x	-	Yes	☒ BAM-C ☒ TBDC ☐ Previous survey ☒Current survey	Partial	Species included for further assessment in Murrumbidgee subregion but excluded from the Murray Fans. Refer to section 5.1.1. Recorded in corridor (Bionet record and during survey)	PCTs 44 & 46.

Common name	Scientific name	Listing status			Subregion (IBRA)			Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
		BC Act[1]	SAII[2]	EPBC Act[3]	Murray Fans	Murrumbidgee	Inland Slopes					
Regent Parrot (eastern)	*Polytelis anthopeplus monarchoides*	E	No	V	x	x	-	Yes	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	No	Species excluded as geographic constraints not met. Refer to section 5.1.1.	Nil
Superb Parrot	*Polytelis swainsonii*	V	No	V	x	x	x	Yes	☒ BAM-C ☒ TBDC ☐ Previous survey ☐ Current survey	Yes	Species included for further assessment. Recorded in corridor (Bionet record)	PCTs 7, 10, 11, 13, 23, 26, 28, 45, 46, 76, 70, 237, 266, 277 &343.
Masked Owl	*Tyto novaehollandiae*	V	No	–	x	x	x	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Partial	Species included for further assessment in the Murray Fans and Murrumbidgee (excluding PCT 24 IBRA subregions). Species excluded in the Inland Slopes IBRA subregion, based on Humelink species expert report (Niche, 2024).	PCTs 7, 10, 11, 13, 24, 26, 70, 76, 237, 266 &277.

Common name	Scientific name	Listing status			Subregion (IBRA)			Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
		BC Act[1]	SAII[2]	EPBC Act[3]	Murray Fans	Murrumbidgee	Inland Slopes					
Mammals												
Eastern Pygmy-possum	*Cercartetus nanus*	V	No	–	-	-	x	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	No	Species excluded. Habitat within the subject land is not considered suitable to support this species and species considered vagrant. See section 5.1.2.	Nil
Large-eared Pied Bat	*Chalinolobus dwyeri*	V	Yes	E	-	-	x	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	No	Species excluded. Habitat within the subject land is not considered suitable to support this species. See section 5.1.1.	Nil
Large Bent-winged Bat	*Miniopterus orianae oceanensis*	V	Yes	–	-	-	x	Yes	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	No	Species excluded as habitat constraints not met. Refer to section 5.1.1.	Nil

Common name	Scientific name	Listing status			Subregion (IBRA)			Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
		BC Act[1]	SAII[2]	EPBC Act[3]	Murray Fans	Murrumbidgee	Inland Slopes					
Southern Myotis	*Myotis macropus*	V	No	–	x	x	x	No	☒ BAM-C ☒ TBDC ☐ Previous survey ☐ Current survey	Partial	Species included for further assessment in the Murray Fans IBRA subregion (excluding PCTs 17 & 160). Species excluded in the Murrumbidgee and Inland Slopes IBRA subregions.	PCTs 2, 7, 10, 11, 17, 24, 70, 76, 160, 237, 266, 277 & 343.
Squirrel Glider	*Petaurus norfolcensis*	V	No	–	x	-	x	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	No	Species excluded based on species expert report (refer to Appendix I). Where suitable habitat has been identified within the Inland Slopes, the species is considered under the endangered population listing.	Species has been excluded from assessment.

Common name	Scientific name	Listing status			Subregion (IBRA)			Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
		BC Act[1]	SAII[2]	EPBC Act[3]	Murray Fans	Murrumbidgee	Inland Slopes					
Squirrel Glider	*Petaurus norfolcensis – endangered population*	E	No	–	-	-	x	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Species included for further assessment.	PCTs 76, 266, 277 & 343.
Brush-tailed Rock-Wallaby	*Petrogale penicillata*	E	Yes	V	-	-	x	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	No	Species excluded as geographic constraints not met. Refer to section 5.1.1.	Nil

Common name	Scientific name	Listing status			Subregion (IBRA)			Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
		BC Act[1]	SAII[2]	EPBC Act[3]	Murray Fans	Murrumbidgee	Inland Slopes					
Koala	*Phascolarctos cinereus*	E	No	E	x	x	x	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Partial	Species included for further assessment in the Murray Fans (excluding PCTs 19, 28, 86, 160 & 216) & Inland Slopes IBRA subregion where koala feed trees have been identified to occur. Species excluded in the Murrumbidgee IBRA subregion (refer to section 5.1.1).	PCTs 2, 7, 10, 11, 13, 15, 20, 23, 24, 26, 58, 70, 76, 157, 159, 170, 237, 266, 277, 319 & 343.
Brush-tailed Phascogale	*Phascogale tapoatafa*	V	No	–	x	-	x	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	No	Species excluded based on species expert report. Refer to Appendix I.	Nil

Common name	Scientific name	Listing status			Subregion (IBRA)			Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
		BC Act[1]	SAII[2]	EPBC Act[3]	Murray Fans	Murrumbidgee	Inland Slopes					
Grey-headed Flying Fox	*Pteropus poliocephalus*	V	No	V	-	-	x	Yes	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	No	Species excluded as habitat constraints not met. Refer to section 5.1.1.	Nil
Reptiles												
Pink-tailed Worm-lizard	*Aprasia parapulchella*	V	No	V	-	x	x	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Partial	Species has been excluded from the Murrumbidgee IBRA subregion as habitat constraints of rocky areas not being met. Species has been retained for the Inland Slopes IBRA subregion. Refer to section 5.1.1.	PCT 319
Striped Legless Lizard	*Delma impar*	V	No	V	-	-	x	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	No	Species excluded based on Humelink species expert report (Niche, 2024).	Nil

Common name	Scientific name	Listing status			Subregion (IBRA)			Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
		BC Act[1]	SAII[2]	EPBC Act[3]	Murray Fans	Murrumbidgee	Inland Slopes					
Grey Snake	*Hemiaspis damelii*	E	No	E	x	x	-	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Species included for further assessment.	PCTs 2, 7, 10, 11, 13, 15, 17, 19, 24, 44, 46 & 160
Invertebrates												
Key's Matchstick Grasshopper	*Keyacris scurra*	E	No	E	-	-	x	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	No	Species excluded based on Humelink species expert report (Niche, 2024).	Nil
Golden Sun Moth	*Synemon plana*	V	No	V	-	-	x	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	No	Species excluded based on Humelink species expert report (Niche, 2024).	Nil

(1) Indicates a species is listed V = Vulnerable, E = Endangered, or CE = Critically Endangered under the Biodiversity Conservation Act 2016.

(2) Indicates SAII = Serious and Irreversible Impact

(3) Indicates a species is listed V = Vulnerable, E = Endangered, CE = Critically Endangered, and/or M = Migratory under the Environmental Protection and Biodiversity Conservation Act 1999

5.2 Presence of candidate species credit species

Following the steps outlined in BAM subsection 5.2.4, candidate species have been excluded based on geographical limitations, habitat constraints or the subject land does not contain any species with important habitat mapped area. The next section identifies the candidate flora species (see Table 5.7) and fauna species (see Table 5.8) recorded during survey effort or assumed present in areas not subject to field survey. The following candidate species have been determined to be present within the subject land, in accordance with BAM subsection 5.2.4, based on:

- targeted threatened species surveys,
- assumed presence within the subject land,
- important habitat map (for dual credit species), or
- an expert report.

The sections below provide a description of the candidate species credit species found within the subject land during the field surveys undertaken for this BDAR.

Table 5.7 Determining the presence of candidate flora species credit species on the subject land

Common name	Scientific name	Listing status		Method used to determine presence	Present?	Further assessment required? (BAM subsections 5.2.5 and 5.2.6)
		BC Act	EPBC Act			
Ausfeld's Wattle	*Acacia ausfeldii*	V	-	Excluded	No	No
Yass Daisy	*Ammobium craspedioides*	V	V	Assumed present	Assumed present	Yes
River Swamp Wallaby-grass, Floating Swamp Wallaby-Grass	*Amphibromus fluitans*	V	V	Assumed present	Assumed present	Yes
-	*Austrostipa metatoris*	V	V	Targeted threatened species survey Assumed present	Assumed present	Yes
-	*Austrostipa wakoolica*	E	E	Targeted threatened species survey Assumed present	Assumed present	Yes
Mueller Daisy	*Brachyscome muelleroides*	V	V	Targeted threatened species survey Assumed present	Assumed present	Yes
Mossgiel Daisy	*Brachyscome papillosa*	V	V	Targeted threatened species survey	Yes	Yes
Sand-hill Spider Orchid	*Caladenia arenaria*	E	E	Assumed present	Assumed present	Yes
Burr-daisy	*Calotis moorei*	E	E	Targeted threatened species survey Assumed present	Assumed present	Yes
Bindweed	*Convolvulus tedmoorei*	E	-	Targeted threatened species survey	No	No
Small Scurf-pea	*Cullen parvum*	E	-	Assumed present	Assumed present	Yes
Pine Donkey Orchid	*Diuris tricolor*	V	-	Assumed present	Assumed present	Yes

Common name	Scientific name	Listing status		Method used to determine presence	Present?	Further assessment required? (BAM subsections 5.2.5 and 5.2.6)
		BC Act	EPBC Act			
Yellow Gum	*Eucalyptus leucoxylon subsp. pruinosa*	V	-	Targeted threatened species survey Assumed present	Assumed present	Yes
Spike rush	*Eleocharis obicis*	V	V	Targeted threatened species survey	Yes	Yes
-	*Euphrasia arguta*	CE	CE	Excluded	No	No
Tumut Grevillea	*Grevillea wilkinsonii*	CE	CE	Assumed present	Assumed present	Yes
-	*Indigofera efoliata*	E	E	Excluded	No	No
Winged Peppercress	*Lepidium monoplocoides*	E	E	Targeted threatened species survey	Yes	Yes
Lanky Buttons	*Leptorhynchos orientalis*	E	-	Targeted threatened species survey Assumed present	Assumed present	Yes
Chariot Wheels	*Maireana cheelii*	V	V	Targeted threatened species survey	Yes	Yes
Austral Pillwort	*Pilularia novae-hollandiae*	E	-	Targeted threatened species survey	Yes	Yes
-	*Prasophyllum sp. Moama*	CE	-	Assumed present	Assumed present	Yes
Tarengo Leek Orchid	*Prasophyllum petilum*	E	-	Assumed present	Assumed present	Yes
-	*Prasophyllum sp. Wybong*	-	CE	Excluded	No	No
Lowly Greenhood	*Pterostylis despectans*	CE	E	Targeted threatened species survey Assumed present	Assumed present	Yes
Dwarf Bush-pea	*Pultenaea humilis*	V	-	Assumed present	Assumed present	Yes

Common name	Scientific name	Listing status		Method used to determine presence	Present?	Further assessment required? (BAM subsections 5.2.5 and 5.2.6)
		BC Act	EPBC Act			
Turnip Copperburr	*Sclerolaena napiformis*	E	E	Targeted threatened species survey Assumed present	Assumed present	Yes
Woolly Ragwort	*Senecio garlandii*	V	-	Targeted threatened species survey Assumed present	Assumed present	Yes
Menindee Nightshade	*Solanum karsense*	V	V	Targeted threatened species survey Assumed present	Assumed present	Yes
Slender Darling-pea, Slender Swainson, Murray Swainson-pea	*Swainsona murrayana*	V	V	Targeted threatened species survey	Yes	Yes
Red Darling-pea, Red Swainson-pea	*Swainsona plagiotropis*	V	V	Targeted threatened species survey Assumed present	Assumed present	Yes
Small Purple-pea	*Swainsona recta*	E	E	Assumed present	Assumed present	Yes
Silky Swainson-pea	*Swainsona sericea*	V	-	Assumed present	Assumed present	Yes

Table 5.8 Determining the presence of candidate fauna species credit species on the subject land

Common name	Scientific name	Listing status		Method used to determine presence	Present?	Further assessment required? (BAM subsections 5.2.5 and 5.2.6)
		BC Act	EPBC Act			
Amphibians						
Growling Grass Frog / Southern Bell Frog	*Litoria raniformis*	E	V	Targeted threatened species survey	Yes	Yes
Birds						
Australian Bustard	*Ardeotis australis*	E	-	Targeted threatened species survey	Assumed present	Yes
Bush Stone-curlew	*Burhinus grallarius*	E	-	Targeted threatened species survey	Yes	Yes
Great Knot	*Calidris tentuirostris*	V	V; M	Targeted threatened species survey	No	No
Gang-gang Cockatoo	*Callocephalon fimbriatum*	E	E	Assumed present	Assumed present	Yes
South-eastern Glossy Black-Cockatoo	*Calyptorhynchus lathami lathami*	V	V	Excluded	No	No
Black-breasted Buzzard	*Hamirostra melanosternon*	V	-	Targeted threatened species survey	Assumed present	Yes
White-bellied Sea-eagle	*Haliaeetus leucogaster*	V	-	Targeted threatened species survey	Assumed present	Yes
Little Eagle	*Hieraaetus morphnoides*	V	-	Targeted threatened species survey	Assumed present	Yes
Pink Cockatoo	*Lophochroa leadbeateri*	V	E	Assumed present	Assumed present	Yes
Square-tailed Kite	*Lophoictinia isura*	V	-	Assumed present	Assumed present	Yes
Barking Owl	*Ninox connivens*	V	-	Assumed present	Assumed present	Yes
Plains-wanderer	*Pedionomus torquatus*	E	CE	Within important habitat mapped area	Yes	Yes

Common name	Scientific name	Listing status		Method used to determine presence	Present?	Further assessment required? (BAM subsections 5.2.5 and 5.2.6)
		BC Act	EPBC Act			
Superb Parrot	*Polytelis swainsonii*	V	V	Assumed present	Assumed present	Yes
Masked Owl	*Tyto novaehollandiae*	V	-	Assumed present	Assumed present	Yes
Mammals						
Southern Myotis	*Myotis macropus*	V	-	Assumed present	Assumed present	Yes
Squirrel Glider	*Petaurus norfolcensis*	V	-	Targeted survey in Murray Fans and Murrumbidgee IBRA subregions. Expert report	Assumed presence based on Species Expert Report but has been assessed as the Endangered population	Yes
Squirrel Glider	*Petaurus norfolcensis – endangered population*	E	-	Expert report	Assumed presence based on Species Expert Report	Yes
Koala	*Phascolarctos cinereus*	E	E	Assumed present Targeted threatened species survey	Assumed present	Yes
Brush-tailed Phascogale	*Phascogale tapoatafa*	V	-	Expert report	No	No

Common name	Scientific name	Listing status		Method used to determine presence	Present?	Further assessment required? (BAM subsections 5.2.5 and 5.2.6)
		BC Act	EPBC Act			
Reptiles						
Pink-tailed Worm-lizard	*Aprasia parapulchella*	V	V	Assumed present	Assumed present	Yes
Striped Legless Lizard	*Delma impar*	V	V	Expert report	No	No
Grey Snake	*Hemiaspis damelii*	E	E	Assumed present in unsurveyed lands Targeted threatened species survey	Assumed present	Yes
Invertebrates						
Key's Matchstick Grasshopper	*Keyacris scurra*	E	E	Expert report	No	No
Golden Sun Moth	*Synemon plana*	V	V	Expert report	No	No

5.2.1 Yass Daisy (*Ammobium craspedioides*)

Ammobium craspedioides is a rosette-forming perennial with hemispherical-button flower heads to 20 millimetres wide and is listed as Vulnerable under both the BC and EPBC Acts. It is found from near Crookwell on the Southern Tablelands to near Wagga Wagga on the South Western Slopes. Most populations are in the Yass region (DEH, 2025).

Ammobium craspedioides was not recorded within the subject land during seasonal surveys. Despite this, 2.08 hectares of potential habitat for *Ammobium craspedioides* has been identified in unsurveyed areas of PCTs 266 and 277 within the Inland Slopes IBRA subregion. As this is a count species, area (hectares) have not been included in credit generation and representative one individual has been applied to each impacted vegetation zone. Further consultation with CPHR would be completed to quantify impacts to this species.

5.2.2 Floating Swamp Wallaby-grass (*Amphibromus fluitans*)

Amphibromus fluitans is a perennial grass to 0.8 metres tall that spreads by both underground and above-ground stems and is listed as Vulnerable under both the BC and EPBC Acts. There are many historic collections in the City of Greater Albury. It has been recorded recently in lagoons beside the Murray River near Cooks Lagoon (Shire of Greater Hume), Mungabarina Reserve, East Albury, at Ettamogah, Thurgoona (Charles Sturt University Campus), near Narranderra, and also further west along the Murray River (near Mathoura) and in Victoria (DEH, 2025).

Amphibromus fluitans was not recorded within the subject land during targeted seasonal surveys. Despite this, where targeted surveys were not possible due to property access restrictions, this species has been assumed present within 0.43 hectares of potential habitat where PCTs 11, 17 and 160 have been recorded in Moderate-good condition and where PCT 2 is recorded in the SVTM.

5.2.3 A Spear-grass (*Austrostipa metatoris*)

Austrostipa metatoris is a perennial spear-grass that grows in tussocks to one metre tall and is listed as Vulnerable under both the BC and EPBC Acts. Most records occur in the Murray Valley with sites including Cunninyeuk Station, Stony Crossing, Kyalite State Forest (now part of Murrumbidgee Valley Regional Park) and Lake Benanee (DEH, 2025).

Austrostipa metatoris was not recorded within the subject land during targeted seasonal surveys. Despite this, where targeted surveys were not possible due to property access restrictions, this species has been assumed present within 1.24 hectares pf potential habitat where PCT 7 has been recorded in Moderate-good condition, PCT 28 has been recorded within Derived and Derived Tall Shrubland condition and where PCT 19 is recorded in the SVTM.

5.2.4 A Spear-grass (*Austrostipa wakoolica*)

Austrostipa wakoolica is a densely tufted, perennial spear-grass that grows to one metre tall and is listed as Endangered under both the BC and EPBC Acts. This species is mostly confined to the floodplains of the Murray River tributaries of central-western and south-western NSW, with localities including Manna State Forest, Matong, Lake Tooim, Merran Creek, Tulla, Cunninyeuk and South West Woodland Nature Reserve (DEH, 2025).

Austrostipa wakoolica was not recorded within the subject land during targeted seasonal surveys. Despite this, where targeted surveys were not possible due to property access restrictions, this species has been assumed present within 19.4 hectares of potential habitat where PCT 26 has been recorded in Moderate-good, Derived and Thinned condition, PCT 28 has been recorded in Derived and Derived Tall Shrubland condition, and where PCTs 17, 26 and 28 are recorded in the SVTM.

5.2.5 Mueller Daisy (Brachyscome muelleroides)

Brachyscome muelleroides is an annual herb to 14 centimetres tall that produces single white flowers to four millimetres diameter. It is listed as Vulnerable under both the BC and EPBC Acts and predominantly occurs in the Wagga Wagga, Narranderra, Tocumwal and Walbundrie areas (DEH, 2025).

Brachyscome muelleroides was not recorded within the subject land during targeted seasonal surveys. Despite this, where targeted surveys were not possible within the Murrumbidgee IBRA subregion due to property access restrictions, this species has been assumed present where PCTs 44 and 45 are recorded in the SVTM.

5.2.6 Mossgiel Daisy (Brachyscome papillosa)

Brachyscome papillosa is a threatened perennial herb daisy listed as Vulnerable under both the BC Act and EPBC Act. The plant is generally multi-stemmed up to 40 centimetres in height with distinct broad obovate winged seeds (achenes) with densely flattened papillae Photo 5.3). *Brachyscome papillosa* is listed as having mauve flowers however, within the subject land individuals of this species have been exclusively identified as a white phenotype (Photo 5.1).

Brachyscome papillosa is only known from NSW where it is generally restricted to the Riverina bioregion with most records occurring chiefly from the Mossgiel to Urana districts with records from Jerilderie, Darlington Point, Wouldandra Lakes and north to Ivanhoe (Photo 5.4). The species is listed to be primarily found on clay soils associated with Bladder saltbush (PCT 157) and Cotton bush (PCT 164) (DEWHA, 2008) (Photo 5.2). The population size of *Brachyscome papillosa* is currently unknown and the species is not considered adequately reserved in conservation areas.

Across the subject land, the population was recorded in numerous vegetation types including:

- PCT 15_Moderate-good
- PCT 46_Moderate-good
- PCT 163_Moderate-good
- PCT 164_Moderate-good.

Populations of this species were recorded on light grey or grey, heavy clay soils in depressions associated with ephemeral waterways and red to red brown flat alluvial plains associated with PCT 46. Samples, including reproductive material, were collected and forwarded to the Royal Botanical Gardens. Positive confirmation of this species was received on 10 December 2024.

The unit of measure under BAM-C for *Brachyscome papillosa* is area. Area calculations for species polygons have been established by applying threatened species habitat polygons to all contiguous areas of similar (same PCT) vegetation associated with recorded sub-populations where:

- there are no barriers to the dispersal of genetic material including tracks and irrigation channels, or
- phase-two of the two-phase grid identified the extent of the population.

The TBDC lists September – November as the suitable survey period for this species. Extensive survey effort, including two-phase grid-based systematic survey and parallel field traverses, were undertaken during this period. However, due to design refinements and access restrictions, several areas of the subject land lack adequate survey effort. Assumed threatened flora species habitat polygons were applied to areas lacking adequate threatened flora survey effort where suitable habitat has been identified by the TBDC including PCT 15, PCT 44, PCT 45, PCT 46, PCT 157, PCT 160, PCT 163 and PCT 164. Polygons were restricted to within the Murrumbidgee IBRA subregion to the east of Jerilderie.



Photo 5.1 Individual of Brachyscome papillosa with white flowers



Photo 5.2 Typical habitat of Brachyscome papillosa in PCT 164



Photo 5.3 Brachyscome papillosa seed (achene) with distinct broad obovate wings and densely flattened papillae

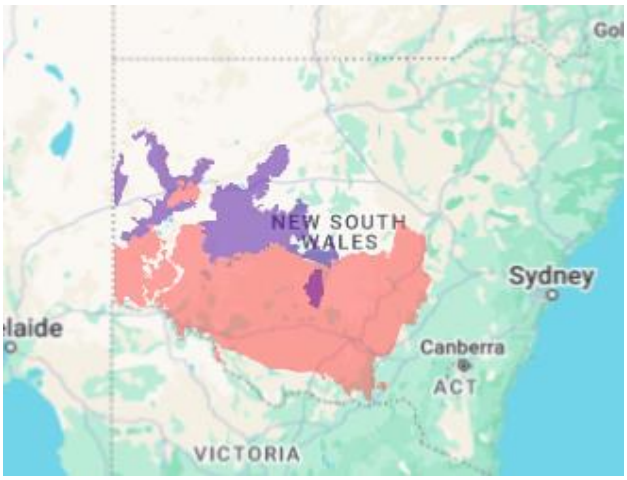


Photo 5.4 Brachyscome papillosa distribution in NSW with Pink indicating known and purple indicating predicted

5.2.7 *Sand-hill Spider Orchid (Caladenia arenaria)*

Caladenia arenaria is a threatened orchid species that occurs in woodland with sandy soil, especially that dominated by White Cypress Pine (*Callitris glaucophylla*). It is listed as Endangered under both the BC and EPBC Acts and is found mostly on the south west plains and western south west slopes (DEH, 2025).

Caladenia arenaria was not recorded within the subject land during targeted seasonal surveys. Despite this, where targeted surveys were not possible within the Inland Slopes IBRA subregion due to property access restrictions, this species has been assumed present within 0.30 hectares of potential habitat where PCT 76 has been recorded in Thinned condition.

5.2.8 *A burr-daisy (Calotis moorei)*

Calotis moorei is a perennial daisy to 45 centimetres tall that is listed as Endangered under both the BC and EPBC Acts. This species is confined to NSW and is known from only four populations in NSW: north-west of Louth, west of Wilcannia, around the Menindee area and an old record at Zara Station near Deniliquin (DEH, 2025).

Calotis moorei was not recorded within the subject land during targeted seasonal surveys. Despite this, where targeted surveys were not possible within the Murrumbidgee IBRA subregion due to property access restrictions, this species has been assumed present within 12.14 hectares of potential habitat where the following vegetation has been recorded:

- PCT_23 Moderate-good
- PCT_23 Derived
- PCT_157 Moderate-good
- PCT_157 SVTM.

5.2.9 Bindweed (Convolvulus tedmoorei)

Convolvulus tedmoorei is a threatened perennial herb with trailing stems. The species has been recorded from northern inland areas of South Australia, south-western Queensland and western NSW. There are few known records from NSW: two areas on the Murrumbidgee and Darling River floodplains in central-western NSW (from Toganmain Station, Darlington Point, and from a locality eight kilometres north-west of Louth); and two other records from east of Broken Hill on the road to Wilcannia, and from the Menindee Road, Scarsdale (DEH, 2025).

Convolvulus tedmoorei was not recorded within the subject land during targeted seasonal surveys. Despite this, where targeted surveys were not possible within the Murrumbidgee IBRA subregion due to property access restrictions, this species has been assumed present within 28.92 hectares of potential habitat where PCTs 44, 157, 160, 163 and 164 were recorded in Moderate-good condition, and where PCTs 17, 44, 45, 157 and 160 are recorded in the SVTM.

5.2.10 Small Scurf-pea (Cullen parvum)

Cullen parvum is a procumbent to decumbent perennial herb to 30 centimetres high listed as Endangered under the BC Act. It is known from South Australia, Victoria and NSW with populations from Victoria and New South Wales being mainly restricted to grassland, River Red Gum woodland or Box-Gum Woodland where the plant has been recorded on table drains or adjacent to drainage lines of watercourses (DEH, 2025). Furthermore, most records are associated with the Murrumbidgee and Murray Rivers and their tributaries. The plant is recognised to be generally restricted to areas that receive between 450 and 700 millimetres of rainfall annually.

Cullen parvum was not recorded within the subject land during targeted seasonal surveys. Despite this, where targeted surveys were not possible in the Inland Slopes and Murrumbidgee IBRA subregions due to property access restrictions, this species has been assumed present within 25.49 hectares of potential habitat where the following vegetation has been recorded:

- PCT 44_Moderate-good
- PCT 44_SVTM
- PCT 277_Moderate-good
- PCT 277_Thinned.

5.2.11 Pine Donkey Orchid (Diuris tricolor)

Diuris tricolor is a terrestrial orchid with two to six bright yellow to orange flowers that are speckled with red to purple and white markings. It is listed as Vulnerable under the BC Act only. *Diuris tricolor* is sporadically distributed on the western slopes of NSW, extending from south of Narrandera all the way to the north of NSW (DEH, 2025).

Diuris tricolor was not recorded within the subject land during targeted seasonal surveys. Despite this, where targeted surveys were not possible within the Inland Slopes due to property access restrictions, this species has been assumed present within 0.30 hectares where PCT 76 has been recorded in Thinned condition.

5.2.12 A Spike Rush (Eleocharis obicis)

Eleocharis obicis is a tufted perennial sedge listed as Vulnerable under both the BC and EPBC Acts. It grows to about 30 centimetres high with striated culms approximately one millimetre in diameter that are longitudinally and transversely septate. The leaf sheath does not have a real mucro with one side forming an oblique triangle (Photo 5.6). Flowerheads are 20-30 millimetres long and about 2.5 millimetres wide, straw-coloured tinged to dark red brown.

This species has historically been found near Condobolin and Hay from ephemerally wet areas including depressions (gilgais) in low-lying grasslands and chenopod shrublands and roadside drains (TBDC). This species has been found to be locally frequent to abundant in western NSW populations. While there is little known about this species, it is assumed the main dispersal vector of genetic material is localised flooding where viable seeds get moved from one gilgai to another.

Within the subject land, *Eleocharis obicis* was recorded in recently inundated gilgais, within chenopod shrublands (PCT 164) and freshwater wetlands (PCT 24). Typically, this species was recorded from heavy light grey to grey clays and is regularly associated with a similar assemblage of species to *Pilularia novae-holandiae* being, *Swainsona procumbens, Myriocephalus rhizocephalus, Marsilea drummondii* and *Rhodanthe corymbiflora.* Samples, including reproductive material, were collected and forwarded to the Royal Botanical Gardens. Positive confirmation of this species was received on 18 March 2024.

Vegetation types within the subject land where *Eleocharis obicis* was recorded include:

- PCT 24_Moderate-good
- PCT 163_Moderate-good
- PCT 164_Moderate-good.

The TBDC lists October – November as suitable survey months for this species but notes that the species is ephemeral and requires good soaking rains to emerge indicating survey effort should be focused after soaking rains during periods of gilgai activation or immediately post-activation. However, the species has been recorded within the locality from as early as September and as late as February. As such, targeted survey effort that falls outside of the TBDC listed months where the species has been recorded have been utilised in the creation of species polygons and are considered valid survey effort for this species.

As this species is highly restricted in habitat to gilgai complexes, microhabitat searches of gilgais were deemed to be the most suitable survey methodology.

The unit of measure under BAM-C for *Eleocharis obicis* is area. Area calculations for species polygons have been established by:

- identifying gilgai known to support or potentially support populations of this species , and
- creating a threatened species habitat polygon for each gilgai utilizing aerial imagery to identify the extent of the gilgai complex.

Extensive survey effort, including two-phase grid-based systematic survey and parallel field traverses, were undertaken during this period. However, due to design refinements and access restrictions, several areas of the subject land lack adequate survey effort. Assumed threatened flora species habitat polygons were applied to areas lacking adequate threatened flora survey effort where suitable habitat has been identified by the TBDC including:

- Murray Fans: PCT 10, PCT 13, PCT 163 and
- Murrumbidgee; PCT 17, PCT 157, PCT 160, PCT 163 and PCT 164.



Photo 5.5 An individual of Eleocharis obicis that has been recently grazed

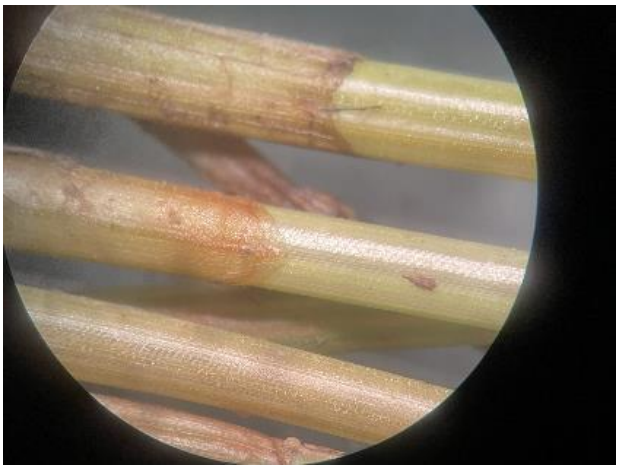


Photo 5.6 Example of the unique oblique leaf sheath present on Eleocharis obicis



Photo 5.7 A population of Eleocharis obicis persisting on a recently inundated gilgai on grey clays

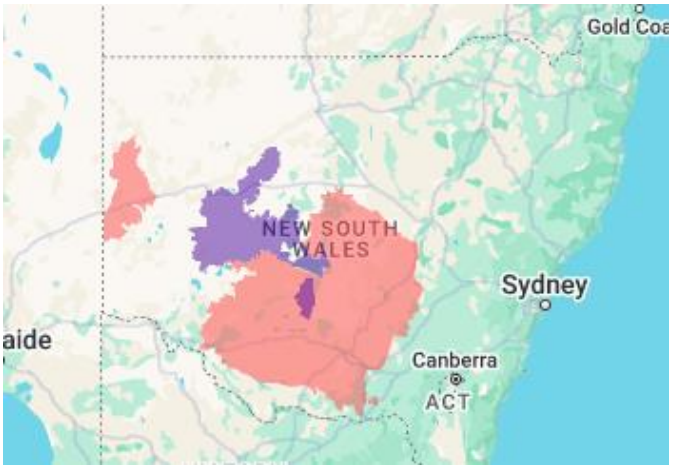


Photo 5.8 Eleocharis obicis distribution in NSW with pink indicating known and purple indicating predicted

5.2.13 *Yellow Gum (Eucalyptus leucoxylon subsp. pruinosa)*

Eucalyptus leucoxylon subsp. pruinosa is a small to medium-sized tree growing to about 20 metres high, with dark rough bark at the base and smooth grey, mottled yellow or white and bluish-grey, shedding in oval patches above. This species is restricted to several small areas between Barham and Euston, NSW, and often occurs at the base of sandy rises and on loamy clay flats on the floodplains of the Murray River and its tributaries in the Riverina bioregion. It is listed as Vulnerable under the BC Act (DEH, 2025).

Eucalyptus leucoxylon subsp. pruinose was not recorded within the subject land during seasonal surveys. Despite this, 9.13 hectares of potential habitat for this species has been identified in unsurveyed areas within the Murray Fans and Murrumbidgee IBRA subregions. As this is a count species, area (hectares) have not been included in credit generation and representative one individual has been applied to each impacted vegetation zone. Further consultation with CPHR would be completed to quantify impacts to this species.

5.2.14 Tumut Grevillea (Grevillea wilkinsonii)

Grevillea wilkinsonii typically grows to a large spreading shrub up to 2.5 metres tall and two metres wide and is highly restricted in the NSW South-west Slopes region. Its main occurrence is along a 6 km stretch of the Goobarragandra River approximately 20 kilometres east of Tumut where about 1,000 plants are known. The other occurrence is a small population that straddles the boundary of two private properties at Gundagai where only eight mature plants survive (DEH, 2025). It is listed as Critically Endangered under both the BC and EPBC Acts.

Grevillea wilkinsonii was not recorded within the subject land during targeted seasonal surveys. Despite this, where targeted surveys were not possible within the Inland Slopes IBRA subregion due to property access restrictions, this species has been assumed present within 0.10 hectares of potential habitat where PCT 266 has been recorded in Moderate-good and Thinned condition.

5.2.15 Winged Peppercress (Lepidium monoplocoides)

Lepidium monoplocoides is an annual herb listed as Endangered under the BC Act and EPBC Act. It is a 15–20-centimetre-high erect herb with angular and striped stems roughened with small warts. It is widespread in the semi-arid western plains regions of NSW with many historical records although fewer recent collections. It has previously been recorded from Bourke, Cobar, Urana, Lake Cargelligo, Balranald, Wanganella and Deniliquin. Recorded more recently from the Hay Plain, south-eastern Riverina, and from near Pooncarie (DEH, 2025).

Lepidium monoplocoides was recorded within the subject land during targeted seasonal surveys. One record was located at H341, within the Murrumbidgee IBRA subregion where PCT 46 is in Moderate-good condition. As the species is not widespread and is known to typically occur within specific microhabitat, being scalded red soils species polygon creation was limited to a 30-metre buffer from the recorded individual. Where targeted surveys were not possible within the Murray Fans and Murrumbidgee IBRA subregions due to property access restrictions, this species has been assumed present within 64.86 hectares of potential habitat across multiple PCTs and condition states (refer to section 12.3).

5.2.16 Lanky Buttons (Leptorhynchos orientalis)

Leptorhynchos orientalis is a daisy to 30 centimetres high with yellow button flowers at the end of slender stalks. It is listed as Endangered under the BC Act and not listed under the EPBC Act. *Leptorhynchos orientalis* is known from a small number of areas within Hay Plain and southern Riverina districts in NSW. The species is also known to occur in Victoria and southern Eyre Peninsular of South Australia. In NSW, the plant has been recorded near Hillston, Griffith, Urana and land to the west of Buckingbong State Forest (DEH, 2025).

Leptorhynchos orientalis was not recorded within the subject land during targeted seasonal surveys. Despite this, where targeted surveys were not possible within the Murrumbidgee due to property access restrictions, this species has been assumed present within 34.41 hectares of potential habitat where PCT 26 has been recorded within Moderate-good, Thinned and Derived condition, and where PCTs 26, 44, 45 and 46 are recorded in the SVTM.

5.2.17 Chariot Wheels (Maireana cheelii)

Maireana cheelii is a perennial forb listed as Vulnerable under both the BC Act and EPBC Act. This species grows to a height of about 20 centimetres, has narrow-cylindrical hairless leaves and is easily identified by its distinctly wheel-like fan shaped fruits (Photo 5.9 and Photo 5.10). *Maireana cheelii* has a restricted distribution in the southern Riverina region of NSW, mainly in the area between Deniliquin and Hay (Photo 5.12). The species is also known to have a limited distribution in Victoria where it is considered very rare.

The species appears to occupy niche habitat in the form of shallow depressions, often on scalded surfaces or edges of bare, windswept claypans, in shallow depressions of eroded surfaces where rainwater collects (Photo 5.11). *Maireana cheelii* has been documented to favour heavy brown to red-brown clay-loams, hard cracking red clay and other heavy texture-contrast soils (Department of Planning Industry and Environment 2021).

Maireana cheelii was recorded throughout the subject land on primarily grey and red-brown clays. All habitat consisted of scalded, wind-swept clays where moisture had historically pooled. Populations of this species were typically recorded from red to red-brown clay soils in scalded surfaces or claypans where water pooled. Microhabitat searches of red to red-brown clay scalds were undertaken to increase survey effort in areas of preferred habitat. Within the subject land the population spanned numerous vegetation types across the including:

- PCT 24_Moderate-good
- PCT 44_Moderate-good
- PCT 157_Moderate-good
- PCT 163_Moderate-good
- PCT 164_Moderate-good.

The unit of measure under BAM-C for *Maireana cheelii* is area. As the species known to typically occur within specific microhabitat, being scalded red soils species polygon creation was limited to a 30 metre buffer from the recorded individual.

The TBDC lists September – November as the suitable survey period for this species. Extensive survey effort, including two-phase grid-based systematic survey, parallel field traverses and microhabitat searches, were undertaken during this period. However, due to design refinements and access restrictions, several areas of the subject land lacks adequate survey effort. Assumed threatened flora species habitat polygons were applied to areas lacking adequate threatened flora survey effort where suitable habitat has been identified by the TBDC being PCT 44 within the Murray Fans IBRA subregion and PCT 26, 44, 46, 157 and 164 within the Murrumbidgee IBRA subregion restricted to the East of Deniliquin.



Photo 5.9 Individual of Maireana cheelii



Photo 5.10 Distinct fan-shaped wings on wheel-like fruiting body of Maireana cheelii



Photo 5.11 Typical Maireana cheelii habitat in shallow depression of wind-swept scalded areas where moisture collects



Photo 5.12 Maireana cheelii distribution in NSW with pink indicating known distribution

5.2.18 *Austral Pillwort (Pilularia novae-hollandiae)*

Pilularia novae-hollandiae is a semi-aquatic fern listed as Endangered and SAII under the BC Act. This species is not listed under the EPBC Act. *Pilularia novae-hollandiae* superficially resembles a small fine grass like plant with thread like fronds (Photo 5.14) to eight centimetres in height occurring in tuffs arising from underground stems (rhizomes). Fruiting bodies are distinct small hairy pills that occur at the base of the fronds generally underground.

Pilularia novae-hollandiae is widely distributed throughout southern Australia with known occurrences in New South Wales, the Australian Capital Territory, Victoria, Tasmania, South Australia and Western Australia (Department of Planning Industry and Environment 2021). Although widely distributed the species is rare in New South Wales and has been recorded from suburban Sydney, Khancoban, the Riverina between Albury and Urana (including Henty, Walbundrie, Balldale and Howlong), Oolambeyan National Park near Carathool and at Lake Cowal near West Wyalong (Department of Planning Industry and Environment 2021) (Photo 5.16).

Within the subject land, *Pilularia novae-hollandiae* was recorded in inundated, or recently inundated gilgais, within *Acacia pendula* woodlands (PCT 26) (Photo 5.15) and freshwater wetlands (PCT 17) in Moderate-good condition. Typically, this species was recorded from heavy light grey to grey clays associated with a similar assemblage of species to that of *Eleocharis obicis* being, *Swainsona procumbens, Myriocephalus rhizocephalus, Marsilea drummondii* and *Rhodanthe corymbiflora.*

The TBDC lists October – December as suitable survey months for this species but notes that the species is typically recorded in drying mud after inundation. Within the subject land, individuals of this species were recorded during September and October when survey effort occurred after rainfall events and gilgais were recorded to be active. It should be noted that recent rainfall itself cannot be utilised as an indicator of this species persistence in the landscape, as the largest rainfall total prior to field survey occurred in early 2024. However, due to typical summer conditions (i.e. hot days with low humidity) gilgais were not recorded to be active in February 2024 and the species was not recorded. As such, survey effort in the form of two-phase grid-based systematic survey, parallel field traverse and microhabitat searches that occurred outside of the listed optimal survey period but occurred after recent rainfall where gilgais were recorded to be active within the subject land is considered suitable to detect this species. This includes individuals identified in September 2024 in an active gilgai complex within PCT 26 (Photo 5.15).

As this species is highly restricted in habitat to gilgai complexes, microhabitat searches of gilgais were deemed to be the most suitable survey methodology.

The unit of measure under BAM-C for *Pilularia novae-hollandiae* is area. Area calculations for species polygons have been established by:

- identifying gilgai known to support or potentially support populations of this species , and
- creating a threatened species habitat polygon for each gilgai utilizing aerial imagery to identify the extent of the gilgai complex.

Extensive survey effort, including two-phase grid-based systematic survey, parallel field traverses and microhabitat searches, were undertaken during this period. However, due to design refinements and access restrictions, several areas of the subject land lacks adequate survey effort. Assumed threatened habitat polygons were applied to areas lacking adequate threatened flora survey effort where suitable habitat has been identified by the TBDC including within the:

- Murray Fans: PCT 2, PCT 13, PCT 15, PCT 44 and
- Murrumbidgee; PCT 15, PCT 26, PCT 44 and PCT 45.



Photo 5.13 Individuals of Pilularia novae-hollandiae recorded on the muddy bank of an inundated gilgai



Photo 5.14 Close up of Pilularia novae-hollandiae with opening frond



Photo 5.15 Typical habitat of Pilularia novae-hollandiae surrounding an inundated gilgai of PCT 26



Photo 5.16 Pilularia novae-hollandiae distribution in NSW with pink indicating known and purple indicating predicted

5.2.19 Tarengo Leek Orchid (*Prasophyllum petilum*)

Prasophyllum petilum is an orchid to 35 centimetres tall, distinguished by the pinkish-purple base to the leaf. It is listed as Endangered under the BC and EPBC Acts with natural populations known from a total of five sites in NSW. These are near Boorowa, Queanbeyan area, Ilford, Delegate and Muswellbrook. It also occurs at Hall in the Australian Capital Territory (DEH, 2025).

Prasophyllum petilum was not recorded within the subject land during targeted seasonal surveys. Despite this, where targeted surveys were not possible within the Inland Slopes IBRA subregion due to property access restrictions, this species has been assumed present within 1.98 hectares of potential habitat where PCT 277 has been recorded in Moderate-good and Thinned condition.

5.2.20 *Prasophyllum* sp. Moama

Prasophyllum sp. Moama is a terrestrial herb to 30 cm tall with a single erect leek-like leaf to 2-3 millimetres in diameter. It is Critically Endangered under the BC Act however not listed under the EPBC Act and is known in NSW from only one locality, discovered in 2005, near Moama (Murray Local Government Area). Despite this, the species is not endemic to New South Wales, also occurring in Victoria in small to moderate-sized populations within 50 kilometres of Echuca (DEH, 2025).

Prasophyllum sp. Moama was not recorded within the subject land during targeted seasonal surveys. Despite this, where targeted surveys were not possible within the Murray Fans IBRA subregion due to property access restrictions, this species has been assumed present within 9.88 hectares of potential habitat where PCT 44 is recorded in the SVTM.

5.2.21 *Pterostylis despectans*

Pterostylis despectans is a terrestrial herb with flowering stems 30-80 millimetres tall and characterised by the flower colours, a short flower stem, long spreading pedicels, sepal points often resting on the soil, and a labellum with two prominent basal bristles. It is listed as Critically Endangered under the BC Act and Endangered under the EPBC Act. In New South Wales, the species is known only from a single population discovered in 2005 near Moama in the Murray Local Government Area. It also occurs as very small, fragmented populations in central Victoria and in South Australia (DEH, 2025).

Pterostylis despectans was not recorded within the subject land during targeted seasonal surveys. Despite this, where targeted surveys were not possible within the Murray Fans IBRA subregion due to property access restrictions, this species has been assumed present within 9.88 hectares of potential habitat where PCT 44 is recorded in the SVTM.

5.2.22 Dwarf Bush-pea (*Pultenaea humilis*)

Pultenaea humilis is an erect to prostrate shrub between 0.2-0.8 m high, and with branchlets erect or drooping that are sparsely to moderately hairy. In NSW, it is known from three confirmed localities in the NSW South Western Slopes bioregion. *Pultenaea humilis* is listed as Vulnerable under the BC Act (DEH, 2025).

Pultenaea humilis was not recorded within the subject land during seasonal surveys. As adequate survey was completed for this species, no presence has been assumed for *Pultenaea humilis*.

5.2.23 Turnip Copperburr (*Sclerolaena napiformis*)

Sclerolaena napiformis is a low subshrub to about 30 centimetres high with slender branches sparsely covered with short, curled hairs. It is known from only a few small populations in remnant grassland in the southern Riverina of NSW and north-central Victoria. NSW populations are confined to the area between Jerilderie and Moama on travelling stock routes and road reserves. This species is listed as Endangered under the BC and EPBC Acts (DEH, 2025).

Sclerolaena napiformis was not recorded within the subject land during targeted seasonal surveys. Despite this, where targeted surveys were not possible within the Murrumbidgee IBRA subregion due to property access restrictions, this species has been assumed present within 34.10 hectares of potential habitat where PCT 26 has been recorded in Moderate-good, Thinned and Derived condition, and where PCTs 26, 44 and 46 are recorded in the SVTM.

5.2.24 Woolly Ragwort (Senecio garlandii)

Senecio garlandii is a branched perennial herb or shrub growing to 1.2 metres high, with woolly stems and large leaves, of which are also woolly below, up to 15 centimetres long and with toothed edges. It is found between Temora, Bethungra and Albury, and possibly Burrinjuck near Yass. The largest populations are at The Rock and Mt Tabletop. This species is listed as Vulnerable under the BC Act (DEH, 2025).

Senecio garlandii was not recorded within the subject land during targeted seasonal surveys. As adequate survey was completed for this species, no presence has been assumed for *Senecio garlandii*.

5.2.25 Menindee Nightshade (Solanum karsense)

Solanum karsense is a grey-green downy forb to 0.3 metres high, densely covered with pale star-shaped hairs. It is listed as Vulnerable under both the BC and EPBC Acts. This species is endemic to NSW, restricted to the far south-western plains, extending up the Darling River to the Menindee and Wilcannia districts. Mainly restricted to the area between the Darling and Lachlan Rivers (DEH, 2025).

Solanum karsense was not recorded within the subject land during targeted seasonal surveys. Despite this, where targeted surveys were not possible within the Murrumbidgee due to property access restrictions, this species has been assumed present within 0.24 hectares of potential habitat where PCT 15 has been recorded in Derived condition.

5.2.26 Slender Darling-pea (Swainsona murrayana)

Swainsona murrayana is a small, prostrate, sparsely downy forb listed as Vulnerable under both the BC Act and EPBC Act. The species has narrow linear leaves (Photo 5.19) and greyish, thin or tapered, stiffly leathery pods. The pea-like flowers are pink or purple with dark stripes (Photo 5.17) on densely and darkly hairy slender stalks (Department of Planning Industry and Environment 2021).

Swainsona murrayana is known to occur as scattered populations throughout NSW from Jerilderie and Deniliquin areas of the southern riverine plain and the broader the Hay plains as far north as Wouldandra National Park (Department of Planning Industry and Environment 2021) (Photo 5.19).

Swainsona murrayana was recorded throughout the subject land. The population spanned several vegetation types across the subject land including:

- PCT 15_Derived
- PCT 17_Moderate-good
- PCT 24_Moderate-good
- PCT 26_Moderate-good
- PCT 26_Thinned
- PCT 26_Derived
- PCT 44_Moderate-good
- PCT 46_Moderate-good
- PCT 157_Moderate-good
- PCT 163_Moderate-good
- PCT 164_Moderate-good.

Populations of this species were recorded from red, red-brown, light grey and grey clay soils and is not typically associated with any form of microhabitat.

The unit of measure under BAM-C for *Swainsona murrayana* is area. Area calculations for species polygons have been established by applying threatened species habitat polygons to all contiguous areas of similar (same PCT) vegetation associated with recorded sub-populations where:

- there are no barriers to the dispersal of genetic material including tracks and irrigation channels, or
- phase-two of the two-phase grid identified the extent of the population.

The TBDC lists September – November as the suitable survey period for this species. Extensive survey effort, including two-phase grid-based systematic survey, parallel field traverses and microhabitat searches, were undertaken during this period. However, due to design refinements and alterations, several areas of the subject land lack adequate survey effort. Assumed threatened flora species habitat polygons were applied to areas lacking adequate threatened flora survey effort where suitable habitat has been identified by the TBDC being PCT 15, PCT 23, PCT 26, PCT 28, PCT 44, PCT 45, PCT 46, PCT 157, PCT 163 and PCT 164.



Photo 5.17 Close up of Swainsona murrayana showing distinctive dark lines in petals



Photo 5.18 Swainsona murrayana in situ showing linear leaves and slender stalks

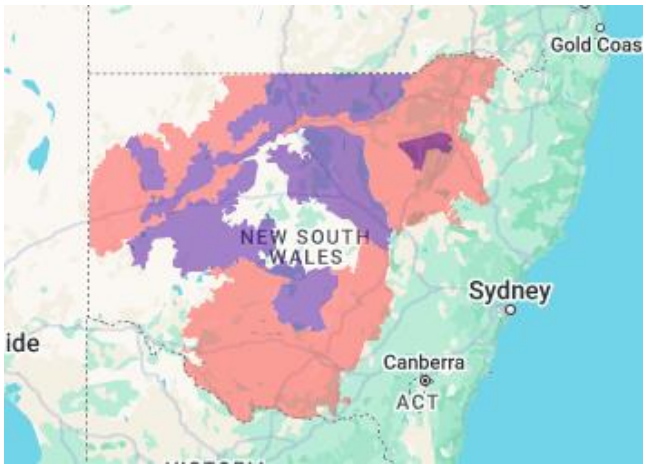


Photo 5.19 Swainsona murrayana distribution in NSW with pink indicating known and purple indicating predicted

5.2.27 Red Darling Pea (Swainsona plagiotropis)

Swainsona plagiotropis is a small prostrate forb to 15 centimetres high, with densely white-downy stalks and reddish-purple to bright red pea-like flowers. It is listed as Vulnerable under both the BC and EPBC Acts. This species occurs in the upper Murray River valley in the south-western plains of NSW and into Victoria. Most NSW records are from the Jerilderie area, with possible collections from the Louth-Bourke area and a disjunct record in the north-western plains from Buttabone Stud Park. It is also rare in Victoria, restricted to a few sites in the central north, mostly between Bendigo and the Murray River south of Echuca (DEH, 2025).

Swainsona plagiotropis was not recorded within the subject land during targeted seasonal surveys. Despite this, where targeted surveys were not possible within the Murrumbidgee IBRA subregion due to property access restrictions, this species has been assumed present within 36.38 hectares of potential habitat PCT 26 has been recorded in Moderate-good, Thinner and Derived condition, where PCT 44 has been recorded in Moderate-good condition, where PCT 163 has been recorded in Moderate-good condition, and where PCTs 26, 44, 45 and 46 are recorded in the SVTM.

5.2.28 Small Purple-pea (Swainsona recta)

Swainsona recta is a slender, erect perennial herb growing to 30 centimetres tall, bearing one to several sprays of 10 to 20 purple, pea-shaped flowers. It is listed as Endangered under both the BC and EPBC Acts. This species was recorded historically from places such as Carcoar, Culcairn and Wagga Wagga where it is probably now extinct. Populations still exist in the Queanbeyan and Wellington-Mudgee areas. It is also known from the ACT and a single population of four plants near Chiltern in Victoria (DEH, 2025).

Swainsona recta was not recorded within the subject land during seasonal surveys. Despite this, where targeted surveys were not possible within the Inland Slopes IBRA subregion due to property access restrictions, this species has been assumed present within 2.08 hectares of potential habitat where PCTs 266 and 277 have been recorded in Moderate-good and Thinned condition.

5.2.29 Silky Swainson-pea (Swainsona sericea)

Swainsona sericea grows to a height of 10 centimetres with densely hairy stems and leaves. The pea shaped flowers range from mauve to pink and are followed by a hairy seed pod up to 17 millimetres long. *Swainsona sericea* is known from the Northern Tablelands to the Southern Tablelands and further inland on the slopes and plains of NSW. It is also known to occur in South Australia, Victoria and Queensland (DEH, 2025).

Swainsona sericea was not recorded within the subject land during targeted seasonal surveys. Despite this, where surveys were not possible within the Inland Slopes and Murrumbidgee IBRA subregions due to property access restrictions, the species has been assumed present within 38.10 hectares of potential habitat. In the Inland Slopes IBRA subregion, where PCTs 266 and 277 have been recorded in Moderate-good and Thinned condition. In the Murrumbidgee IBRA subregion, where PCT 26 has been recorded in Moderate-good, Thinned and Derived condition, and where PCTs 26, 28, 44, 45 and 46 are recorded in the SVTM.

5.2.30 Australian Bustard (Ardeotis australis)

The Australian Bustard is listed as Endangered under the BC Act, however, is not listed as a threatened species under the EPBC Act.

The Australian Bustard is a very large, heavy-bodied, ground-dwelling bird up to one metre tall. The head, neck and breast are white with dark grey specks, the upper surface of the wings and tail are brown with fine dark patterns, and there is a bold black and white patch on the lower edge of the wing. In NSW, they are mainly found in the north-west corner and less often recorded in the lower western and central west plains regions. Occasional vagrants are still seen as far east as the western slopes and Riverine plain. Breeding now only occurs in the north-west region of NSW.

This species primarily inhabits tussock and hummock grasslands, though prefers tussock grasses to hummock grasses. It also occurs in low shrublands and low open grassy woodlands, and occasionally seen in pastoral and cropping country, golf courses and near dams.

The Australian Bustard was not recorded within the subject land during seasonal surveys. Despite this, where targeted surveys were not possible within the Murray Fans and Murrumbidgee IBRA subregions, this species has been assumed present within 116.10 hectares of potential habitat where PCTs 157 and 163 have been recorded in Moderate-good condition, and where PCTs 15, 28, 44, 46, 157, 160, 163 and 164 are recorded in the SVTM.

5.2.31 *Barking Owl (Ninox connivens)*

The Barking Owl is considered vulnerable under the NSW BC Act, but it is currently not listed as a threatened species under the EPBC Act.

The Barking Owl is a medium-sized owl with a body length of approximately 42 centimetres and an average weight of 650 grams. Its eyes are bright yellow, and it has white breast that is vertically streaked with brown. The species is distributed throughout continental Australia, with the exception of the central arid regions. In NSW it has a wide but sparse distribution, with core populations occurring on the western slopes and plains, and some northeast forests.

The Barking Owl prefers woodland and open forest habitat, including forest remnant patches, but requires a large permanent territory – with breeding pairs requiring areas of up to 2000 hectares for foraging and permanent home ranges of up to 6000 hectares. The species roost in shaded portions of tree canopies, including tall mid-storey trees. They prefer living eucalypts, but dead trees are also used as nest sites. Pairs often repeatedly use the same site over years. Nesting occurs during mid-winter and spring.

Barking Owls were not recorded within the subject land during targeted seasonal surveys. Despite this, where targeted surveys were not possible within the Murray Fans and Murrumbidgee IBRA subregions due to property restrictions or seasonality of survey effort, this species has been assumed present where a suitable PCT has been recorded by WSP verified vegetation mapping or SVTM and the vegetation meets or potentially meets the habitat requirements for the species (i.e. has been identified to contain suitable breeding hollows for the species or has a lack of hollow-bearing tree survey effort). Further, the species is not assumed to be present where vegetation has been identified to be in derived, Derived_LCV or Derived_TS condition classes due to the lack of suitable habitat features required by the species to nest. Within the Inland Slopes IBRA subregion, a species expert report undertaken as part of the approved HumeLink BDAR (Niche, 2024) has been utilised to identify a lack suitable breeding habitat within the subject land, and no species polygons have been created within the Inland Slopes.

5.2.32 *Black-breasted Buzzard (Hamirostra melanosternon)*

The Black-breasted Buzzard (*Hamirostra melanosternon*) is listed as Vulnerable under the BC Act, but is not listed under the EPBC Act.

The Black-breasted Buzzard is a bird of prey with a wingspan of up to 1.5 metres and a short square tail. In flight, this species is recognised by its black breast and the conspicuous white patches at the base of the black ‘fingered’ primaries. At rest, it has a reddish nape against the black face and back (DPE, 2017).

The Black-breasted Buzzard occurs in areas of less than 500 millimetres rainfall, from north-western NSW and north-eastern South Australia to the east coast at about Rockhampton. It lives in a range of inland habitats along timbered watercourses, of which is the preferred breeding habitat, and hunts over grasslands and sparsely timbered woodlands. Species range is limited to areas within 40 metres of rivers and/or large waterbodies and PCTs that meet the habitat constraint (DPE, 2017).

Black-breasted Buzzards were not recorded within the subject land during targeted seasonal surveys. Where targeted surveys were not possible within the Murray Fans IBRA subregion due to property access restrictions or seasonal survey timing constraints, this species has been assumed present in suitable habitat types identified by either WSP verified vegetation mapping or SVTM, within 40 metres of a named watercourse (i.e. where the species habitat constraint would be met). Areas subject to habitat assessments and survey effort outside of targeted diurnal bird surveys that failed to

record large stick nests have also been excluded. Further, the species is not assumed to be present where vegetation has been identified to be in derived, Derived_LCV or Derived_TS condition classes due to the lack of suitable habitat features required by the species to nest.

5.2.33 Bush Stone-curlew (Burhinus grallarius)

The Bush Stone-curlew (*Burhinus grallarius*) is listed as Endangered under the BC Act and is not listed under the EPBC Act.

The Bush Stone-curlew is about 55 centimetres tall. It has a grey to light brown back, marked with black blotches, a streaked rump, buff and white underparts with dark streaks, and a black band that runs from near its eye down its neck. The species has large, bright yellow eyes and a hunch-shouldered stance on long spindly legs. When disturbed it lies flat on the ground, with its head and neck outstretched. Its call is a loud eerie wailing "wee-loo", mostly heard at night.

The Bush Stone-curlew inhabits open forests and woodlands with a sparse grassy ground stratum and fallen timber. It is largely nocturnal and feeds on insects and small vertebrates, such as frogs, lizards and snakes. The Bush Stone-curlew lays two eggs in Spring and early Summer, in nests which are scrapes or small bare patches on the ground.

Within the subject land, suitable habitat for this species is found predominantly within the western half of the alignment (i.e. south of Moulamein) in woodlands dominated by Black Box and River Red Gum. There are anecdotal reports of Bush-stone Curlew sightings around the Wakool River, though landowners noted that the species is highly cryptic, and calls and sightings are historically irregular within these properties.

Within the subject land, Bush Stone-curlew was recorded (heard) during call playback surveys completed in April 2025. All records were located within PCT 10 - River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion). Records of Bush Stone-curlew were recorded (heard) at two locations; one at H217 and one at H283 (refer to Figure 15.11). Species polygons have been created at these locations which incorporate the entirety of the vegetation patch associated with the records.

Where targeted surveys were not possible within the Murray Fans, Murrumbidgee and Inland Slopes IBRA subregion, the species has been assumed present within suitable habitat types identified by WSP verified vegetation mapping and SVTM.

5.2.34 Gang-gang Cockatoo (Callocephalon fimbriatum)

The Gang-gang Cockatoo (*Callocephalon fimbriatum*) is listed as Endangered under the BC Act and EPBC Act.

The Gang-gang cockatoo is a distinctive bird which is primarily slate-grey, with males having a scarlet head and wispy crest, while females have a grey head and crest and feathers edged with salmon pink on the underbelly. They range in length from 32 to 37 cm, with a wingspan of 62 to 76 centimetres. The call has been likened to a creaking gate or cork being pulled from a bottle.

The Gang-gang Cockatoo is distributed from southern Victoria through south- and central-eastern New South Wales. In New South Wales, the Gang-gang Cockatoo is distributed from the south-east coast to the Hunter region, and inland to the Central Tablelands and south-west slopes. It occurs regularly in the Australian Capital Territory. It is rare at the extremities of its range, with isolated records known from as far north as Coffs Harbour and as far west as Mudgee.

In spring and summer, the species is usually found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In autumn and winter, the species often moves to lower altitudes in drier more open eucalypt forests and woodlands, particularly box-gum and box-ironbark assemblages, or in dry forest in coastal areas and often found in urban areas. The species can also occur in sub-alpine Snow Gum (*Eucalyptus pauciflora*) woodland and occasionally in temperate rainforests. It favours old growth forest and woodland attributes for nesting and roosting. Nests are located in hollows that are 7 centimetres in diameter or larger in eucalypts and 3 metres or more above the ground.

Gang-gang Cockatoos were not recorded within the subject land during targeted seasonal surveys. Where targeted surveys were not possible within the Inland Slopes, this species has been assumed present in PCTs 266 and 277 where suitable breeding hollows have been recorded.

5.2.35 Grey Snake (Hemiaspis damelii)

The Grey Snake is listed as Endangered under the BC Act and EPBC Act.

The Grey Snake is a relatively small, crepuscular to nocturnal, venomous, front-fanged snake with a uniform pale or dark grey to olive grey body. The top of the head and a few scale rows on the nape are black in juveniles, and more of a crescent or absent in adults. Belly colour is white, cream, or pale yellow, often with darker flecks, and the skin between the scales is black. The eyes are large relative to other small snakes that share a similar habitat.

The Grey Snake has a wide overall range from inland southern NSW to central Queensland, though the distribution is not continuous across this full range and consists of several isolated subpopulations. In NSW the species occupies five geographically discrete subpopulations, predominantly associated with the lower reaches of major westerly flowing rivers, including the Gwydir, Namoi, Castlereagh, Macquarie, Lachlan, and Murrumbidgee River systems. Some NSW subpopulations occur in protected areas including Yanga National Park and Gayini Nimmie-Caira, a property under the management and ownership of the Nari Nari Tribal Council in southern NSW.

Floodplains and ephemeral wetlands associated with heavy clay soils are key habitat features for the Grey Snake. In NSW, the Grey Snake's habitat includes the margins of ephemeral wetlands within River Red Gum (*Eucalyptus camaldulensis*) and Black Box (*E. largiflorens*) vegetation communities and Tangled Lignum (*Duma florulenta*) swamps. The species shelters in soil cracks, rocks, logs, flood debris, and abandoned burrows within these habitats. The Grey Snake has not been sighted in dry phase wetlands, suggesting its detectability and activity patterns may be related to wetland inundation regimes and suitable weather conditions. Cracks in clay soils are used in the species' hunting strategy, where it travels along cracks searching for ground-dwelling frogs, which are often found between these cracks.

Grey Snake was not recorded within the subject land. Where targeted surveys were not possible within the Murray Fans and Murrumbidgee IBRA subregions, the species was assumed present within areas of suitable vegetation identified by either WSP verified vegetation mapping of STVM. Patches of isolated vegetation in an otherwise highly disturbed landscape (i.e. subject to intensive agriculture) are not considered habitat for the species and have been excluded from polygon creation.

5.2.36 Koala (Phascolarctos cinereus)

The Koala is currently listed as endangered under both the BC Act and the EPBC Act.

The Koala is an arboreal marsupial with fur ranging from grey to brown above, and white below. It has large furry ears, a prominent black nose and no tail. It spends most of its time in trees and has long, sharp claws, adapted for climbing.

The Koala has a fragmented distribution throughout eastern Australia from north-east Queensland to the Eyre Peninsula in South Australia. In New South Wales, koala populations are found on the central and north coasts, southern highlands, southern and northern tablelands, Blue Mountains, southern coastal forests, with some smaller populations on the plains west of the Great Dividing Range.

Koalas inhabit eucalypt woodlands and forests, feeding on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area would select preferred browse species. They are inactive for most of the day, feeding and moving mostly at night. They spend most of their time in trees but would descend and traverse open ground to move between trees. Koala home range size varies with quality of habitat, ranging from less than two ha to several hundred hectares in size. Koalas are generally solitary but have complex social hierarchies based on a dominant male with a territory overlapping several females and sub-ordinate males on the periphery.

Koalas were not recorded within the subject land, and targeted survey effort for the species is limited. Within the Murray Fans and Inland slopes IBRA subregions, Koalas have been assumed present in all suitable vegetation types, identified by WSP verified vegetation mapping or SVTM, where Koala use trees are typically recorded from the vegetation type. The species is not assumed to be present where vegetation has been identified to be in derived, Derived_LCV or Derived_TS condition classes due to the lack of suitable habitat features required by the species.

5.2.37 Masked Owl (Tyto novaehollandiae)

The Masked Owl is currently listed as vulnerable under the BC Act and is currently not listed as a threatened species under the EPBC Act.

This species is recorded across 90 per cent of NSW with a home-range of approximately 1,000 ha for a breeding pair. Masked Owls avoid areas of young regrowth, utilising dry Eucalypt Forest and woodlands greater than 60 years old, with optimal habitat featuring a mosaic understorey of dense shrubby and sparse grassy ground cover ideal for hunting their preferred prey species which includes ground dwelling mammals, especially rats.

The species roost generally in Eucalypts hollows greater than 5 metres above ground, live or dead, dense foliage in moist Eucalypt gullies, and recesses in cliffs or caves. While nesting also occurs in old Eucalypts hollows these are generally 3 m above the ground, in live or dead trees measuring at least 90 centimetres diameter at breast height. Further, these hollows must be greater than 40 centimetres wide and 1 metre deep for Masked Owl nesting suitability.

Masked Owl was not recorded within the subject land. Despite this, where targeted surveys were not possible within the Murray Fans and Murrumbidgee IBRA subregions due to property restrictions or seasonality of survey effort, this species has been assumed present where a suitable PCT has been recorded by WSP verified vegetation mapping or SVTM and the vegetation meets or potentially meets the habitat requirements for the species (i.e. has been identified to contain suitable breeding hollows for the species or has a lack of hollow-bearing tree survey effort). Further, the species is not assumed to be present where vegetation has been identified to be in derived, Derived_LCV or Derived_TS condition classes due to the lack of suitable habitat features required by the species to nest. Within the Inland Slopes IBRA subregion, a species expert report undertaken as part of the approved HumeLink BDAR (Niche, 2024) has been utilised to identify a lack suitable breeding habitat within the subject land, and no species polygons have been created within the Inland Slopes

5.2.38 Little Eagle (Hieraaetus morphnoides)

The Little Eagle (Hieraaetus morphnoides) is listed as Vulnerable under the BC Act, and currently not listed as threatened under the EPBC Act.

The Little Eagle occurs as a single population throughout NSW but is found throughout the Australian mainland except the most densely forested parts of the Dividing Range escarpment. It typically occupies open eucalypt forests, woodlands or open woodlands and pastures. They have been observed utilising Sheoak or Acacia woodland and riparian woodlands of inland NSW, with a strong association to yellow box – Red Gum Grassy Woodland and Derived Native Grassland.

Little Eagles build their nests in tall, living trees within a remnant patch, where pairs build a large stick nest in winter. Adult breeding Little Eagles are resident in permanent home ranges for at least several consecutive years, individuals and juveniles however are quite dispersive and can travel up to 3000 kilometres away.

Little Eagle was recorded in one location just outside of the subject land on property 354, flying over a dam within chenopod shrubland. Targeted survey effort failed to identify a breeding pair or evidence of a breeding pair within the subject land. Where targeted surveys were not possible due to property access restrictions or seasonal survey timing in the Murray Fans and Murrumbidgee IBRA subregions, the species has been assumed present within suitable habitat identified by either WSP verified vegetation mapping or SVTM where the listed habitat constraint would be met (i.e. Acacia shrublands, Chenopod shrublands, areas of derived, derived_LCV or derived_TS have been excluded due to the lack of ‘live (occasionally dead) large old trees’). Furthermore, areas subject to habitat assessments and survey effort outside of targeted diurnal bird surveys that failed to record large stick nests have also been excluded. Within the Inland Slopes IBRA subregion, a species expert report undertaken as part of the approved HumeLink BDAR (Niche, 2024) has

been utilised to identify a lack suitable breeding habitat within the subject land, and no species polygons have been created within the Inland Slopes.

5.2.39 Pink Cockatoo (Lophochroa leadbeateri leadbeateri)

The Pink Cockatoo (*Lophochroa leadbeateri leadbeateri*), formerly known as Major Mitchell's Cockatoo, is listed as Endangered under the EPBC Act and is not listed under the BC Act. This listing is primarily due to population estimations in 2011 which found a 67 per cent decline in population within a single generation.

The Pink Cockatoo is a small, pink and white cockatoo with a long, forward pointing, scarlet and yellow-banded crest. Birds are mostly white, washed salmon pink on sides of the head, grading to white on the lower belly. The crest appears white when folded and shows broad red and yellow bands through the centre when raised and spread. The narrow yellow band varies individually and between sexes. Adults weigh around 365–480 grams, and have a body length of 39 centimetres.

This subspecies occurs in the Murray-Darling, Eyre and Bulloo River Basins, from Isisford and Roma in the north, through western New South Wales to north-west Victoria and west to eastern South Australia. It occupies arid and semi-arid woodlands dominated by mulga (*Acacia aneura*), mallee and box eucalypts, slender cypress pine (*Callitris gracilis*) or belah (*Casuarina cristata*). Within these vegetation types, the subspecies' main requirements are fresh surface water and trees with suitable nesting hollows. Observed nesting hollows are averaged to have a 13.3 x 27.7 centimetres entrance diameter with a 53.9-centimetre depth. These hollows are usually restricted to large, tall trees preferably 130-140 years old and found in intact mature woodland.

Within the subject land, vegetation species associated with arid and semi-arid woodlands are scattered; however, fresh surface water and trees with suitable nesting hollows are locally abundant. Mature River Red Gums along water courses provide suitable nesting hollows for the species, and rivers and irrigation channels provide fresh surface water. While the species has not been recorded within the subject land during surveys to date, it is a highly mobile species and would move throughout the landscape while foraging, including within the subject land, though remaining within proximity to fresh water. The species was observed flying across Maude Road within a kilometre of the subject land on several occasions in October 2024; these movements were between agricultural land where it was presumably foraging, and mature River Red Gums along the Edward River. Further observations were made in October 2024 on Berrambong Railway Road/Keri Keri Road within proximity of the subject land.

Where targeted surveys were not possible due to property access restrictions or seasonal survey timing in the Murray Fans and Murrumbidgee IBRA subregions, the species has been assumed present within suitable habitat identified by either WSP verified vegetation mapping or SVTM where the listed habitat constraint would be met or potentially met being 'hollow-bearing trees or living or dead tree with hollows greater than 10 cm diameter'. Furthermore, areas subject to habitat assessments and survey effort outside of targeted diurnal bird surveys that failed to record suitable hollows for the species have also been excluded. Within the Inland Slopes IBRA subregion, the species is considered a vagrant as discussed in section 5.1.2 and the species has not been assumed present.

5.2.40 Pink-tailed Legless Lizard (Aprasia parapulchella)

The Pink-tailed Legless Lizard (*Aprasia parapulchella*) is listed as Vulnerable under the BC Act and EPBC Act.

The Pink-tailed Legless Lizard is a worm-like lizard with a pale grey or grey-brown body, pink or reddish-brown tail and dark brown head and nape. The broad, non-forked tongue and small hind-limb flaps distinguish It from a juvenile snake. The species grows up to about 25 centimetres in length.

The Pink-tailed Legless Lizard is primarily known from the Central and Southern Tablelands and the South Western Slopes, with a confirmed outlier record on the Hay Plains north of Hay. There is a concentration of populations in the Canberra/Queanbeyan Region. Other populations have been recorded near Cooma, Yass, Bathurst, Albury and West Wyalong. This species is also found in the Australian Capital Territory.

The species inhabits sloping, open woodland areas with predominantly native grassy ground layers, particularly those dominated by Kangaroo Grass (*Themeda australis*). Sites are typically well-drained, with rocky outcrops or scattered, partially buried rocks. Individuals are commonly found beneath small, partially embedded rocks and appear to spend considerable time in burrows below these rocks; the burrows have been constructed by and are often still inhabited by small black ants and termites.

Pink-tailed Legless Lizard was not recorded within the subject land. However where targeted surveys were not possible due to timing of seasonal survey requirements in the Inland Slopes IBRA subregion, the species has been assumed present within suitable habitat identified as 'rocky habitats' by the species habitat constraint.

5.2.41 Plains-wanderer (Pedionomus torquatus)

The Plains-wanderer (*Pedionomus torquatus*) is listed as Endangered (Species Credit) under the BC Act and listed as Critically Endangered under the EPBC Act.

The Plains-wanderer is a relatively small grassland bird that exists as a single species in its monotypic family. It is most closely related to the shorebirds, its closest genetic associations with the seed snipes of South America.

Although the Plains-wanderer's range extends through northern Victoria, South Australia, the lower Northern Territory and through western NSW to south-western Queensland, their stronghold is in the NSW Riverina district and the northern Victoria grasslands. The subject land traverses some of important habitat mapped areas for the species in NSW which roughly extends from Griffith in the north to Deniliquin in the south and from west of the Cobb Highway to the Urana area in the east.

From comparisons of genetic material, between the Victorian and NSW Riverina populations, there is evidence that the two areas share individuals, although movements haven't been confirmed through banding (David Parker pers. comm.). There is at least some hard evidence that Plains-wanderers move relatively large distances, with a bird being recorded over 140 kilometres from a banding location with significant barriers (river and woodland) between the two locations (David Parker pers comm.).

Although the Plains-wanderer is superficially similar in habitat choice to quail, it is unable to negotiate dense grassland types like quail do and it is far less likely to flush when approached. It avoids woodland habitats by a significant margin, which is thought to be due to the potential haunt for predators that woodlands represent. Its difficulty in negotiating dense grassland types and preference for high grassland plant diversity has limited the availability of preferred habitat types due to widespread pasture improvement and grazing pressures throughout its natural range. The Plains-wanderer's habitat preference is for substrates denuded of the "A" horizon where grasses can only grow sparsely, leaving soil substrates open and providing opportunities for short native herbs and tufted native grasses to offer forage and cover. Its highly specific requirements for habitat quality and structure is further dependant on land use and grazing regimes; sheep often being employed as a means of reducing grass densities during periods of strong growth returning preferred habitat areas to structural condition preferred by the bird.

The Plains-wanderer is diurnal in its habits, but almost impossible to see during daylight hours. All surveys conducted for the species are therefore undertaken at night. Currently, the species is experiencing a low population ebb because of a prevailing dry period extending back twenty years and this weather pattern has contributed to a population reduction from an estimated 3,000 individuals down to approximately 700 birds during that period (David Parker pers. comm.). There is strong evidence that the species moves in response to changes in habitat quality, with birds present in locations when habitat is of high quality and absent when habitat quality wanes (David Parker pers. comm.). This tendency to move in response to habitat quality, which is widely recorded in many other bird species, has important implications for results returned from Plains-wanderer survey works.

Within the subject land, one individual adult female Plains-wanderer was identified on the H32 property, 3.16 kilometres west of the intersection of the alignment with Wouldurah Road (see Photo 5.20).

Steps have been undertaken at each stage of the project to avoid important habitat mapping for the Plains-wanderer. However, the current indicative disturbance footprint intersects at three locations with important habitat mapped areas. Two of these are located on access tracks or roads where steps can be taken to remain on existing tracks or roads without further impacts through appropriate mitigation. The third location is on holding H32 on PCT 44 and the areas can be avoided through mitigation including the creation of a special biodiversity protection zone (refer to section 9.4.2). Based on the current important habitat mapping, 3.39 hectares has the potential to be impacted and avoidance of this is further discussed in section 9.4.2.



Photo 5.20 Adult female Plains-wanderer within subject land

5.2.42 Square-tailed Kite (Lophoictinia isura)

The Square-tailed Kite (*Lophoictinia isura*) is listed as Vulnerable under the BC Act and is not listed under the EPBC Act.

The Square-tailed Kite is a reddish, medium-sized, long-winged raptor, about the size of a Little Eagle or harrier. The Square-tailed Kite ranges along coastal and subcoastal areas from south-western to northern Australia, Queensland, NSW and Victoria. In NSW, scattered records of the species throughout the state indicate that the species is a regular resident in the north, north-east and along the major west-flowing river systems. It is a summer breeding migrant to the south-east, including the NSW south coast, arriving in September and leaving by March.

Found in a variety of timbered habitats including dry woodlands and open forests. Shows a particular preference for timbered watercourses. In arid north-western NSW, it has been observed in stony country with a ground cover of chenopods and grasses, open acacia scrub and patches of low open eucalypt woodland. It is a specialist hunter of passerines, especially honeyeaters, and most particularly nestlings, and insects in the tree canopy, picking most prey items from the outer foliage. The species appears to occupy large hunting ranges of more than 100 square kilometres. Breeding is from July to February, with nest sites generally located along or near watercourses, in a fork or on large horizontal limbs.

The Squared-tailed Kite was not recorded within the subject land. Despite this, where targeted surveys were not possible due to property access restrictions or seasonal survey timing in the Murray Fans and Murrumbidgee IBRA subregions, the species has been assumed present within suitable habitat identified by either WSP verified vegetation mapping or SVTM where the listed habitat constraint would be met or would be potentially met (i.e. the habitat constraint is ‘nest trees’ so areas of natural grasslands and chenopod shrublands have been excluded due to the lack of suitable trees for nesting). Furthermore, areas subject to habitat assessments and survey effort outside of targeted diurnal bird surveys that failed to record large stick nests have also been excluded. Within the Inland Slopes IBRA subregion, a species expert report undertaken as part of the approved HumeLink BDAR (Niche, 2024) has been utilised to identify a lack suitable breeding habitat within the subject land, and no species polygons have been created within the Inland Slopes.

5.2.43 Squirrel Glider (Petaurus norfolcensis)

While not listed as threatened under the EPBC Act, the Squirrel Glider's conservation status within NSW is considered vulnerable under the BC Act. This Species Credit species has a wide, albeit sparse, distribution throughout eastern Australia, from northern Queensland to western Victoria. Although not distinguished legislatively, squirrel gliders can be split into two genetically distinct geographical groups, the northern coastal population and the southern population west of the Great Dividing Range.

West of the Great Dividing Range, Squirrel Glider's inhabit mature or old growth River Red Gum Forest as well as Box and Box-Ironbark woodlands with a preference for stands of mixed species featuring an Acacia dominated or shrubby mid-storey. These habitat preferences reflect the varied seasonal diet of Squirrel Gliders which includes Acacia gum, Eucalyptus sap, nectar, manna, honeydew and pollen, alongside the consumption of invertebrates. The squirrel glider Relies on large old trees with hollows for breeding and nesting. These trees are also critical for movement and typically need to be closely connected (i.e. no more than 50 metres apart).

Within the Murray Fans IBRA subregion the Squirrel Glider was not recorded within the subject land during targeted survey effort and has been discounted by a species expert report (Appendix I). Within the Inland Slopes where targeted surveys were not possible, the species was assumed present within areas of PCT 76, 266, 277 and 319 (based on the species expert report in Appendix I). Furthermore, as this section of the subject land falls within the Wagga Wagga LGA, the species is considered to form part of the Wagga Wagga LGA endangered population.

5.2.44 Southern Bell Frog (Litoria raniformis)

The Southern Bell Frog (*Litoria raniformis*) is Listed as Endangered under the BC Act and Vulnerable under the EPBC Act. It is one of the largest frog species in Australia, reaching up to 104 millimetres in length, with females usually larger than males. Animals vary greatly in colour and pattern but are typically olive to bright emerald green, with irregular gold, brown, black or bronze spotting with a pale green stripe down the centre of the back. Undersides are white and coarsely granular, although during the breeding season males may become yellow or dark grey/black under the throat. The groin and posterior of the thighs are turquoise blue. The Southern Bell Frog lacks webbing on its fingers but the toes are almost fully webbed, and toe discs are small and approximately equal in width to the digits.

In NSW the species was once distributed along the Murray and Murrumbidgee Rivers and their tributaries, the southern slopes of the Monaro district and the central southern tablelands as far north as Tarana, near Bathurst. Currently, the species is known to exist in isolated populations in the Coleambally Irrigation Area, the Lowbidgee floodplain and around Lake Victoria. A large population is also present in the Murray Irrigation Area. The species is also found in Victoria, Tasmania and South Australia, where it has also become endangered.

Within these regions, the Southern Bell Frog generally occupies permanent or ephemeral Black Box/Lignum/Nitre Goosefoot swamps, Lignum/Typha swamps and River Red Gum swamps or billabongs along floodplains and river valleys. They are also found in irrigated rice crops, particularly where there is no available natural habitat.

Within the subject land (and within habitats which are within close proximity and connected to the subject land), Southern Bell Frog was recorded both audially and visually in the western section of the project, almost exclusively within the Murray Fans IBRA subregion aside from one location within the Murrumbidgee IBRA subregion. Individuals were recorded during targeted spotlighting and call playback surveys, in addition to incidentally. Individuals were mostly associated with water bodies and associated vegetation around rivers, farm dams, billabongs, and irrigation channels, with almost all water bodies surveyed, irrespective of size, hosting the species during surveys in January-February 2024 following heavy rain events in the preceding month Breeding was also observed in one incidence in January 2025, where tadpoles were recorded in addition to adults in a billabong approximately 8.5 kilometres north of the intersection between the project and Noorong Road. Species polygons have been created utilising a 200 metre buffer from the top of bank at each contiguous water body associated with the species, including spans on non-native vegetation up to 50 metres wide.



Photo 5.21 Southern Bell Frog within subject land



Photo 5.22 Second Southern Bell Frog individual within subject land

5.2.45 Southern Myotis (Myotis Macropus)

The Southern Myotis (*Macropus macropus*) is listed as vulnerable under the BC Act and is not listed under the EPBC Act.

The Southern Myotis has disproportionately large feet; more than eight millimetres long, with widely spaced toes which are distinctly hairy and with long, curved claws. It has dark grey to reddish brown fur above and is paler below. It weighs up to 15 grams and has a wingspan of about 28 centimetres.

The species is found in the coastal band from the north-west of Australia, across the top-end and south to western Victoria. It is rarely found more than 100 kilometres inland, except along major rivers, as the species uses streams and pools as foraging sites.

Southern Myotis generally roost in groups of 10-15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, wharves, bridges and dense foliage. The species forages over streams and pools catching insects and small fish by raking their feet across the water surface.

Southern Myotis was not recorded within the subject land. However, where targeted surveys were not possible due to property access restrictions or seasonal survey timing constraints in the Murray Fans IBRA subregion, this species has been assumed present in habitats identified to meet the species habitat constraint being ‘waterbodies with permanent pools / stretches 3 m or wider, including rivers, large creeks, billabongs, lagoons, estuaries, dams and other waterbodies on or within 200 m of the site’. In the Murrumbidgee and Inland Slopes IBRA subregion, the species has been excluded due to a lack of permanent suitable waterbodies being identified within the subject land.

5.2.46 Superb Parrot (Polytelis swainsonii)

The Superb Parrot (*Polytelis swainsonii*) is listed as Vulnerable under the BC Act and EPBC Act.

The Superb Parrot is a distinctive medium-sized, bright grass-green parrot with a long, narrow tail and sharply back-angled wings in flight.

The Superb Parrot is found throughout eastern inland NSW. On the South-western Slopes their core breeding area is roughly bounded by Cowra and Yass in the east, and Grenfell, Cootamundra and Coolac in the west. Birds breeding in this region are mainly absent during winter, when they migrate north to the region of the upper Namoi and Gwydir Rivers. The other main breeding sites are in the Riverina along the corridors of the Murray, Edward and Murrumbidgee Rivers where birds are present all year round. It is estimated that there are less than 5000 breeding pairs left in the wild.

Inhabit Box-Gum, Box-Cypress-pine and Boree woodlands and River Red Gum Forest. In the Riverina superb parrots nest in the hollows of large trees (dead or alive) mainly in tall riparian River Red Gum Forest or woodland. On the South West Slopes and Southern Tablelands nest trees can be in open Box-Gum woodland or isolated living or dead paddock trees. Species known to be used are Blakely's Red Gum, Yellow Box, Apple Box and Red Box.

Superb Parrots nest in tree hollows with an entrance diameter of six centimetres or wider, and that are at least 3.5 metres above the ground. They nest in small colonies, often with more than one nest in a single tree. May forage up to 10 kilometres from nesting sites, primarily in grassy box woodland. They feed in trees and understorey shrubs and on the ground and their diet consists mainly of grass seeds and herbaceous plants. Also eaten are fruits, berries, nectar, buds, flowers, insects and grain.

Superb Parrot was not recorded within the subject land. In areas of the Murray Fans, Murrumbidgee and Inland Slopes IBRA subregion where targeted seasonal surveys were not conducted due to property access restrictions or seasonal survey timing constraints, the species has been assumed present in areas identified as suitable habitat by either WSP verified vegetation mapping or SVTM. Suitable habitat has been identified as vegetation associated with the species by the TBDC but also typically recorded to contain *E. blakelyi, E. melliodora, E. albens, E. camaldulensis, E. microcarpa, E. polyanthemos, E. mannifera, E. intertexta, E. bridgesiana*. Where habitat assessments were undertaken, habitat for the species was further restricted to areas with hollows greater than 5 cm diameter that are greater than 4 m above ground or trees with a DBH of greater than 30 cm.

5.2.47 White-bellied Sea-eagle (Haliaeetus leucogaster)

The White-bellied Sea-eagle *(Haliaeetus leucogaster)* is listed as Vulnerable under the BC Act and is not listed under the EPBC Act.

The White-bellied Sea-eagle is a large, predominantly white and grey eagle that has long broad wings and a short, wedge-shaped tail. It measures 75–85 centimetres in length and has a wingspan of 180–220 centimetres.

The White-bellied Sea-eagle is distributed around the Australian coastline, including Tasmania, and well inland along rivers and wetlands of the Murray Darling Basin. In New South Wales it is widespread along the east coast, and along all major inland rivers and waterways.

Habitat for the White-bellied Sea-eagle is characterised by the presence of large areas of open water including larger rivers, swamps, lakes, and the sea. The species occurs at sites near the sea or seashore, such as around bays and inlets, beaches, reefs, lagoons, estuaries and mangroves; and at, or in the vicinity of freshwater swamps, lakes, reservoirs, billabongs and saltmarsh. Terrestrial habitats include coastal dunes, tidal flats, grassland, heathland, woodland, and forest (including rainforest). Breeding habitat consists of mature tall open forest, open forest, tall woodland, and swamp sclerophyll forest close to foraging habitat. Nest trees are typically large emergent eucalypts and often have emergent dead branches or large dead trees nearby which are used as 'guard roosts'. Nests are large structures built from sticks and lined with leaves or grass. The species feeds mainly on fish and freshwater turtles, but also waterbirds, reptiles, mammals and carrion.

There was one record of White-bellied Sea-eagle within 4 km of the subject land, consisting of two individuals seen at 3711-3711 Wanganella Moulamein Road. Where targeted seasonal surveys were not possible due to property access restrictions or seasonal survey timing constraints, the species has been assumed present in TBDC identified vegetation types considered to meet the habitat constraints of the species, being living or dead mature trees within suitable vegetation, within 1 km of a river, lake, large dam or creek, wetland or coastline. As such, the species has only been assumed within 1 km of a named watercourse or waterbody in areas of vegetation capable of supporting living or dead mature trees (i.e. chenopod shrublands and grasslands including derived grasslands have been excluded). Within the Inland Slopes IBRA subregion, a species expert report undertaken as part of the approved HumeLink BDAR (Niche, 2024) has been utilised to identify a lack suitable breeding habitat within the subject land, and no species polygons have been created within the Inland Slopes.

5.3 Threatened species surveys

Sections 5.3.1 and 5.3.2 outline the survey method, timing and people effort of targeted threatened species surveys for each identified candidate flora and fauna species identified to potentially occur within the subject land. Additionally, section 5.3.3 outlines the predicted threatened fauna species with associated habitat identified within the subject land during field survey and which require further assessment to determine presence.

5.3.1 Candidate flora targeted threatened species surveys

Table 5.9 Targeted threatened species surveys for candidate flora species credit species on the subject land

Common name	Scientific name	Threatened species surveys				Present	Further assessment required (BAM Subsections 5.2.5 and 5.2.6
		Survey method (transects or grids)	Timing of survey – within recommended period		Effort (hours and number of people)		
Floating Swamp Wallaby-grass	*Amphibromus fluitans*	2-phase grid (Dec – Mar) Opportunistic	☒ Yes January 2024 February 2024 January 2025 February 2025	☐ No	2-phase grid 30 Jan 2024: 3 x 2.5 hrs 1 Feb 2024: 3 x 2.5 hrs 2 Feb 2024: 3 x 2.5 hrs 29 Jan 2025: 2 people x 11 hrs 30 Jan 2025: 2 people x 10 hrs 30 Jan 2025: 2 people x 2 hrs 31 Jan 2025: 2 people x 8 hrs Opportunistic 24 Feb 2025: 2 people x 7.5 hrs 25 Feb 2025: 2 people x 7.5 hrs 26 Feb 2025: 2 people x 7.5 hrs 27 Feb 2025: 2 people x 7.5 hrs	Assumed present	Yes

Common name	Scientific name	Threatened species surveys				Present	Further assessment required (BAM Subsections 5.2.5 and 5.2.6
		Survey method (transects or grids)	Timing of survey – within recommended period		Effort (hours and number of people)		
A Spear-grass	*Austrostipa metatoris*	2-phase grid (Oct – Nov)	☒ Yes October 2024	☐ No	2-phase grid 9-10 Oct 2024: 2 people x 8 hrs 11 Oct 2024: 3 people x 8 hrs 12-14 Oct 2024: 2 people x 8 hrs 15 Oct 2024: 2 people x 6 hrs 16-17 Oct 2024: 2 people x 4 hrs 22 Oct 2024: 1 people x 3 hrs 23 Oct 2024: 1 people x 6 hrs Transect 16 Oct 2024: 2 people x 1 hr 20 Oct 2024: 2 people x 3 hr 23 Oct 2024: 2 people x 1 hr	Assumed present	Yes

Common name	Scientific name	Threatened species surveys				Present	Further assessment required (BAM Subsections 5.2.5 and 5.2.6
		Survey method (transects or grids)	Timing of survey – within recommended period		Effort (hours and number of people)		
A Spear-grass	*Austrostipa wakoolica*	2-phase grid (Oct-Dec)	☒ Yes October 2024	☐ No	2-phase grid 9-10 Oct 2024: 2 people x 8 hrs 11 Oct 2024: 3 people x 8 hrs 12-14 Oct 2024: 2 people x 8 hrs 15 Oct 2024: 2 people x 6 hrs 16-17 Oct 2024: 2 people x 4 hrs 22 Oct 2024: 1 people x 3 hrs 23 Oct 2024: 1 people x 6 hrs Transect 16 Oct 2024: 2 people x 1 hr 20 Oct 2024: 2 people x 3 hr 23 Oct 2024: 2 people x 1 hr	Assumed present	Yes

Common name	Scientific name	Threatened species surveys				Present	Further assessment required (BAM Subsections 5.2.5 and 5.2.6
		Survey method (transects or grids)	Timing of survey – within recommended period		Effort (hours and number of people)		
Small Scurf-pea	*Cullen parvum*	2-phase grid Transects Approved PECe BDAR survey effort	☒ Yes January 2025	☐ No	2-phase grid 30 Jan 2025: 2 people x 8 hrs 31 Jan 2025: 2 people x 8 hrs Transects 29 Jan 2025: 2 people x 1 hrs 30 Jan 2025: 2 people x 2 hrs 31 Jan 2025: 2 people x 2 hrs Approved PECe BDAR post approval survey effort was utilised for VNI.	Assumed present	Yes
Mueller Daisy	*Brachyscome muelleroides*	2-phase grid (Sept-Nov) Transect Approved PECe BDAR survey effort	☒ Yes September 2023 September 2024 October 2024	☐ No	2-phase grid 18-23 Sept 2023: 4 people x 7.5 hrs 1 Sept 2024: 1 people x 1 hrs 1 Sept 2024: 2 people x 3 hrs 2 Sept 2024: 2 people x 8 hrs 6 Sept 2024: 2 people x 3.5 hrs 7 Sept 2024: 2 people x 2 hrs 10 Sept 2024: 2 people x 4 hrs 10-11 Sept 2024: 2 people x 8 hrs 11 Sept 2024: 3 people x 5 hrs 12 Sept 2024: 2 people x 6 hrs	Assumed present	Yes

Common name	Scientific name	Threatened species surveys				Present	Further assessment required (BAM Subsections 5.2.5 and 5.2.6
		Survey method (transects or grids)	Timing of survey – within recommended period		Effort (hours and number of people)		
					12 Sept 2024: 3 people x 7 hrs 12-17 Sept 2024: 3 people x 8 hrs 13-16 Sept 2024: 2 people x 8 hrs 9-10 Oct 2024: 2 people x 8 hrs 11 Oct 2024: 3 people x 8 hrs 12-14 Oct 2024: 2 people x 8 hrs 15 Oct 2024: 2 people x 6 hrs 16-17 Oct 2024: 2 people x 4 hrs 22 Oct 2024: 1 people x 3 hrs 23 Oct 2024: 1 people x 6 hrs Transect 1 Sept 2024: 2 people x 1 hr 3 Sept 2024: 2 people x 2 hr 9 Sept 2024: 3 people x 1 hr 16 Oct 2024: 2 people x 1 hr 20 Oct 2024: 2 people x 3 hr 23 Oct 2024: 2 people x 1 hr Approved PECe BDAR survey effort at Dinawan and H008 was utilised for VNI.		

Common name	Scientific name	Threatened species surveys				Present	Further assessment required (BAM Subsections 5.2.5 and 5.2.6
		Survey method (transects or grids)	Timing of survey – within recommended period		Effort (hours and number of people)		
Mossgiel Daisy	*Brachyscome papillosa*	2-phase grid Transects (Sept-Nov) Opportunistic Approved PECe BDAR survey effort	☒ Yes September 2023 September 2024 October 2024	☐ No	2-phase grid 18-23 Sept 2023: 4 people x 7.5 hrs 1 Sept 2024: 1 people x 1 hrs 1 Sept 2024: 2 people x 3 hrs 2 Sept 2024: 2 people x 8 hrs 6 Sept 2024: 2 people x 3.5 hrs 7 Sept 2024: 2 people x 2 hrs 10 Sept 2024: 2 people x 4 hrs 10-11 Sept 2024: 2 people x 8 hrs 11 Sept 2024: 3 people x 5 hrs 12 Sept 2024: 2 people x 6 hrs 12 Sept 2024: 3 people x 7 hrs 12-17 Sept 2024: 3 people x 8 hrs 13-16 Sept 2024: 2 people x 8 hrs 9-10 Oct 2024: 2 people x 8 hrs 11 Oct 2024: 3 people x 8 hrs 12-14 Oct 2024: 2 people x 8 hrs 15 Oct 2024: 2 people x 6 hrs 16-17 Oct 2024: 2 people x 4 hrs 22 Oct 2024: 1 people x 3 hrs	Yes	Yes

Common name	Scientific name	Threatened species surveys				Present	Further assessment required (BAM Subsections 5.2.5 and 5.2.6
		Survey method (transects or grids)	Timing of survey – within recommended period		Effort (hours and number of people)		
					23 Oct 2024: 1 people x 6 hrs Transect 31 Aug 2024: 2 people x 2 hrs 1 Sept 2024: 2 people x 1 hr 3 Sept 2024: 2 people x 2 hr 9 Sept 2024: 3 people x 1 hr 16 Oct 2024: 2 people x 1 hr 20 Oct 2024: 2 people x 3 hr 23 Oct 2024: 2 people x 1 hr Opportunistic 31 Aug 2024: 2 people x 1 hrs Approved PECe BDAR survey effort at Dinawan and H008 was utilised for VNI.		

Common name	Scientific name	Threatened species surveys				Present	Further assessment required (BAM Subsections 5.2.5 and 5.2.6
		Survey method (transects or grids)	Timing of survey – within recommended period		Effort (hours and number of people)		
Sand-hill Spider Orchid	*Caladenia arenaria*	2-phase grid (Sept)	☒ Yes September 2023 September 2024	☐ No	2-phase grid 18-23 Sept 2023: 4 people x 7.5 hrs 1 Sept 2024: 1 people x 1 hrs 1 Sept 2024: 2 people x 3 hrs 2 Sept 2024: 2 people x 8 hrs 6 Sept 2024: 2 people x 3.5 hrs 7 Sept 2024: 2 people x 2 hrs 10 Sept 2024: 2 people x 4 hrs 10-11 Sept 2024: 2 people x 8 hrs 11 Sept 2024: 3 people x 5 hrs 12 Sept 2024: 2 people x 6 hrs 12 Sept 2024: 3 people x 7 hrs 12-17 Sept 2024: 3 people x 8 hrs 13-16 Sept 2024: 2 people x 8 hrs	Assumed present	Yes

Common name	Scientific name	Threatened species surveys				Present	Further assessment required (BAM Subsections 5.2.5 and 5.2.6
		Survey method (transects or grids)	Timing of survey – within recommended period		Effort (hours and number of people)		
A Burr Daisy	*Calotis moorei*	2-phase grid (Sept-Nov)	☒ Yes September 2023 September 2024 October 2024	☐ No	2-phase grid 18-23 Sept 2023: 4 people x 7.5 hrs 1 Sept 2024: 1 people x 1 hrs 1 Sept 2024: 2 people x 3 hrs 2 Sept 2024: 2 people x 8 hrs 6 Sept 2024: 2 people x 3.5 hrs 7 Sept 2024: 2 people x 2 hrs 10 Sept 2024: 2 people x 4 hrs 10-11 Sept 2024: 2 people x 8 hrs 11 Sept 2024: 3 people x 5 hrs 12 Sept 2024: 2 people x 6 hrs 12 Sept 2024: 3 people x 7 hrs 12-17 Sept 2024: 3 people x 8 hrs 13-16 Sept 2024: 2 people x 8 hrs 9-10 Oct 2024: 2 people x 8 hrs 11 Oct 2024: 3 people x 8 hrs 12-14 Oct 2024: 2 people x 8 hrs 15 Oct 2024: 2 people x 6 hrs 16-17 Oct 2024: 2 people x 4 hrs 22 Oct 2024: 1 people x 3 hrs	Assumed present	Yes

Common name	Scientific name	Threatened species surveys				Present	Further assessment required (BAM Subsections 5.2.5 and 5.2.6
		Survey method (transects or grids)	Timing of survey – within recommended period		Effort (hours and number of people)		
					23 Oct 2024: 1 people x 6 hrs Transect 1 Sept 2024: 2 people x 1 hr 3 Sept 2024: 2 people x 2 hr 9 Sept 2024: 3 people x 1 hr 16 Oct 2024: 2 people x 1 hr 20 Oct 2024: 2 people x 3 hr 23 Oct 2024: 2 people x 1 hr		

Common name	Scientific name	Threatened species surveys				Present	Further assessment required (BAM Subsections 5.2.5 and 5.2.6
		Survey method (transects or grids)	Timing of survey – within recommended period		Effort (hours and number of people)		
Bindweed	*Convolvulus tedmoorei*	2-phase grid (June-Sept)	☒ Yes September 2023 September 2024	☐ No	2-phase grid 18-23 Sept 2023: 4 people x 7.5 hrs 1 Sept 2024: 1 people x 1 hrs 1 Sept 2024: 2 people x 3 hrs 2 Sept 2024: 2 people x 8 hrs 6 Sept 2024: 2 people x 3.5 hrs 7 Sept 2024: 2 people x 2 hrs 10 Sept 2024: 2 people x 4 hrs 10-11 Sept 2024: 2 people x 8 hrs 11 Sept 2024: 3 people x 5 hrs 12 Sept 2024: 2 people x 6 hrs 12 Sept 2024: 3 people x 7 hrs 12-17 Sept 2024: 3 people x 8 hrs 13-16 Sept 2024: 2 people x 8 hrs Transect 1 Sept 2024: 2 people x 1 hr 3 Sept 2024: 2 people x 2 hr 9 Sept 2024: 3 people x 1 hr	Assumed present	Yes

Common name	Scientific name	Threatened species surveys				Present	Further assessment required (BAM Subsections 5.2.5 and 5.2.6
		Survey method (transects or grids)	Timing of survey – within recommended period		Effort (hours and number of people)		
Spike-Rush	*Eleocharis obicis*	2-phase grid Transects (Oct-Nov) Opportunistic	☒ Yes October 2024	☒ No September 2024 February 2024 September 2024	2-phase grid 18-23 Sept 2023: 4 people x 7.5 hrs 1 Sept 2024: 1 people x 1 hrs 1 Sept 2024: 2 people x 3 hrs 2 Sept 2024: 2 people x 8 hrs 6 Sept 2024: 2 people x 3.5 hrs 7 Sept 2024: 2 people x 2 hrs 10 Sept 2024: 2 people x 4 hrs 10-11 Sept 2024: 2 people x 8 hrs 11 Sept 2024: 3 people x 5 hrs 12 Sept 2024: 2 people x 6 hrs 12 Sept 2024: 3 people x 7 hrs 12-17 Sept 2024: 3 people x 8 hrs 13-16 Sept 2024: 2 people x 8 hrs 9-10 Oct 2024: 2 people x 8 hrs 11 Oct 2024: 3 people x 8 hrs 12-14 Oct 2024: 2 people x 8 hrs 15 Oct 2024: 2 people x 6 hrs 16-17 Oct 2024: 2 people x 4 hrs 22 Oct 2024: 1 people x 3 hrs	Yes	Yes

Common name	Scientific name	Threatened species surveys				Present	Further assessment required (BAM Subsections 5.2.5 and 5.2.6
		Survey method (transects or grids)	Timing of survey – within recommended period		Effort (hours and number of people)		
					23 Oct 2024: 1 people x 6 hrs Transect 1 Sept 2024: 2 people x 1 hr 3 Sept 2024: 2 people x 2 hr 9 Sept 2024: 3 people x 1 hr 16 Oct 2024: 2 people x 1 hr 20 Oct 2024: 2 people x 3 hr 23 Oct 2024: 2 people x 1 hr Opportunistic 3 Feb 2024: 2 people x 1 hrs 17 Sept 2024: 2 people x 1 hr		

Common name	Scientific name	Threatened species surveys				Present	Further assessment required (BAM Subsections 5.2.5 and 5.2.6
		Survey method (transects or grids)	Timing of survey – within recommended period		Effort (hours and number of people)		
Yellow Gum	*Eucalyptus leucoxylon subsp. pruinosa*	2-phase grid Transects (All year) Opportunistic Approved PECe BDAR survey effort	☒ Yes April 2024 October 2024	☐ No	2-phase grid 9-10 Oct 2024: 2 people x 8 hrs 11 Oct 2024: 3 people x 8 hrs 12-14 Oct 2024: 2 people x 8 hrs 15 Oct 2024: 2 people x 6 hrs 16-17 Oct 2024: 2 people x 4 hrs 22 Oct 2024: 1 people x 3 hrs 23 Oct 2024: 1 people x 6 hrs Transect 16 Oct 2024: 2 people x 1 hr 20 Oct 2024: 2 people x 3 hr 23 Oct 2024: 2 people x 1 hr Opportunistic 15 April 2024: 2 people x 1 hr Approved PECe BDAR survey effort was utilised for VNI.	Yes	Yes

Common name	Scientific name	Threatened species surveys				Present	Further assessment required (BAM Subsections 5.2.5 and 5.2.6
		Survey method (transects or grids)	Timing of survey – within recommended period		Effort (hours and number of people)		
Winged Peppercress	*Lepidium monoplocoides*	2-phase grid Transects (Sep-Dec) Approved PECe BDAR survey effort	☒ Yes September 2023 September 2024 October 2024	☐ No	2-phase grid 18-23 Sept 2023: 4 people x 7.5 hrs 1 Sept 2024: 1 people x 1 hrs 1 Sept 2024: 2 people x 3 hrs 2 Sept 2024: 2 people x 8 hrs 6 Sept 2024: 2 people x 3.5 hrs 7 Sept 2024: 2 people x 2 hrs 10 Sept 2024: 2 people x 4 hrs 10-11 Sept 2024: 2 people x 8 hrs 11 Sept 2024: 3 people x 5 hrs 12 Sept 2024: 2 people x 6 hrs 12 Sept 2024: 3 people x 7 hrs 12-17 Sept 2024: 3 people x 8 hrs 13-16 Sept 2024: 2 people x 8 hrs 9-10 Oct 2024: 2 people x 8 hrs 11 Oct 2024: 3 people x 8 hrs 12-14 Oct 2024: 2 people x 8 hrs 15 Oct 2024: 2 people x 6 hrs 16-17 Oct 2024: 2 people x 4 hrs 22 Oct 2024: 1 people x 3 hrs	Yes	Yes

Common name	Scientific name	Threatened species surveys				Present	Further assessment required (BAM Subsections 5.2.5 and 5.2.6
		Survey method (transects or grids)	Timing of survey – within recommended period		Effort (hours and number of people)		
					23 Oct 2024: 1 people x 6 hrs Transect 1 Sept 2024: 2 people x 1 hr 3 Sept 2024: 2 people x 2 hr 9 Sept 2024: 3 people x 1 hr 16 Oct 2024: 2 people x 1 hr 20 Oct 2024: 2 people x 3 hr 23 Oct 2024: 2 people x 1 hr Approved PECe BDAR survey effort was utilised for VNI.		
Lanky Buttons	*Leptorhynchos orientalis*	2-phase grid (Sept-Nov) Approved PECe BDAR survey effort	☒ Yes September 2023 September 2024 October 2024	☐ No	2-phase grid 18-23 Sept 2023: 4 people x 7.5 hrs 1 Sept 2024: 1 people x 1 hrs 1 Sept 2024: 2 people x 3 hrs 2 Sept 2024: 2 people x 8 hrs 6 Sept 2024: 2 people x 3.5 hrs 7 Sept 2024: 2 people x 2 hrs 10 Sept 2024: 2 people x 4 hrs 10-11 Sept 2024: 2 people x 8 hrs 11 Sept 2024: 3 people x 5 hrs 12 Sept 2024: 2 people x 6 hrs	Assumed present	Yes

Common name	Scientific name	Threatened species surveys				Present	Further assessment required (BAM Subsections 5.2.5 and 5.2.6
		Survey method (transects or grids)	Timing of survey – within recommended period		Effort (hours and number of people)		
					12 Sept 2024: 3 people x 7 hrs 12-17 Sept 2024: 3 people x 8 hrs 13-16 Sept 2024: 2 people x 8 hrs 9-10 Oct 2024: 2 people x 8 hrs 11 Oct 2024: 3 people x 8 hrs 12-14 Oct 2024: 2 people x 8 hrs 15 Oct 2024: 2 people x 6 hrs 16-17 Oct 2024: 2 people x 4 hrs 22 Oct 2024: 1 people x 3 hrs 23 Oct 2024: 1 people x 6 hrs Transect 1 Sept 2024: 2 people x 1 hr 3 Sept 2024: 2 people x 2 hr 9 Sept 2024: 3 people x 1 hr 16 Oct 2024: 2 people x 1 hr 20 Oct 2024: 2 people x 3 hr 23 Oct 2024: 2 people x 1 hr Approved PECe BDAR survey effort was utilised for VNI.		

Common name	Scientific name	Threatened species surveys				Present	Further assessment required (BAM Subsections 5.2.5 and 5.2.6
		Survey method (transects or grids)	Timing of survey – within recommended period		Effort (hours and number of people)		
Chariot Wheels	*Maireana cheelii*	2-phase grid Transects (Sept-Dec) Opportunistic Approved PECe BDAR survey effort	☒ Yes September 2023 September 2024 October 2024	☐ No	2-phase grid 18-23 Sept 2023: 4 people x 7.5 hrs 1 Sept 2024: 1 people x 1 hrs 1 Sept 2024: 2 people x 3 hrs 2 Sept 2024: 2 people x 8 hrs 6 Sept 2024: 2 people x 3.5 hrs 7 Sept 2024: 2 people x 2 hrs 10 Sept 2024: 2 people x 4 hrs 10-11 Sept 2024: 2 people x 8 hrs 11 Sept 2024: 3 people x 5 hrs 12 Sept 2024: 2 people x 6 hrs 12 Sept 2024: 3 people x 7 hrs 12-17 Sept 2024: 3 people x 8 hrs 13-16 Sept 2024: 2 people x 8 hrs 9-10 Oct 2024: 2 people x 8 hrs 11 Oct 2024: 3 people x 8 hrs 12-14 Oct 2024: 2 people x 8 hrs 15 Oct 2024: 2 people x 6 hrs 16-17 Oct 2024: 2 people x 4 hrs 22 Oct 2024: 1 people x 3 hrs	Yes	Yes

Common name	Scientific name	Threatened species surveys				Present	Further assessment required (BAM Subsections 5.2.5 and 5.2.6
		Survey method (transects or grids)	Timing of survey – within recommended period		Effort (hours and number of people)		
					23 Oct 2024: 1 people x 6 hrs Transect 1 Sept 2024: 2 people x 1 hr 3 Sept 2024: 2 people x 2 hr 9 Sept 2024: 3 people x 1 hr 16 Oct 2024: 2 people x 1 hr 20 Oct 2024: 2 people x 3 hr 23 Oct 2024: 2 people x 1 hr Opportunistic 17 Sept 2024: 2 people x 1 hr Approved PECe BDAR survey effort was utilised for VNI.		
Austral Pillwort	*Pilularia novae-hollandiae*	2-phase grid Transects (Oct-Dec) Approved PECe BDAR survey effort	☒ Yes October 2024	☒ No September 2023 September 2024	2-phase grid 18-23 Sept 2023: 4 people x 7.5 hrs 1 Sept 2024: 1 people x 1 hrs 1 Sept 2024: 2 people x 3 hrs 2 Sept 2024: 2 people x 8 hrs 6 Sept 2024: 2 people x 3.5 hrs 7 Sept 2024: 2 people x 2 hrs 10 Sept 2024: 2 people x 4 hrs 10-11 Sept 2024: 2 people x 8 hrs	Yes	Yes

Common name	Scientific name	Threatened species surveys				Present	Further assessment required (BAM Subsections 5.2.5 and 5.2.6
		Survey method (transects or grids)	Timing of survey – within recommended period		Effort (hours and number of people)		
					11 Sept 2024: 3 people x 5 hrs 12 Sept 2024: 2 people x 6 hrs 12 Sept 2024: 3 people x 7 hrs 12-17 Sept 2024: 3 people x 8 hrs 13-16 Sept 2024: 2 people x 8 hrs 9-10 Oct 2024: 2 people x 8 hrs 11 Oct 2024: 3 people x 8 hrs 12-14 Oct 2024: 2 people x 8 hrs 15 Oct 2024: 2 people x 6 hrs 16-17 Oct 2024: 2 people x 4 hrs 22 Oct 2024: 1 people x 3 hrs 23 Oct 2024: 1 people x 6 hrs Transect 1 Sept 2024: 2 people x 1 hr 3 Sept 2024: 2 people x 2 hr 9 Sept 2024: 3 people x 1 hr 16 Oct 2024: 2 people x 1 hr 20 Oct 2024: 2 people x 3 hr 23 Oct 2024: 2 people x 1 hr Approved PECe BDAR survey effort was utilised for VNI.		

Common name	Scientific name	Threatened species surveys				Present	Further assessment required (BAM Subsections 5.2.5 and 5.2.6
		Survey method (transects or grids)	Timing of survey – within recommended period		Effort (hours and number of people)		
Prasophyllum sp. Moama	*Prasophyllum sp. Moama*	2-phase grid (Sept)	☒ Yes September 2023 September 2024	☐ No	2-phase grid 18-23 Sept 2023: 4 people x 7.5 hrs 1 Sept 2024: 1 people x 1 hrs 1 Sept 2024: 2 people x 3 hrs 2 Sept 2024: 2 people x 8 hrs 6 Sept 2024: 2 people x 3.5 hrs 7 Sept 2024: 2 people x 2 hrs 10 Sept 2024: 2 people x 4 hrs 10-11 Sept 2024: 2 people x 8 hrs 11 Sept 2024: 3 people x 5 hrs 12 Sept 2024: 2 people x 6 hrs 12 Sept 2024: 3 people x 7 hrs 12-17 Sept 2024: 3 people x 8 hrs 13-16 Sept 2024: 2 people x 8 hrs Transect 1 Sept 2024: 2 people x 1 hr 3 Sept 2024: 2 people x 2 hr 9 Sept 2024: 3 people x 1 hr	Assumed present	Yes

Common name	Scientific name	Threatened species surveys				Present	Further assessment required (BAM Subsections 5.2.5 and 5.2.6
		Survey method (transects or grids)	Timing of survey – within recommended period		Effort (hours and number of people)		
Pterostylis despectans	*Pterostylis despectans*	2-phase grid (July; Oct-Nov)	☒ Yes October 2024	☐ No	2-phase grid 9-10 Oct 2024: 2 people x 8 hrs 11 Oct 2024: 3 people x 8 hrs 12-14 Oct 2024: 2 people x 8 hrs 15 Oct 2024: 2 people x 6 hrs 16-17 Oct 2024: 2 people x 4 hrs 22 Oct 2024: 1 people x 3 hrs 23 Oct 2024: 1 people x 6 hrs Transect 16 Oct 2024: 2 people x 1 hr 20 Oct 2024: 2 people x 3 hr 23 Oct 2024: 2 people x 1 hr	Assumed present	Yes
Dwarf Bush-pea	*Pultenaea humilis*	Approved Humelink BDAR (Niche, 2024) survey effort (Oct – Dec)	☒ Yes	☐ No	Approved Humelink BDAR (Niche, 2024) survey effort was utilised for VNI.	No	No

Common name	Scientific name	Threatened species surveys				Present	Further assessment required (BAM Subsections 5.2.5 and 5.2.6
		Survey method (transects or grids)	Timing of survey – within recommended period		Effort (hours and number of people)		
Turnip Copperburr	*Sclerolaena napiformis*	2-phase grid (Sept-Dec) Approved PECe BDAR survey effort	☒ Yes October 2024	☐ No	2-phase grid 9-10 Oct 2024: 2 people x 8 hrs 11 Oct 2024: 3 people x 8 hrs 12-14 Oct 2024: 2 people x 8 hrs 15 Oct 2024: 2 people x 6 hrs 16-17 Oct 2024: 2 people x 4 hrs 22 Oct 2024: 1 people x 3 hrs 23 Oct 2024: 1 people x 6 hrs Transect 16 Oct 2024: 2 people x 1 hr 20 Oct 2024: 2 people x 3 hr 23 Oct 2024: 2 people x 1 hr Approved PECe BDAR survey effort was utilised for VNI.	Assumed present	Yes

Common name	Scientific name	Threatened species surveys				Present	Further assessment required (BAM Subsections 5.2.5 and 5.2.6
		Survey method (transects or grids)	Timing of survey – within recommended period		Effort (hours and number of people)		
Woolly Ragwort	*Senecio garlandii*	Opportunistic (all year) Approved Humelink BDAR (Niche, 2024) survey effort	☒ Yes September 2021 October 2021 November 2021 December 2021 January 2022 February 2022 March 2022 May 2022 February 2025	☐ No	Opportunistic 24 Feb 2025: 2 people x 7.5 hrs 25 Feb 2025: 2 people x 7.5 hrs 26 Feb 2025: 2 people x 7.5 hrs 27 Feb 2025: 2 people x 7.5 hrs Approved Humelink BDAR (Niche, 2024) survey effort was utilised for VNI.	No	No
Menindee Nightshade	*Solanum karsense*	2-phase grid (Sept-Nov) Approved PECe BDAR survey effort	☒ Yes September 2023 September 2024 October 2024	☐ No	2-phase grid 18-23 Sept 2023: 4 people x 7.5 hrs 1 Sept 2024: 1 people x 1 hrs 1 Sept 2024: 2 people x 3 hrs 2 Sept 2024: 2 people x 8 hrs 6 Sept 2024: 2 people x 3.5 hrs 7 Sept 2024: 2 people x 2 hrs 10 Sept 2024: 2 people x 4 hrs 10-11 Sept 2024: 2 people x 8 hrs 11 Sept 2024: 3 people x 5 hrs	Assumed present	Yes

Common name	Scientific name	Threatened species surveys				Present	Further assessment required (BAM Subsections 5.2.5 and 5.2.6
		Survey method (transects or grids)	Timing of survey – within recommended period		Effort (hours and number of people)		
					12 Sept 2024: 2 people x 6 hrs 12 Sept 2024: 3 people x 7 hrs 12-17 Sept 2024: 3 people x 8 hrs 13-16 Sept 2024: 2 people x 8 hrs 9-10 Oct 2024: 2 people x 8 hrs 11 Oct 2024: 3 people x 8 hrs 12-14 Oct 2024: 2 people x 8 hrs 15 Oct 2024: 2 people x 6 hrs 16-17 Oct 2024: 2 people x 4 hrs 22 Oct 2024: 1 people x 3 hrs 23 Oct 2024: 1 people x 6 hrs Transect 1 Sept 2024: 2 people x 1 hr 3 Sept 2024: 2 people x 2 hr 9 Sept 2024: 3 people x 1 hr 16 Oct 2024: 2 people x 1 hr 20 Oct 2024: 2 people x 3 hr 23 Oct 2024: 2 people x 1 hr Approved PECe BDAR survey effort was utilised for VNI.		

Common name	Scientific name	Threatened species surveys				Present	Further assessment required (BAM Subsections 5.2.5 and 5.2.6
		Survey method (transects or grids)	Timing of survey – within recommended period		Effort (hours and number of people)		
Slender Darling Pea	*Swainsona murrayana*	2-phase grid Transects (Sept) Opportunistic Approved PECe BDAR survey effort	☒ Yes September 2023 September 2024	☒ No August 2024 October 2024	2-phase grid 18-23 Sept 2023: 4 people x 7.5 hrs 1 Sept 2024: 1 people x 1 hrs 1 Sept 2024: 2 people x 3 hrs 2 Sept 2024: 2 people x 8 hrs 6 Sept 2024: 2 people x 3.5 hrs 7 Sept 2024: 2 people x 2 hrs 10 Sept 2024: 2 people x 4 hrs 10-11 Sept 2024: 2 people x 8 hrs 11 Sept 2024: 3 people x 5 hrs 12 Sept 2024: 2 people x 6 hrs 12 Sept 2024: 3 people x 7 hrs 12-17 Sept 2024: 3 people x 8 hrs 13-16 Sept 2024: 2 people x 8 hrs Transect 1 Sept 2024: 2 people x 1 hr 3 Sept 2024: 2 people x 2 hr 9 Sept 2024: 3 people x 1 hr Opportunistic 29 Aug 2024: 2 people x 1 hr	Yes	Yes

Common name	Scientific name	Threatened species surveys				Present	Further assessment required (BAM Subsections 5.2.5 and 5.2.6
		Survey method (transects or grids)	Timing of survey – within recommended period		Effort (hours and number of people)		
					30 Aug 2024: 2 people x 1 hr 30 Aug 2024: 2 people x 3.5 hrs 18 Oct 2024: 2 people x 1 hr Approved PECe BDAR survey effort was utilised for VNI.		
Red Darling Pea	*Swainsona plagiotropis*	2-phase grid (Sept) Approved PECe BDAR survey effort	☒ Yes September 2023 September 2024	☐ No	2-phase grid 18-23 Sept 2023: 4 people x 7.5 hrs 1 Sept 2024: 1 people x 1 hrs 1 Sept 2024: 2 people x 3 hrs 2 Sept 2024: 2 people x 8 hrs 6 Sept 2024: 2 people x 3.5 hrs 7 Sept 2024: 2 people x 2 hrs 10 Sept 2024: 2 people x 4 hrs 10-11 Sept 2024: 2 people x 8 hrs 11 Sept 2024: 3 people x 5 hrs 12 Sept 2024: 2 people x 6 hrs 12 Sept 2024: 3 people x 7 hrs 12-17 Sept 2024: 3 people x 8 hrs 13-16 Sept 2024: 2 people x 8 hrs Transect 1 Sept 2024: 2 people x 1 hr	Assumed present	Yes

Common name	Scientific name	Threatened species surveys				Present	Further assessment required (BAM Subsections 5.2.5 and 5.2.6
		Survey method (transects or grids)	Timing of survey – within recommended period		Effort (hours and number of people)		
					3 Sept 2024: 2 people x 2 hr 9 Sept 2024: 3 people x 1 hr Approved PECe BDAR survey effort was utilised for VNI.		
Silky Swainson-pea	*Swainsona sericea*	2-phase grid (Sept-Nov)	☒ Yes September 2023 September 2024	☐ No	2-phase grid 18-23 Sept 2023: 4 people x 7.5 hrs 1 Sept 2024: 1 people x 1 hrs 1 Sept 2024: 2 people x 3 hrs 2 Sept 2024: 2 people x 8 hrs 6 Sept 2024: 2 people x 3.5 hrs 7 Sept 2024: 2 people x 2 hrs 10 Sept 2024: 2 people x 4 hrs 10-11 Sept 2024: 2 people x 8 hrs 11 Sept 2024: 3 people x 5 hrs 12 Sept 2024: 2 people x 6 hrs 12 Sept 2024: 3 people x 7 hrs 12-17 Sept 2024: 3 people x 8 hrs 13-16 Sept 2024: 2 people x 8 hrs Transect 1 Sept 2024: 2 people x 1 hr 3 Sept 2024: 2 people x 2 hr 9 Sept 2024: 3 people x 1 hr	Assumed present	Yes

5.3.2 *Candidate fauna threatened species survey*

Table 5.10 Threatened species surveys for candidate fauna species credit species on the subject land

Common name	Scientific name	Threatened fauna species surveys				Present	Further assessment required (BAM Subsections 5.2.5 and 5.2.6)
		Survey method (e.g. harp trap, Elliott trap, bioacoustics, etc.)	Timing of survey – within recommended period? (BAM-C / TBDC)		Effort (hours & no. people)		
Amphibians							
Sloane's Froglet	*Crinia sloanei*	Habitat assessment, call playback and spotlighting	☒ Yes August 2024	☐ No	21 Aug 24: 2 people x 20 mins 22 Aug 24: 2 people x 15 mins	No	No
Booroolong Frog	*Litoria booroolongensis*	Habitat assessment	☐ Yes	☒ No	Habitat Assessment 24 Feb 2025: 2 people x 1.5 hrs 25 Feb 2025: 2 people x 1.5 hrs 26 Feb 2025: 2 people x 1.5 hrs 27 Feb 2025: 2 people x 1.5 hrs	No	No See Section 2.6.3.
Southern Bell Frog	*Litoria raniformis*	Call playback	☒ Yes January 2024 January 2025	☒ No February 2024	30 Jan 24: 2 people x 4 hrs 31 Jan 24: 2 people x 4 hrs 01 Feb 24: 2 people x 4 hrs 02 Feb 24: 2 people x 4 hrs 27 Jan 25: 2 people x 2.5 hrs 28 Jan 25: 2 people x 2 hrs 29 Jan 25: 2 people x 2 hrs 30 Jan 25: 2 people x 2 hrs	Yes	Yes

Common name	Scientific name	Threatened fauna species surveys				Present	Further assessment required (BAM Subsections 5.2.5 and 5.2.6)
		Survey method (e.g. harp trap, Elliott trap, bioacoustics, etc.)	Timing of survey – within recommended period? (BAM-C / TBDC)		Effort (hours & no. people)		
		Spotlighting	☒ Yes January 2024 January 2025	☒ No February 2024	30 Jan 24: 2 people x 4 hrs 31 Jan 24: 2 people x 4 hrs 01 Feb 24: 2 people x 4 hrs 02 Feb 24: 2 people x 4 hrs 19 Feb 24: 2 people x 2.5 hrs 20 Feb 24: 2 people x 2.5 hrs 21 Feb 24: 2 people x 2.5 hrs 22 Feb 24: 2 people x 2.5 hrs 27 Jan 25: 2 people x 2.5 hrs 28 Jan 25: 2 people x 2 hrs 29 Jan 25: 2 people x 2 hrs 30 Jan 25: 2 people x 2 hrs		
		Incidental (spotlighting for other species)	☐ Yes	☒ No August 2024	23 Aug 24: 2 people x 20 mins 24 Aug 24: 2 people x 20 mins 25 Aug 24: 2 people x 20 mins		

Common name	Scientific name	Threatened fauna species surveys				Present	Further assessment required (BAM Subsections 5.2.5 and 5.2.6)
		Survey method (e.g. harp trap, Elliott trap, bioacoustics, etc.)	Timing of survey – within recommended period? (BAM-C / TBDC)		Effort (hours & no. people)		
Birds							
Australian Bustard	*Ardeotis australis*	20 min 2 ha diurnal survey	☒ Yes October 2024	☐ No	01 Oct 24: 2 people x 2 hrs 02 Oct 24: 2 people x 2 hrs 03 Oct 24: 2 people x 1 hr 04 Oct 24: 2 people x 1 hr 05 Oct 24: 2 people x 2 hrs 06 Oct 24: 2 people x 2hrs 07 Oct 24: 2 people x 3 hrs 08 Oct 24: 2 people x 1 hr	No	No

Common name	Scientific name	Threatened fauna species surveys				Present	Further assessment required (BAM Subsections 5.2.5 and 5.2.6)
		Survey method (e.g. harp trap, Elliott trap, bioacoustics, etc.)	Timing of survey – within recommended period? (BAM-C / TBDC)		Effort (hours & no. people)		
		Opportunistic Habitat Assessment	☒ Yes January February April May August September October November December	☐ No	18 – 23 Sept 23: 4 people x 45 hrs 28 – 30 Nov 23: 2 people x 4 hrs 01 Dec 2023: 2 people x 0.5 hrs 27 – 31 Jan 24: 4 people x 20.5 hrs 01 – 06 Feb 24: 4 people x 19.5 hrs 17 – 24 Feb 24: 4 people x 21 hrs 17 – 21 Feb 25: 4 people x 24 hrs 24 – 27 Feb 25: 6 people x 22 hrs 03 – 05 Apr 24: 2 people x 18 hrs 15 – 18 Apr 24: 8 people x 34 hrs 30 Apr – 09 May 24: 3 people x 44 hrs 19 – 31 Aug 24: 6 people x 38 hrs 01 – 10 Sept 24: 2 people x 36 hrs 06 – 15 Oct 24: 4 people x 68 hrs 26 Nov 24: 4 people x 6 hrs 27 – 31 Jan 25: 4 people x 22 hrs 03 – 05 Feb 25: 2 people x 18 hrs 17 – 21 Feb 25: 4 people x 24 hrs 24 – 27 Feb 25: 6 people x 22 hrs 05 – 14 Apr 25: 4 people x 40 hrs		

Common name	Scientific name	Threatened fauna species surveys				Present	Further assessment required (BAM Subsections 5.2.5 and 5.2.6)
		Survey method (e.g. harp trap, Elliott trap, bioacoustics, etc.)	Timing of survey – within recommended period? (BAM-C / TBDC)		Effort (hours & no. people)		
Bush Stone-curlew	*Burhinus grallarius*	Call playback	☒ Yes August 2024 April 2025	☐ No	20 Aug 24: 2 people x 1 hr 21 Aug 24: 4 people x 6 hrs 22 Aug 24: 4 people x 6 hrs 23 Aug 24: 4 people x 6 hrs 24 Aug 24: 4 people x 6 hrs 25 Aug 24: 2 people x 3 hrs 26 Aug 24: 4 people x 6 hrs 05 Apr 25: 2 people x 4 hrs 06 Apr 25: 2 people x 4 hrs 07 Apr 25: 2 people x 4 hrs 08 Apr 25: 4 people x 4 hrs 09 Apr 25: 4 people x 4 hrs 10 Apr 25: 4 people x 4 hrs 11 Apr 25: 2 people x 4 hrs 12 Apr 25: 2 people x 4 hrs 13 Apr 25: 2 people x 4 hrs 14 Apr 25: 2 people x 4 hrs	Yes	Yes

Common name	Scientific name	Threatened fauna species surveys				Present	Further assessment required (BAM Subsections 5.2.5 and 5.2.6)
		Survey method (e.g. harp trap, Elliott trap, bioacoustics, etc.)	**Timing of survey – within recommended period? (BAM-C / TBDC)**		**Effort (hours & no. people)**		
		Spotlighting	☒ Yes August 2024 April 2025	☐ No	20 Aug 24: 2 people x 1 hr 21 Aug 24: 4 people x 6 hrs 22 Aug 24: 4 people x 6 hrs 23 Aug 24: 4 people x 6 hrs 24 Aug 24: 4 people x 6 hrs 25 Aug 24: 2 people x 3 hrs 26 Aug 24: 4 people x 6 hrs 05 Apr 25: 2 people x 4 hrs 06 Apr 25: 2 people x 4 hrs 07 Apr 25: 2 people x 4 hrs 08 Apr 25: 4 people x 4 hrs 09 Apr 25: 4 people x 4 hrs 10 Apr 25: 4 people x 4 hrs 11 Apr 25: 2 people x 4 hrs 12 Apr 25: 2 people x 4 hrs 13 Apr 25: 2 people x 4 hrs 14 Apr 25: 2 people x 4 hrs		
		Approved PECe BDAR survey effort	☒ Yes	☐ No	Approved PECe BDAR survey effort was utilised for VNI.		

Common name	Scientific name	Threatened fauna species surveys				Present	Further assessment required (BAM Subsections 5.2.5 and 5.2.6)
		Survey method (e.g. harp trap, Elliott trap, bioacoustics, etc.)	Timing of survey – within recommended period? (BAM-C / TBDC)		Effort (hours & no. people)		
Gang-gang Cockatoo	*Callocephalon fimbriatum*	Habitat Assessment	☐ Yes N/A	☐ No N/A	24 Feb 2025: 2 people x 1.5 hrs 25 Feb 2025: 2 people x 1.5 hrs 26 Feb 2025: 2 people x 1.5 hrs 27 Feb 2025: 2 people x 1.5 hrs	Assumed present Inland Slopes	Yes
White-bellied Sea-eagle	*Haliaeetus leucogaster*	20 min 2 ha diurnal survey	☒ Yes August 2024 October 2024	☐ No	20 Aug 24: 2 people x 40 mins 21 Aug 24: 2 people x 20 mins 26 Aug 24: 2 people x 20 mins 01 Oct 24: 7 people x 20 mins 02 Oct 24: 6 people x 20 mins 03 Oct 24: 3 people x 20 mins 04 Oct 24: 4 people x 20 mins 05 Oct 24: 7 people x 20 mins 06 Oct 24: 6 people x 20 mins 07 Oct 24: 9 people x 20 mins 08 Oct 24: 4 people x 20 mins	Assumed present	Yes
		Opportunistic Habitat Assessment	☒ Yes August September October November December	☐ No	18 – 23 Sept 23: 4 people x 45 hrs 28 – 30 Nov 23: 2 people x 4 hrs 01 Dec 2023: 2 people x 0.5 hrs 19 – 31 Aug 24: 6 people x 38 hrs 01 – 10 Sept 24: 2 people x 36 hrs 06 – 15 Oct 24: 4 people x 68 hrs 26 Nov 24: 4 people x 6 hrs		

Common name	Scientific name	Threatened fauna species surveys				Present	Further assessment required (BAM Subsections 5.2.5 and 5.2.6)
		Survey method (e.g. harp trap, Elliott trap, bioacoustics, etc.)	Timing of survey – within recommended period? (BAM-C / TBDC)		Effort (hours & no. people)		
Black-breasted Buzzard	*Hamirostra melanosternon*	20 min 2 ha diurnal survey	☒ Yes October 2024	☒ No August 2024	20 Aug 24: 2 people x 40 mins 21 Aug 24: 2 people x 20 mins 26 Aug 24: 2 people x 20 mins 01 Oct 24: 7 people x 20 mins 02 Oct 24: 6 people x 20 mins 03 Oct 24: 3 people x 20 mins 04 Oct 24: 4 people x 20 mins 05 Oct 24: 7 people x 20 mins 06 Oct 24: 6 people x 20 mins 07 Oct 24: 9 people x 20 mins 08 Oct 24: 4 people x 20 mins	Assumed present	Yes
		Opportunistic Habitat Assessment	☒ Yes September October November December	☐ No	18 – 23 Sept 23: 4 people x 45 hrs 28 – 30 Nov 23: 2 people x 4 hrs 01 Dec 2023: 2 people x 0.5 hrs 01 – 10 Sept 24: 2 people x 36 hrs 06 – 15 Oct 24: 4 people x 68 hrs 26 Nov 24: 4 people x 6 hrs		

Common name	Scientific name	Threatened fauna species surveys				Present	Further assessment required (BAM Subsections 5.2.5 and 5.2.6)
		Survey method (e.g. harp trap, Elliott trap, bioacoustics, etc.)	Timing of survey – within recommended period? (BAM-C / TBDC)		Effort (hours & no. people)		
Little Eagle	*Hieraaetus morphnoides*	20 min 2 ha diurnal survey	☒ Yes August 2024 October 2024	☐ No	20 Aug 24: 2 people x 40 mins 21 Aug 24: 2 people x 20 mins 26 Aug 24: 2 people x 20 mins 01 Oct 24: 7 people x 20 mins 02 Oct 24: 6 people x 20 mins 03 Oct 24: 3 people x 20 mins 04 Oct 24: 4 people x 20 mins 05 Oct 24: 7 people x 20 mins 06 Oct 24: 6 people x 20 mins 07 Oct 24: 9 people x 20 mins 08 Oct 24: 4 people x 20 mins	Assumed present	Yes
		Opportunistic Habitat Assessment	☒ Yes August September October	☐ No	18 – 23 Sept 23: 4 people x 45 hrs 19 – 31 Aug 24: 6 people x 38 hrs 01 – 10 Sept 24: 2 people x 36 hrs 06 – 15 Oct 24: 4 people x 68 hrs		

Common name	Scientific name	Threatened fauna species surveys				Present	Further assessment required (BAM Subsections 5.2.5 and 5.2.6)
		Survey method (e.g. harp trap, Elliott trap, bioacoustics, etc.)	Timing of survey – within recommended period? (BAM-C / TBDC)		Effort (hours & no. people)		
Pink Cockatoo	*Lophochroa leadbeateri*	20 min 2 ha diurnal survey	☒ Yes October 2024	☒ No August 2024	20 Aug 24: 2 people x 40 mins 21 Aug 24: 2 people x 20 mins 26 Aug 24: 2 people x 20 mins 01 Oct 24: 7 people x 20 mins 02 Oct 24: 6 people x 20 mins 03 Oct 24: 3 people x 20 mins 04 Oct 24: 4 people x 20 mins 05 Oct 24: 7 people x 20 mins 06 Oct 24: 6 people x 20 mins 07 Oct 24: 9 people x 20 mins 08 Oct 24: 4 people x 20 mins	Assumed present	Yes
		Opportunistic Habitat Assessment	☒ Yes September October November December	☐ No	18 – 23 Sept 23: 4 people x 45 hrs 28 – 30 Nov 23: 2 people x 4 hrs 01 Dec 2023: 2 people x 0.5 hrs 01 – 10 Sept 24: 2 people x 36 hrs 06 – 15 Oct 24: 4 people x 68 hrs 26 Nov 24: 4 people x 6 hrs		

Common name	Scientific name	Threatened fauna species surveys				Present	Further assessment required (BAM Subsections 5.2.5 and 5.2.6)
		Survey method (e.g. harp trap, Elliott trap, bioacoustics, etc.)	Timing of survey – within recommended period? (BAM-C / TBDC)		Effort (hours & no. people)		
Square-tailed Kite	*Lophoictinia isura*	20 min 2 ha diurnal survey	☒ Yes October 2024	☒ No August 2024	20 Aug 24: 2 people x 40 mins 21 Aug 24: 2 people x 20 mins 26 Aug 24: 2 people x 20 mins 01 Oct 24: 7 people x 20 mins 02 Oct 24: 6 people x 20 mins 03 Oct 24: 3 people x 20 mins 04 Oct 24: 4 people x 20 mins 05 Oct 24: 7 people x 20 mins 06 Oct 24: 6 people x 20 mins 07 Oct 24: 9 people x 20 mins 08 Oct 24: 4 people x 20 mins	No	No
		Opportunistic Habitat Assessment	☒ Yes September October November December January	☐ No	18 – 23 Sept 23: 4 people x 45 hrs 28 – 30 Nov 23: 2 people x 4 hrs 01 Dec 2023: 2 people x 0.5 hrs 27 – 31 Jan 24: 4 people x 20.5 hrs 01 – 10 Sept 24: 2 people x 36 hrs 06 – 15 Oct 24: 4 people x 68 hrs 26 Nov 24: 4 people x 6 hrs 27 – 31 Jan 25: 4 people x 22 hrs		

Common name	Scientific name	Threatened fauna species surveys				Present	Further assessment required (BAM Subsections 5.2.5 and 5.2.6)
		Survey method (e.g. harp trap, Elliott trap, bioacoustics, etc.)	Timing of survey – within recommended period? (BAM-C / TBDC)		Effort (hours & no. people)		
Barking Owl	*Ninox connivens*	Call playback	☒ Yes August 2024 April 2025	☐ No	20 Aug 24: 2 people x 1 hr 21 Aug 24: 4 people x 6 hrs 22 Aug 24: 4 people x 6 hrs 23 Aug 24: 4 people x 6 hrs 24 Aug 24: 4 people x 6 hrs 25 Aug 24: 2 people x 3 hrs 26 Aug 24: 4 people x 6 hrs 05 Apr 25: 2 people x 4 hrs 06 Apr 25: 2 people x 4 hrs 07 Apr 25: 2 people x 4 hrs 08 Apr 25: 4 people x 4 hrs 09 Apr 25: 4 people x 4 hrs 10 Apr 25: 4 people x 4 hrs 11 Apr 25: 2 people x 4 hrs 12 Apr 25: 2 people x 4 hrs 13 Apr 25: 2 people x 4 hrs 14 Apr 25: 2 people x 4 hrs	Assumed present	Yes
		Spotlighting	☒ Yes February 2024 August 2024	☐ No	19 Feb 24: 2 people x 2.5 hrs 20 Feb 24: 2 people x 2.5 hrs 21 Feb 24: 2 people x 2.5 hrs		

Common name	Scientific name	Threatened fauna species surveys				Present	Further assessment required (BAM Subsections 5.2.5 and 5.2.6)
		Survey method (e.g. harp trap, Elliott trap, bioacoustics, etc.)	Timing of survey – within recommended period? (BAM-C / TBDC)		Effort (hours & no. people)		
			April 2025		22 Feb 24: 2 people x 2.5 hrs 20 Aug 24: 2 people x 1 hr 21 Aug 24: 4 people x 6 hrs 22 Aug 24: 4 people x 6 hrs 23 Aug 24: 4 people x 6 hrs 24 Aug 24: 4 people x 6 hrs 25 Aug 24: 2 people x 3 hrs 26 Aug 24: 4 people x 6 hrs 05 Apr 25: 2 people x 4 hrs 06 Apr 25: 2 people x 4 hrs 07 Apr 25: 2 people x 4 hrs 08 Apr 25: 4 people x 4 hrs 09 Apr 25: 4 people x 4 hrs 10 Apr 25: 4 people x 4 hrs 11 Apr 25: 2 people x 4 hrs 12 Apr 25: 2 people x 4 hrs 13 Apr 25: 2 people x 4 hrs 14 Apr 25: 2 people x 4 hrs		
		Approved PECe BDAR survey effort	☒ Yes	☐ No	Approved PECe BDAR survey effort was utilised for VNI.		

Common name	Scientific name	Threatened fauna species surveys				Present	Further assessment required (BAM Subsections 5.2.5 and 5.2.6)
		Survey method (e.g. harp trap, Elliott trap, bioacoustics, etc.)	**Timing of survey – within recommended period? (BAM-C / TBDC)**		**Effort (hours & no. people)**		
Plains-wanderer	*Pedionomus torquatus*	Spotlighting - based on Important Habitat Map	N/A		26 Nov 24: 2 people x 2 hrs 26 Nov 24: 2 people x 1 hr 25 Feb 25: 6 people x 2 hrs 26 Feb 25: 6 people x 2 hrs 27 Feb 25: 6 people x 2 hrs	Yes	Yes
Superb Parrot	*Polytelis swainsonii*	20 min 2 ha diurnal survey	☒ Yes October 2024	☒ No August 2024	20 Aug 24: 2 people x 40 mins 21 Aug 24: 2 people x 20 mins 26 Aug 24: 2 people x 20 mins 01 Oct 24: 7 people x 20 mins 02 Oct 24: 6 people x 20 mins 03 Oct 24: 3 people x 20 mins 04 Oct 24: 4 people x 20 mins 05 Oct 24: 7 people x 20 mins 06 Oct 24: 6 people x 20 mins 07 Oct 24: 9 people x 20 mins 08 Oct 24: 4 people x 20 mins	Assumed present	Yes
		Opportunistic Habitat Assessment	☒ Yes September October November	☐ No	18 – 23 Sept 23: 4 people x 45 hrs 28 – 30 Nov 23: 2 people x 4 hrs 01 – 10 Sept 24: 2 people x 36 hrs 06 – 15 Oct 24: 4 people x 68 hrs 26 Nov 24: 4 people x 6 hrs		

Common name	Scientific name	Threatened fauna species surveys				Present	Further assessment required (BAM Subsections 5.2.5 and 5.2.6)
		Survey method (e.g. harp trap, Elliott trap, bioacoustics, etc.)	Timing of survey – within recommended period? (BAM-C / TBDC)		Effort (hours & no. people)		
Masked Owl	*Tyto novaehollandiae*	Call playback	☒ Yes August 2024 April 2025	☐ No	20 Aug 24: 2 people x 1 hr 21 Aug 24: 4 people x 6 hrs 22 Aug 24: 4 people x 6 hrs 23 Aug 24: 4 people x 6 hrs 24 Aug 24: 4 people x 6 hrs 25 Aug 24: 2 people x 3 hrs 26 Aug 24: 4 people x 6 hrs 05 Apr 25: 2 people x 4 hrs 06 Apr 25: 2 people x 4 hrs 07 Apr 25: 2 people x 4 hrs 08 Apr 25: 4 people x 4 hrs 09 Apr 25: 4 people x 4 hrs 10 Apr 25: 4 people x 4 hrs 11 Apr 25: 2 people x 4 hrs 12 Apr 25: 2 people x 4 hrs 13 Apr 25: 2 people x 4 hrs 14 Apr 25: 2 people x 4 hrs	Assumed present	Yes
		Spotlighting	☒ Yes February 2024 August 2024	☐ No	19 Feb 24: 2 people x 2.5hrs 20 Feb 24: 2 people x 2.5hrs 21 Feb 24: 2 people x 2.5hrs		

Common name	Scientific name	Threatened fauna species surveys				Present	Further assessment required (BAM Subsections 5.2.5 and 5.2.6)
		Survey method (e.g. harp trap, Elliott trap, bioacoustics, etc.)	Timing of survey – within recommended period? (BAM-C / TBDC)		Effort (hours & no. people)		
			April 2025		22 Feb 24: 2 people x 2.5hrs 20 Aug 24: 2 people x 1 hr 21 Aug 24: 4 people x 6 hrs 22 Aug 24: 4 people x 6 hrs 23 Aug 24: 4 people x 6 hrs 24 Aug 24: 4 people x 6 hrs 25 Aug 24: 2 people x 3 hrs 26 Aug 24: 4 people x 6 hrs 05 Apr 25: 2 people x 4 hrs 06 Apr 25: 2 people x 4 hrs 07 Apr 25: 2 people x 4 hrs 08 Apr 25: 4 people x 4 hrs 09 Apr 25: 4 people x 4 hrs 10 Apr 25: 4 people x 4 hrs 11 Apr 25: 2 people x 4 hrs 12 Apr 25: 2 people x 4 hrs 13 Apr 25: 2 people x 4 hrs 14 Apr 25: 2 people x 4 hrs		
		Approved PECe BDAR survey effort	☒ Yes	☐ No	Approved PECe BDAR survey effort was utilised for VNI.		

Common name	Scientific name	Threatened fauna species surveys				Present	Further assessment required (BAM Subsections 5.2.5 and 5.2.6)
		Survey method (e.g. harp trap, Elliott trap, bioacoustics, etc.)	Timing of survey – within recommended period? (BAM-C / TBDC)		Effort (hours & no. people)		
Mammals							
Southern Myotis	*Myotis macropus*	Anabats	☒ Yes January 2024 February 2024 February 2025	☐ No	30 Jan 24: 2 people x 3.5 hrs 31 Jan 24: 2 people x 3.5 hrs 01 Feb 24: 2 people x 3.5 hrs 02 Feb 24: 2 people x 3.5 hrs 03 Feb 24: 2 people x 7.5 hrs 04 Feb 24: 2 people x 7.5 hrs 05 Feb 24: 2 people x 7.5 hrs 06 Feb 24: 2 people x 7.5 hrs 19 Feb 24: 2 people x 2.5 hrs 20 Feb 24: 2 people x 2.5 hrs 21 Feb 24: 2 people x 2.5 hrs 22 Feb 24: 2 people x 2.5 hrs 17 Feb 25: 2 people x 5 hrs	Assumed present	Yes
		Harp traps	☒ Yes February 2024	☐ No	19 Feb 24: 2 people x 2.5 hrs 20 Feb 24: 2 people x 2.5 hrs 21 Feb 24: 2 people x 2.5 hrs 22 Feb 24: 2 people x 2.5 hrs		

Common name	Scientific name	Threatened fauna species surveys				Present	Further assessment required (BAM Subsections 5.2.5 and 5.2.6)
		Survey method (e.g. harp trap, Elliott trap, bioacoustics, etc.)	Timing of survey – within recommended period? (BAM-C / TBDC)		Effort (hours & no. people)		
Squirrel Glider in the Wagga Wagga LGA	*Petaurus norfolcensis* – endangered population	Camera traps	☒ Yes April 2024 May 2024 October 2024	☐ No	03 Apr 24: 2 people x 10 hrs 04 Apr 24: 2 people x 10 hrs 05 Apr 24: 2 people x 10 hrs 15 Apr 24: 2 people x 7.5 hrs 16 Apr 24: 2 people x 7.5 hrs 17 Apr 24: 2 people x 7.5 hrs 18 Apr 24: 2 people x 7.5 hrs 07 May 24: 2 people x 10 hrs 08 May 24: 2 people x 10 hrs 09 May 24: 2 people x 10 hrs 01 Oct 24: 2 people x 10 hrs	Assumed presence based on Species Expert	Yes
Koala	*Phascolarctos cinereus*	Spotlighting	☒ Yes February 2024 August 2024 January 2025 February 2025	☐ No	19 Feb 24: 2 people x 2.5 hrs 20 Feb 24: 2 people x 2.5 hrs 21 Feb 24: 2 people x 2.5 hrs 22 Feb 24: 2 people x 2.5 hrs 20 Aug 24: 2 people x 40 mins 21 Aug 24: 2 people x 1 hr 22 Aug 24: 2 people x 1.25 hrs 23 Aug 24: 2 people x 1 hr 24 Aug 24: 2 people x 1 hr	Assumed present	Yes

Common name	Scientific name	Threatened fauna species surveys				Present	Further assessment required (BAM Subsections 5.2.5 and 5.2.6)
		Survey method (e.g. harp trap, Elliott trap, bioacoustics, etc.)	Timing of survey – within recommended period? (BAM-C / TBDC)		Effort (hours & no. people)		
					26 Aug 24: 2 people x 45 mins 27 Jan 25: 2 people x 1.5 hrs 28 Jan 25: 2 people x 1.5 hrs 29 Jan 25: 2 people x 1.5 hrs 30 Jan 25: 2 people x 1.5 hrs 03 Feb 25: 2 people x 1 hr 04 Feb 25: 2 people x 2.5 hrs 05 Feb 25: 2 people x 3.5 hrs 06 Feb 25: 2 people x 2 hrs		
		Call playback	☒ Yes August 2024		20 Aug 24: 2 people x 1 hr 21 Aug 24: 4 people x 6 hrs 22 Aug 24: 4 people x 6 hrs 23 Aug 24: 4 people x 6 hrs 24 Aug 24: 4 people x 6 hrs 25 Aug 24: 2 people x 3 hrs 26 Aug 24: 4 people x 6 hrs		

Common name	Scientific name	Threatened fauna species surveys				Present	Further assessment required (BAM Subsections 5.2.5 and 5.2.6)
		Survey method (e.g. harp trap, Elliott trap, bioacoustics, etc.)	Timing of survey – within recommended period? (BAM-C / TBDC)		Effort (hours & no. people)		
Brush-tailed Phascogale	*Phascogale tapoatafa*	Camera traps	☒ Yes April 2024 May 2024	☒ No October 2024 (Camera collection)	03 Apr 24: 2 people x 10 hrs 04 Apr 24: 2 people x 10 hrs 05 Apr 24: 2 people x 10 hrs 15 Apr 24: 2 people x 7.5 hrs 16 Apr 24: 2 people x 7.5 hrs 17 Apr 24: 2 people x 7.5 hrs 18 Apr 24: 2 people x 7.5 hrs 07 May 24: 2 people x 10 hrs 08 May 24: 2 people x 10 hrs 09 May 24: 2 people x 10 hrs	No	No
Reptiles							
Pink-tailed Legless Lizard	*Aprasia parapulchella*	Habitat assessment	☐ Yes	☒ No	01 Oct 24: 2 people x 2 hrs 02 Oct 24: 2 people x 2 hrs 03 Oct 24: 2 people x 1 hr 04 Oct 24: 2 people x 1 hr 05 Oct 24: 2 people x 2 hrs 06 Oct 24: 2 people x 2hrs 07 Oct 24: 2 people x 3 hrs 08 Oct 24: 2 people x 1 hr	Assumed present	Yes

Common name	Scientific name	Threatened fauna species surveys				Present	Further assessment required (BAM Subsections 5.2.5 and 5.2.6)
		Survey method (e.g. harp trap, Elliott trap, bioacoustics, etc.)	Timing of survey – within recommended period? (BAM-C / TBDC)		Effort (hours & no. people)		
Striped Legless Lizard	*Delma impar*	Habitat assessment	☐ Yes	☒ No	Habitat Assessment 24 Feb 2025: 2 people x 1.5 hrs 25 Feb 2025: 2 people x 1.5 hrs 26 Feb 2025: 2 people x 1.5 hrs 27 Feb 2025: 2 people x 1.5 hrs	No	No
Grey Snake	*Hemiaspis damelii*	Spotlighting	☒Yes January 2025 February 2025	☐No	27 Jan 2025: 2 people x 2.5 hrs 28 Jan 2025: 2 people x 2 hrs 29 Jan 2025: 2 people x 2 hrs 30 Jan 2025: 2 people x 2 hrs 03 Feb 2025: 2 people x 1 hr 04 Feb 2025: 2 people x 1 hr 05 Feb 2025: 2 people x 1 hr 06 Feb 2025: 2 people x 1 hr	Assumed present	Yes
Invertebrates							
Key's Matchstick Grasshopper	*Keyacris scurra*	Habitat assessment	☐ Yes	☒ No	Habitat Assessment 24 Feb 2025: 2 people x 1.5 hrs 25 Feb 2025: 2 people x 1.5 hrs 26 Feb 2025: 2 people x 1.5 hrs 27 Feb 2025: 2 people x 1.5 hrs	No	No

Common name	Scientific name	Threatened fauna species surveys				Present	Further assessment required (BAM Subsections 5.2.5 and 5.2.6)
		Survey method (e.g. harp trap, Elliott trap, bioacoustics, etc.)	Timing of survey – within recommended period? (BAM-C / TBDC)		Effort (hours & no. people)		
Golden Sun Moth	*Synemon plana*	Habitat assessment	☐ Yes	No	Habitat Assessment 24 Feb 2025: 2 people x 1.5 hrs 25 Feb 2025: 2 people x 1.5 hrs 26 Feb 2025: 2 people x 1.5 hrs 27 Feb 2025: 2 people x 1.5 hrs	No	No

5.3.3 *Predicted threatened fauna species recorded during surveys*

Table 5.11 Predicted threatened fauna species recorded during surveys and associated survey effort

Common name	Scientific name	Threatened fauna species surveys			Present	Further assessment required (BAM Subsections 5.2.5 and 5.2.6)
		Survey method (e.g. harp trap, Elliott trap, bioacoustics, etc.)	Timing of survey – within recommended period? (BAM-C / TBDC)	Effort (hours & no. people)		
Southern Whiteface	*Aphelocephala leucopsis*	20 min 2 ha diurnal survey	N/A	20 Aug 24: 2 people x 40 mins 21 Aug 24: 2 people x 20 mins 26 Aug 24: 2 people x 20 mins 01 Oct 24: 7 people x 20 mins 02 Oct 24: 6 people x 20 mins 03 Oct 24: 3 people x 20 mins 04 Oct 24: 4 people x 20 mins 05 Oct 24: 7 people x 20 mins 06 Oct 24: 6 people x 20 mins 07 Oct 24: 9 people x 20 mins 08 Oct 24: 4 people x 20 mins	Yes	No

Common name	Scientific name	Threatened fauna species surveys			Present	Further assessment required (BAM Subsections 5.2.5 and 5.2.6)
		Survey method (e.g. harp trap, Elliott trap, bioacoustics, etc.)	Timing of survey – within recommended period? (BAM-C / TBDC)	Effort (hours & no. people)		
Dusky Woodswallow	*Artamus cyanopterus cyanopterus*	20 min 2 ha diurnal survey	N/A	20 Aug 24: 2 people x 40 mins 21 Aug 24: 2 people x 20 mins 26 Aug 24: 2 people x 20 mins 01 Oct 24: 7 people x 20 mins 02 Oct 24: 6 people x 20 mins 03 Oct 24: 3 people x 20 mins 04 Oct 24: 4 people x 20 mins 05 Oct 24: 7 people x 20 mins 06 Oct 24: 6 people x 20 mins 07 Oct 24: 9 people x 20 mins 08 Oct 24: 4 people x 20 mins	Yes	No
Spotted Harrier	*Circus assimilis*	20 min 2 ha diurnal survey	N/A	20 Aug 24: 2 people x 40 mins 21 Aug 24: 2 people x 20 mins 26 Aug 24: 2 people x 20 mins 01 Oct 24: 7 people x 20 mins 02 Oct 24: 6 people x 20 mins 03 Oct 24: 3 people x 20 mins 04 Oct 24: 4 people x 20 mins 05 Oct 24: 7 people x 20 mins 06 Oct 24: 6 people x 20 mins 07 Oct 24: 9 people x 20 mins 08 Oct 24: 4 people x 20 mins	Yes	No

Common name	Scientific name	Threatened fauna species surveys			Present	Further assessment required (BAM Subsections 5.2.5 and 5.2.6)
		Survey method (e.g. harp trap, Elliott trap, bioacoustics, etc.)	Timing of survey – within recommended period? (BAM-C / TBDC)	Effort (hours & no. people)		
Brown Treecreeper (south eastern)	*Climacteris picumnus victoriae*	20 min 2 ha diurnal survey	N/A	20 Aug 24: 2 people x 40 mins 21 Aug 24: 2 people x 20 mins 26 Aug 24: 2 people x 20 mins 01 Oct 24: 7 people x 20 mins 02 Oct 24: 6 people x 20 mins 03 Oct 24: 3 people x 20 mins 04 Oct 24: 4 people x 20 mins 05 Oct 24: 7 people x 20 mins 06 Oct 24: 6 people x 20 mins 07 Oct 24: 9 people x 20 mins 08 Oct 24: 4 people x 20 mins	Yes	No

Common name	Scientific name	Threatened fauna species surveys			Present	Further assessment required (BAM Subsections 5.2.5 and 5.2.6)
		Survey method (e.g. harp trap, Elliott trap, bioacoustics, etc.)	Timing of survey – within recommended period? (BAM-C / TBDC)	Effort (hours & no. people)		
Varied Sittella	*Daphoenositta chrysoptera*	20 min 2 ha diurnal survey	N/A	20 Aug 24: 2 people x 40 mins 21 Aug 24: 2 people x 20 mins 26 Aug 24: 2 people x 20 mins 01 Oct 24: 7 people x 20 mins 02 Oct 24: 6 people x 20 mins 03 Oct 24: 3 people x 20 mins 04 Oct 24: 4 people x 20 mins 05 Oct 24: 7 people x 20 mins 06 Oct 24: 6 people x 20 mins 07 Oct 24: 9 people x 20 mins 08 Oct 24: 4 people x 20 mins	Yes	No
White-fronted Chat	*Epthianura albifrons*	20 min 2 ha diurnal survey	N/A	20 Aug 24: 2 people x 40 mins 21 Aug 24: 2 people x 20 mins 26 Aug 24: 2 people x 20 mins 01 Oct 24: 7 people x 20 mins 02 Oct 24: 6 people x 20 mins 03 Oct 24: 3 people x 20 mins 04 Oct 24: 4 people x 20 mins 05 Oct 24: 7 people x 20 mins 06 Oct 24: 6 people x 20 mins 07 Oct 24: 9 people x 20 mins 08 Oct 24: 4 people x 20 mins	Yes	No

Common name	Scientific name	Threatened fauna species surveys			Present	Further assessment required (BAM Subsections 5.2.5 and 5.2.6)
		Survey method (e.g. harp trap, Elliott trap, bioacoustics, etc.)	Timing of survey – within recommended period? (BAM-C / TBDC)	Effort (hours & no. people)		
Grey Falcon	*Falco hypoleucos*	20 min 2 ha diurnal survey	N/A	20 Aug 24: 2 people x 40 mins 21 Aug 24: 2 people x 20 mins 26 Aug 24: 2 people x 20 mins 01 Oct 24: 7 people x 20 mins 02 Oct 24: 6 people x 20 mins 03 Oct 24: 3 people x 20 mins 04 Oct 24: 4 people x 20 mins 05 Oct 24: 7 people x 20 mins 06 Oct 24: 6 people x 20 mins 07 Oct 24: 9 people x 20 mins 08 Oct 24: 4 people x 20 mins	No	No
Black Falcon	*Falco subniger*	20 min 2 ha diurnal survey	N/A	20 Aug 24: 2 people x 40 mins 21 Aug 24: 2 people x 20 mins 26 Aug 24: 2 people x 20 mins 01 Oct 24: 7 people x 20 mins 02 Oct 24: 6 people x 20 mins 03 Oct 24: 3 people x 20 mins 04 Oct 24: 4 people x 20 mins 05 Oct 24: 7 people x 20 mins 06 Oct 24: 6 people x 20 mins 07 Oct 24: 9 people x 20 mins 08 Oct 24: 4 people x 20 mins	Yes	No

Common name	Scientific name	Threatened fauna species surveys			Present	Further assessment required (BAM Subsections 5.2.5 and 5.2.6)
		Survey method (e.g. harp trap, Elliott trap, bioacoustics, etc.)	Timing of survey – within recommended period? (BAM-C / TBDC)	Effort (hours & no. people)		
Painted Honeyeater	*Grantiella picta*	20 min 2 ha diurnal survey	N/A	20 Aug 24: 2 people x 40 mins 21 Aug 24: 2 people x 20 mins 26 Aug 24: 2 people x 20 mins 01 Oct 24: 7 people x 20 mins 02 Oct 24: 6 people x 20 mins 03 Oct 24: 3 people x 20 mins 04 Oct 24: 4 people x 20 mins 05 Oct 24: 7 people x 20 mins 06 Oct 24: 6 people x 20 mins 07 Oct 24: 9 people x 20 mins 08 Oct 24: 4 people x 20 mins	No	No
Blue-winged Parrot	*Neophema chrysostoma*	20 min 2 ha diurnal survey	N/A	20 Aug 24: 2 people x 40 mins 21 Aug 24: 2 people x 20 mins 26 Aug 24: 2 people x 20 mins 01 Oct 24: 7 people x 20 mins 02 Oct 24: 6 people x 20 mins 03 Oct 24: 3 people x 20 mins 04 Oct 24: 4 people x 20 mins 05 Oct 24: 7 people x 20 mins 06 Oct 24: 6 people x 20 mins 07 Oct 24: 9 people x 20 mins 08 Oct 24: 4 people x 20 mins	Yes	No

Common name	Scientific name	Threatened fauna species surveys			Present	Further assessment required (BAM Subsections 5.2.5 and 5.2.6)
		Survey method (e.g. harp trap, Elliott trap, bioacoustics, etc.)	Timing of survey – within recommended period? (BAM-C / TBDC)	Effort (hours & no. people)		
Grey-crowned Babbler (eastern subspecies)	*Pomatostomus temporalis*	20 min 2 ha diurnal survey	N/A	20 Aug 24: 2 people x 40 mins 21 Aug 24: 2 people x 20 mins 26 Aug 24: 2 people x 20 mins 01 Oct 24: 7 people x 20 mins 02 Oct 24: 6 people x 20 mins 03 Oct 24: 3 people x 20 mins 04 Oct 24: 4 people x 20 mins 05 Oct 24: 7 people x 20 mins 06 Oct 24: 6 people x 20 mins 07 Oct 24: 9 people x 20 mins 08 Oct 24: 4 people x 20 mins	Yes	No

5.4 Expert reports

The BAM in Box 3 (DPIE 2020) states that 'An expert report can be used instead of a species survey for all proposals to determine whether a species is present or not present on the subject land. Where an assessor assumes the species is present (except for a proposed biodiversity stewardship site), an expert report may be used to determine the location and area of fauna/flora habitat for the species polygon, and the estimated number of individuals of the flora species.

An expert report was commissioned to assess the likely presence of the Squirrel Glider and Brush-tailed Phascogale within the subject land. Dr Rodney van der Ree is an approved Species Expert for the Squirrel Glider and Brush-tailed Phascogale and is registered as such under the BAM. The outcome of the expert report has identified suitable habitat for Squirrell Gliders in the network augmentation works component of the project. No other suitable habitat has been identified for Squirrel Gliders or Brush-tailed Phascogales within the subject land. A detailed expert report has been prepared in accordance with BAM Box 3 and is provided in Appendix I.

Additionally, for the network augmentation works located within the study area of the Humelink BDAR (Niche, 2024), the following species expert reports have been utilised to further exclude (full or partial) the following threatened species from this assessment:

- White-bellied Sea-eagle (*Haliaeetus leucogaster*)
- Little Eagle (Hieraaetus morphnoides)
- Square-tailed Kite (*Lophoictinia isura*)
- Barking Owl (Ninox connivens)
- Masked Owl (Tyto novaehollandiae)
- Striped Legless Lizard (*Delmar impar*)
- Keys Matchstick Grasshopper (*Keyacris scurra*)
- Golden Sun Moth (*Synemon plana*).

5.5 Area or count, and location of suitable habitat for a species credit species (a species polygon)

Threatened flora and fauna targeted surveys have been completed where access was available. Surveys are planned within the preferred survey period for each species and in consideration of the relevant survey guidelines. A species polygon for each candidate species is determined by either an area or count as a unit of measure with an appropriate buffer.

Threatened flora species polygons were determined by either count or area. Species polygons using a count apply to an individual or a number of individuals. A 30 metre buffer was applied to the data point location to create the species polygon. The subject land is linear, and the two-phase grid survey methodology applied to area species polygons for threatened flora as well as the PCT, vegetation condition and any associated microhabitats. Threatened flora species that were recorded in the subject have been presented in Table 5.12. Assumed presence for threatened flora applied to areas with limited access or seasonal survey restrictions.

Threatened fauna species polygons were determined to be a count or area as outlined in relevant survey guidelines or TBDC for each species see Table 5.13. Assumed presence for threatened fauna applied PCT state vegetation type mapping where land was inaccessible (i.e. no field verification).

Table 5.12 Results for threatened flora present species

Common name	Scientific name	Biodiversity risk weighting (BAM-C & TBDC*)	SAII entity** (BAM-C & TBDC)	Habitat constraints / microhabitats present on the project footprint / vegetation zone	Abundance – No. individual plants present on project footprint (flora with unit of measure of count)	TBDC species specific recommendations e.g. buffers, general comments (where relevant)		Condition class	Extent (ha) of suitable habitat present in the subject land (flora or fauna with unit of measure of area)
						IBRA subregion[1]	Presence on subject land		
Yass Daisy	*Ammobium craspedioides*	High (2)	No	Geographic limitations: south of Cowra	Count	IS	Assumed presence on unsurveyed lands	266_Moderate-good 266_Thinned 277_Moderate-good 277_Thinned	0.08 0.02 0.16 1.82
River Swamp Wallaby-grass, Floating Swamp Wallaby-grass	*Amphibromus fluitans*	High (2)	No	Habitat constraints Semi-permanent/ephemeral wet areas.	Area	MF	Assumed presence on unsurveyed lands	2_SVTM 11_Moderate-good 17_Moderate-good 160_Moderate-good	0.02 0.13 0.14 0.14
-	*Austrostipa metatoris*	High (2)	No	West of Deniliquin	Area	MF	Assumed presence on unsurveyed lands	7_Moderate-good 19_SVTM 28_Derived 28_Derived Tall Shrubland	0.31 0.54 0.20 0.19
-	*Austrostipa wakoolica*	High (2)	No	Habitat constraints: Alluvial plains and plains South of the Murrumbidgee River	Area	MU	Assumed presence on unsurveyed lands	17_Moderate-good 17_SVTM 26_Derived 26_Moderate-good 26_Thinned 26_SVTM 28_SVTM	0.08 2.19 12.13 2.82 8.53 1.06 1.61
						MF	Assumed presence on unsurveyed lands	28_Derived 28_Derived Tall Shrubland	0.20 0.19
						IS	Assumed presence on unsurveyed lands	76_Thinned	0.30
Mueller Daisy	*Brachyscome muelleroides*	Very High (3)	Yes	Habitat constraints: Floodplains on grey-brown or red-brown clays and claypans. Semi-permanent/ephemeral wet areas.	Area	MU	Assumed presence on unsurveyed lands	44_SVTM 45_SVTM	0.73 0.31

Common name	Scientific name	Biodiversity risk weighting (BAM-C & TBDC*)	SAII entity** (BAM-C & TBDC)	Habitat constraints / microhabitats present on the project footprint / vegetation zone	Abundance – No. individual plants present on project footprint (flora with unit of measure of count)	TBDC species specific recommendations e.g. buffers, general comments (where relevant)		Condition class	Extent (ha) of suitable habitat present in the subject land (flora or fauna with unit of measure of area)
						IBRA subregion[1]	Presence on subject land		
Mossgiel Daisy	*Brachyscome papillosa*	High (2)	No	None listed in the BAM-C	Area	MU	Recorded presence	15_Moderate-good	0.12
								46_Moderate-good	5.49
								163_Moderate-good	2.48
								164_Moderate-good	4.58
							Assumed presence on unsurveyed lands	15_Derived	0.24
								15_SVTM	0.07
								44_SVTM	0.73
								45_SVTM	0.31
								46_SVTM	18.11
								157_Moderate-good	3.97
								157_SVTM	7.46
								160_SVTM	1.20
								163_Moderate-good	1.41
								163_SVTM	6.06
								164_Moderate-good	4.58
								164_SVTM	84.45
Sand-hill Spider Orchid	*Caladenia arenaria*	Very High (3)	Yes	None listed in the BAM-C	Area	IS	Assumed presence on unsurveyed lands	76_Thinned	0.30
Burr-daisy	*Calotis moorei*	Very High (3)	Yes	None listed in the BAM-C	Area	MU	Assumed presence on unsurveyed lands	23_Derived	0.61
								23_Moderate-good	0.10
								157_Moderate-good	3.97
								157_SVTM	7.46
Bindweed	*Convolvulus tedmoorei*	Very High (3)	Yes	None listed in the BAM-C	Area	MU	Assumed presence on unsurveyed lands	17_Moderate-good	0.08
								17_SVTM	1.95
								44_Moderate-good	0.52
								44_SVTM	0.76
								45_SVTM	0.31
								157_Moderate-good	3.97
								157_SVTM	7.55
								160_Moderate-good	0.21
								160_SVTM	1.36
								163_Moderate-good	1.45
								164_Moderate-good	10.76

Common name	Scientific name	Biodiversity risk weighting (BAM-C & TBDC*)	SAII entity** (BAM-C & TBDC)	Habitat constraints / microhabitats present on the project footprint / vegetation zone	Abundance – No. individual plants present on project footprint (flora with unit of measure of count)	TBDC species specific recommendations e.g. buffers, general comments (where relevant)		Condition class	Extent (ha) of suitable habitat present in the subject land (flora or fauna with unit of measure of area)
						IBRA subregion[1]	Presence on subject land		
Small Scurf-pea	*Cullen parvum*	High (2)	No	None listed in the BAM-C	Area	MU	Assumed presence on unsurveyed lands	44_Moderate-good 44_SVTM	14.77 8.74
						IS	Assumed presence on unsurveyed lands	277_Moderate-good 277_Thinned	0.16 1.82
Pine Donkey Orchid	*Diuris tricolor*	Moderate (1.5)	No	None listed in the BAM-C	Area	IS	Assumed presence on unsurveyed lands	76_Thinned	0.30
Spike rush	*Eleocharis obicis*	High (2)	No	Habitat constraints: Semi-permanent/ephemeral wet areas.	Area	MU	Recorded presence	24_Moderate-good 163_Moderate-good 164_Moderate-good	2.84 1.67 7.77
							Assumed presence on unsurveyed lands	17_Moderate-good 17_SVTM 157_Moderate-good 157_SVTM 160_SVTM 163_Moderate-good 163_SVTM 164_Moderate-good 164_SVTM	0.08 2.38 3.97 7.46 1.37 1.41 6.06 4.58 88.45
						MF	Recorded presence	164_Moderate-good	0.93
							Assumed presence on unsurveyed lands	10_Derived 10_Moderate-good 10_Thinned 10_SVTM 13_Derived 13_Moderate-good 13_Thinned 13_SVTM 163_SVTM	2.00 0.41 4.20 0.37 9.55 1.11 2.38 7.83 0.49

Common name	Scientific name	Biodiversity risk weighting (BAM-C & TBDC*)	SAII entity** (BAM-C & TBDC)	Habitat constraints / microhabitats present on the project footprint / vegetation zone	Abundance – No. individual plants present on project footprint (flora with unit of measure of count)	TBDC species specific recommendations e.g. buffers, general comments (where relevant)		Condition class	Extent (ha) of suitable habitat present in the subject land (flora or fauna with unit of measure of area)
						IBRA subregion[1]	Presence on subject land		
Yellow Gum	*Eucalyptus leucoxylon subsp. pruinosa*	High (2)	No	None listed in the BAM-C	Count	MU	Assumed presence on unsurveyed lands	15_SVTM	0.07
						MF		13_Moderate-good	6.12
								13_SVTM	7.80
								13_Thinned	0.20
								15_SVTM	0.67
								19_SVTM	0.54
								86_Moderate-good	0.05
Tumut Grevillea	*Grevillea wilkinsonii*	Very High (3)	Yes	None listed in the BAM-C	Area	IS	Assumed presence on unsurveyed lands	266_Moderate	0.08
								266_Thinned	0.02
Winged Peppercress	*Lepidium monoplocoides*	High (2)	No	None listed in the BAM-C	Area	MF	Assumed presence on unsurveyed lands	13_Derived	9.56
								13_Moderate-good	7.23
								13_Thinned	2.59
								13_SVTM	7.83
								15_SVTM	0.67
								163_SVTM	0.49
						MU	Recorded presence	46_Moderate-good	0.05
							Assumed presence on unsurveyed lands	15_Derived	0.24
								15_SVTM	0.07
								26_Derived	12.13
								26_Moderate-good	2.82
								26_Thinned	8.53
								26_SVTM	1.06
								45_SVTM	0.31
								46_SVTM	18.12
								160_SVTM	1.37
								163_Moderate-good	1.41
								163_SVTM	6.06

Common name	Scientific name	Biodiversity risk weighting (BAM-C & TBDC*)	SAII entity** (BAM-C & TBDC)	Habitat constraints / microhabitats present on the project footprint / vegetation zone	Abundance – No. individual plants present on project footprint (flora with unit of measure of count)	TBDC species specific recommendations e.g. buffers, general comments (where relevant)		Condition class	Extent (ha) of suitable habitat present in the subject land (flora or fauna with unit of measure of area)
						IBRA subregion[1]	Presence on subject land		
Lanky Buttons	*Leptorhynchos orientalis*	High (2)	No	None listed in the BAM-C	Area	MU	Assumed presence on unsurveyed lands	26_Derived	12.13
								26_Moderate-good	2.82
								26_Thinned	8.53
								26_SVTM	1.06
								44_SVTM	0.73
								45_SVTM	0.31
								46_SVTM	18.12
Chariot Wheels	*Maireana cheelii*	High (2)	No	Habitat constraints: Heavy grey clay soils and claypans or shallow depressions.	Area	MF	Recorded presence	164_Moderate-good	0.14
							Assumed presence on unsurveyed lands	44_SVTM	9.88
						MU	Recorded presence	24_Moderate_good	0.06
								44_Moderate_good	0.12
								157_Moderate_good	0.08
								163_Moderate_good	0.82
								164_Moderate_good	3.02
							Assumed presence on unsurveyed lands	26_Derived	12.13
								26_Moderate-good	2.82
								26_Thinned	8.53
								26_SVTM	1.06
								44_SVTM	0.73
								46_SVTM	18.12
								157_Moderate-good	3.42
								157_SVTM	7.46
								164_SVTM	88.45
Austral Pillwort	*Pilularia novae-hollandiae*	High (2)	No	None listed in the BAM-C	Area	MF	Assumed presence on unsurveyed lands	2_SVTM	0.02
								13_Moderate-good	7.67
								13_Thinned	5.15
								13_Derived	9.55
								13_Planted Native Vegetation	0.06
								13_SVTM	7.86
								15_Moderate-good	0.72
								15_SVTM	0.67
								44_SVTM	9.88

Common name	Scientific name	Biodiversity risk weighting (BAM-C & TBDC*)	SAII entity** (BAM-C & TBDC)	Habitat constraints / microhabitats present on the project footprint / vegetation zone	Abundance – No. individual plants present on project footprint (flora with unit of measure of count)	TBDC species specific recommendations e.g. buffers, general comments (where relevant)		Condition class	Extent (ha) of suitable habitat present in the subject land (flora or fauna with unit of measure of area)
						IBRA subregion[1]	Presence on subject land		
						MU	Recorded presence	17_Moderate-good 26_Moderate-good	0.33 10.29
							Assumed presence on unsurveyed lands	15_Moderate-good 26_Moderate-good 26_Thinned 26_Derived 26_SVTM 44_SVTM 45_SVTM	0.05 2.82 9.36 47.57 1.06 0.73 0.31
Tarengo Leek Orchid	*Prasophyllum petilum*	High (2)	No	None listed in the BAM-C	Area	IS	Assumed presence on unsurveyed lands	277_Moderate-good 277_Thinned	0.16 1.82
-	*Prasophyllum sp. Moama*	Very High (3)	Yes	None listed in the BAM-C	Area	MF	Assumed presence on unsurveyed lands	44_SVTM	9.88
Lowly Greenhood	*Pterostylis despectans*	Very High (3)	Yes	None listed in the BAM-C	Area	MF	Assumed presence on unsurveyed lands	44_SVTM	9.88
Turnip Copperburr	*Sclerolaena napiformis*	High (2)	No	None listed in the BAM-C	Area	MU	Assumed presence on unsurveyed lands	26_Derived 26_Moderate-good 26_Thinned 26_SVTM 44_SVTM 46_SVTM	12.13 2.82 8.53 1.06 0.73 18.12
Menindee Nightshade	*Solanum karsense*	Moderate (1.5)	No	Habitat constraints: Semi-permanent/ephemeral wet areas.	Area	MU	Assumed presence on unsurveyed lands	15_Derived	0.24
Slender Darling-pea, Slender Swainson, Murray Swainson-pea	*Swainsona murrayana*	High (2)	No	None listed in the BAM-C	Area	MU	Recorded present	15_Derived 17_Moderate_good 24_Moderate_good 26_Moderate_good 26_Thinned 26_Derived 44_Moderate_good 46_Moderate_good 157_Moderate_good 164_Moderate-good	1.54 0.50 1.12 5.77 9.52 14.74 4.93 1.89 22.25 106.25

Common name	Scientific name	Biodiversity risk weighting (BAM-C & TBDC*)	SAII entity** (BAM-C & TBDC)	Habitat constraints / microhabitats present on the project footprint / vegetation zone	Abundance – No. individual plants present on project footprint (flora with unit of measure of count)	TBDC species specific recommendations e.g. buffers, general comments (where relevant)		Condition class	Extent (ha) of suitable habitat present in the subject land (flora or fauna with unit of measure of area)
						IBRA subregion[1]	Presence on subject land		
							Assumed presence on unsurveyed lands	15_SVTM	0.07
								26_Derived	12.13
								26_Moderate-good	2.82
								26_Thinned	8.53
								26_SVTM	1.06
								28_Derived	1.90
								28_SVTM	1.61
								44_Moderate-good	0.52
								44_SVTM	0.73
								45_SVTM	0.31
								46_SVTM	18.12
								157_Moderate-good	3.97
								157_SVTM	7.46
								163_Moderate-good	2.87
								163_SVTM	6.06
								164_Moderate-good	15.34
								164_SVTM	88.45
Red Darling-pea, Red Swainson-pea	*Swainsona plagiotropis*	High (2)	No	None listed in the BAM-C	Area	MU	Assumed presence on unsurveyed lands	26_Derived	12.13
								26_Moderate-good	2.82
								26_Thinned	8.53
								26_SVTM	1.06
								44_Moderate-good	0.52
								44_SVTM	0.73
								45_SVTM	0.31
								46_SVTM	18.12
								163_Moderate-good	1.45
Small Purple-pea	*Swainsona recta*	High (2)	No	None listed in the BAM-C	Area	IS	Assumed presence on unsurveyed lands	266_Moderate-good	0.08
								266_Thinned	0.02
								277_Moderate-good	0.16
								277_Thinned	1.82

Common name	Scientific name	Biodiversity risk weighting (BAM-C & TBDC*)	SAII entity** (BAM-C & TBDC)	Habitat constraints / microhabitats present on the project footprint / vegetation zone	Abundance – No. individual plants present on project footprint (flora with unit of measure of count)	TBDC species specific recommendations e.g. buffers, general comments (where relevant)		Condition class	Extent (ha) of suitable habitat present in the subject land (flora or fauna with unit of measure of area)
						IBRA subregion[1]	Presence on subject land		
Silky Swainson-pea	*Swainsona sericea*	High (2)	No	Habitat on plains unknown. Sometimes found in association with cypress-pines Callitris spp.	Area	IS	Assumed presence on unsurveyed lands	266_Moderate-good	0.08
								266_Thinned	0.02
								277_Moderate-good	0.16
								277_Thinned	1.82
						MU		26_Derived	12.13
								26_Moderate-good	2.82
								26_Thinned	8.53
								26_SVTM	1.06
								28_SVTM	1.61
								44_SVTM	0.73
								45_SVTM	0.31
								46_SVTM	18.12

(1) IBRA subregions: IS – Inland Slopes; Mu – Murrumbidgee and MF – Murray Fans

Table 5.13 Results for threatened fauna present species

Common name	Scientific name	Biodiversity risk weighting (BAM-C & TBDC*)	SAII entity** (BAM-C & TBDC)	Habitat constraints / microhabitats present on the subject land / vegetation zone	TBDC species specific recommendations e.g. buffers, general comments (where relevant)		Condition class	Extent (ha) of suitable habitat present in the subject land (flora or fauna with unit of measure of area)
					IBRA subregion[1]	Presence on subject land		
Pink-tailed Worm-lizard	*Aprasia parapulchella*	High (2)	No	Habitat constraint: must be within 50 m of rocky areas	IS	Assumed presence on unsurveyed lands	319_Thinned	0.62
Australian Bustard	*Ardeotis australis*	High (2)	No	Microhabitats present on subject land	MF	Assumed presence on unsurveyed lands	15_SVTM	0.68
							44_SVTM	9.53
							163_Moderate-good	0.37
							163_SVTM	0.49
					MU	Assumed presence on unsurveyed lands	28_SVTM	0.92
							46_SVTM	17.80
							157_Moderate-good	3.42
							157_SVTM	4.07
							160_SVTM	1.19
							163_Moderate-good	2.36
							163_SVTM	2.02
							164_SVTM	73.25
Bush Stone-curlew	*Burhinus grallarius*	High (2)	No	Microhabitats present on subject land: must be fallen / standing dead timber including logs	IS	Assumed presence on unsurveyed lands	76_Thinned	0.30
							266_Moderate-good	0.16
							266_Thinned	0.02
							277_Thinned	3.01
							277_Moderate-good	0.10
							343_Moderate-good	0.01
					MF	Recorded presence	7_Moderate-good	0.77
							10_Moderate-good	3.51
							10_Thinned	1.21
							13_Moderate-good	0.79
							13_Thinned	0.18
							216_Moderate-good	0.60
							237_Moderate-good	0.55

Common name	Scientific name	Biodiversity risk weighting (BAM-C & TBDC*)	SAII entity** (BAM-C & TBDC)	Habitat constraints / microhabitats present on the subject land / vegetation zone	TBDC species specific recommendations e.g. buffers, general comments (where relevant)		Condition class	Extent (ha) of suitable habitat present in the subject land (flora or fauna with unit of measure of area)
					IBRA subregion[1]	Presence on subject land		
						Assumed presence on unsurveyed lands	2_SVTM	0.12
							7_Moderate-good	1.11
							10_Moderate-good	1.39
							10_Thinned	9.98
							10_SVTM	1.14
							13_Moderate-good	14.31
							13_Thinned	4.91
							13_SVTM	12.88
							15_Moderate-good	3.27
							15_Thinned	1.14
							15_SVTM	1.58
					MU	Assumed presence on unsurveyed lands	15_Moderate-good	27.13
							15_Thinned	0.72
							15_SVTM	0.31
							20_Thinned	0.16
							23_Moderate-good	1.56
							23_Thinned	0.19
							26_Moderate-good	68.96
							26_Thinned	76.24
							26_SVTM	1.22
							28_Moderate-good	2.94
							28_Thinned	4.76
							28_SVTM	5.35
							58_Moderate-good	0.26
							58_Thinned	0.70
							70_SVTM	0.16
Gang-gang Cockatoo	*Callocephalon fimbriatum*	High (2)	No	Habitat constraint: must be hollow-bearing Eucalypt trees. Hollows are at least 3 m above the ground with a diameter of more than 7 cm	IS	Assumed presence on unsurveyed lands	277_Moderate-good	0.06

Common name	Scientific name	Biodiversity risk weighting (BAM-C & TBDC*)	SAII entity** (BAM-C & TBDC)	Habitat constraints / microhabitats present on the subject land / vegetation zone	TBDC species specific recommendations e.g. buffers, general comments (where relevant)		Condition class	Extent (ha) of suitable habitat present in the subject land (flora or fauna with unit of measure of area)
					IBRA subregion[1]	Presence on subject land		
White-bellied Sea-Eagle	*Haliaeetus leucogaster*	High (2)	No	Habitat constraint: must be living or dead mature trees within suitable vegetation, within 1 km of a river, lake, large dam or creek, wetland or coastline.	MF	Assumed presence on unsurveyed lands	2_SVTM 7_Moderate-good 10_Moderate-good 10_Thinned 10_SVTM 13_Moderate-good 13_Thinned 13_SVTM 15_SVTM	0.12 1.11 2.22 5.90 1.14 1.82 8.51 8.44 0.50
Black-breasted Buzzard	*Hamirostra melanosternon*	Moderate (1.5)	No	Habitat constraint being land within 40 m of riparian woodland on inland watercourses/waterholes containing dead or dying eucalypts	MF	Assumed presence on unsurveyed lands	10_Moderate-good 10_SVTM 13_Moderate-good 13_SVTM 15_SVTM	1.61 0.55 0.02 0.12 0.09
Grey Snake	*Hemiaspis damelii*	High (2)	No	Grey cracking clays	MF	Assumed presence on unsurveyed lands.	2_SVTM 7_Moderate-good 10_Moderate-good 10_Thinned 10_SVTM 11_Moderate-good 13_Moderate-Good 13_Thinned 13_SVTM 15_Moderate-good 15_Thinned 15_SVTM 17_Moderate-good 19_SVTM	0.02 1.00 2.94 3.72 0.29 0.13 26.81 11.96 7.43 5.68 0.97 0.35 0.13 0.54

Common name	Scientific name	Biodiversity risk weighting (BAM-C & TBDC*)	SAII entity** (BAM-C & TBDC)	Habitat constraints / microhabitats present on the subject land / vegetation zone	TBDC species specific recommendations e.g. buffers, general comments (where relevant)		Condition class	Extent (ha) of suitable habitat present in the subject land (flora or fauna with unit of measure of area)
					IBRA subregion[1]	Presence on subject land		
					MU		13_Moderate_good	1.51
							15_Moderate_good	29.22
							15_Thinned	0.54
							15_SVTM	0.33
							17_Moderate_good	12.49
							17_SVTM	2.38
							24_Moderate_good	6.59
							46_Moderate_good	39.35
							46_SVTM	19.07
							47_Moderate_good	0.17
							160_Moderate_good	15.32
							160_SVTM	1.37
Little Eagle	*Hieraaetus morphnoides*	Moderate (1.5)	No	Habitat constraint: must be nest trees which are live (occasionally dead) large old trees within vegetation	MF	Assumed presence on unsurveyed lands	2_SVTM	0.09
							7_Moderate-good	1.11
							10_Moderate-good	1.93
							10_Thinned	9.65
							10_SVTM	0.36
							13_Moderate-good	2.81
							13_Thinned	9.06
							13_SVTM	14.05
							15_SVTM	1.25
							19_SVTM	1.59
					MU		28_SVTM	0.92
Growling Grass Frog / Southern Bell Frog	*Litoria raniformis*	High (2)	No	Within 200 m of permanent water	MF	Recorded and Assumed presence on unsurveyed lands.	7_Moderate-good	0.82
							10_Moderate-good	0.75
							10_Thinned	0.01
							10_Derived	0.15
							11_Moderate-good	0.11
							13_Moderate-good	0.71
							13_Thinned	0.41
							13_Derived	0.19
							13_Planted Native	0.06
							13_SVTM	0.02

Common name	Scientific name	Biodiversity risk weighting (BAM-C & TBDC*)	SAII entity** (BAM-C & TBDC)	Habitat constraints / microhabitats present on the subject land / vegetation zone	TBDC species specific recommendations e.g. buffers, general comments (where relevant)		Condition class	Extent (ha) of suitable habitat present in the subject land (flora or fauna with unit of measure of area)
					IBRA subregion[1]	Presence on subject land		
							15_Moderate-good	1.38
							15_Thinned	0.08
							15_Derived	1.48
							44_SVTM	0.04
							160_Moderate-good	0.14
							163_Moderate-good	2.15
							237_Moderate-good	0.07
					MU		15_Moderate_good	0.33
							163_Moderate_good	1.32
							163_SVTM	0.03
Pink Cockatoo	*Lophochroa leadbeateri*	High (2)	No	Habitat constraint: must be hollow-bearing trees with hollows at least 10 cm diameter	MF	Assumed presence on unsurveyed lands	2_SVTM	0.12
							7_Moderate-good	1.11
							10_Moderate-good	2.22
							10_Thinned	9.65
							10_SVTM	1.39
							13_Moderate-good	2.85
							13_Thinned	9.07
							13_SVTM	14.10
							15_SVTM	1.58
							19_SVTM	1.59
					MU		15_Moderate-good	0.05
							28_SVTM	0.92
							45_SVTM	5.64
Square-tailed Kite	*Lophoictinia isura*	Moderate (1.5)	No	Habitat constraint being nest trees	MF	Assumed presence on unsurveyed lands	2_SVTM	0.12
							10_Moderate-good	2.22
							10_Thinned	7.66
							10_SVTM	1.28
							13_Moderate-good	2.89
							13_Thinned	9.07
							13_SVTM	14.10
							15_SVTM	1.58
					MU		28_SVTM	0.92

Common name	Scientific name	Biodiversity risk weighting (BAM-C & TBDC*)	SAII entity** (BAM-C & TBDC)	Habitat constraints / microhabitats present on the subject land / vegetation zone	TBDC species specific recommendations e.g. buffers, general comments (where relevant)		Condition class	Extent (ha) of suitable habitat present in the subject land (flora or fauna with unit of measure of area)
					IBRA subregion[1]	Presence on subject land		
Southern Myotis	*Myotis macropus*	High (2)	No	Habitat constraint: must be waterbodies with permanent pools of 3 m or wider, including rivers, large creeks, billabongs, lagoons, estuaries, dams and other waterbodies on or within 200 m of the habitat	MF	Assumed presence on unsurveyed lands.	2_SVTM	0.12
							7_Moderate-good	3.25
							10_Moderate-good	10.30
							10_Thinned	3.33
							10_Derived	2.02
							10_SVTM	1.14
							11_Moderate-good	0.02
							237_Moderate-good	0.55
Barking Owl	*Ninox connivens*	High (2)	No	Habitat constraint: must be a living or dead tree with a hollow equal to or greater than 20 cm in diameter, which is greater than 4 m from the ground	MF	Assumed presence on unsurveyed lands	2_SVTM	0.12
							7_Moderate-good	1.11
							10_Moderate-good	1.39
							10_Thinned	9.98
							10_SVTM	1.14
							13_Moderate-good	14.31
							13_Thinned	4.91
							13_SVTM	12.88
							15_Moderate-good	3.27
							15_Thinned	1.14
							15_SVTM	1.58
					MU		15_Moderate_good	27.13
							15_Thinned	0.72
							15_SVTM	0.31
							70_SVTM	0.16

Common name	Scientific name	Biodiversity risk weighting (BAM-C & TBDC*)	SAII entity** (BAM-C & TBDC)	Habitat constraints / microhabitats present on the subject land / vegetation zone	TBDC species specific recommendations e.g. buffers, general comments (where relevant)		Condition class	Extent (ha) of suitable habitat present in the subject land (flora or fauna with unit of measure of area)
					IBRA subregion[1]	Presence on subject land		
Plains-wanderer	*Pedionomus torquatus*	Very High (3)	Yes	Habitat is as per Important Habitat map	MU	Assumed presence on important habitat mapped areas.	26_Derived	0.25
							44_SVTM	0.01
							46_Moderate-good	0.69
							163_SVTM	0.02
							164_Moderate_good	0.10
							164_SVTM	0.01
							216_Moderate-good	0.11
Squirrel Glider	*Petaurus norfolcensis – endangered population*	High (2)	No	Habitat constraint: there is the geographic limitation of Wagga Wagga LGA.	IS	Assumed presence based on Species Expert	76_Thinned	0.28
							266_Moderate-good	0.07
							266_Thinned	0.01
							277_Thinned	0.11
							277_Moderate-good	0.10
							277_Derived_LCV	0.06
							319_Thinned	0.25
							319_Derived_LCV	0.04
Koala	*Phascolarctos cinereus*	High (2)	No	Habitat constraint: presence of koala use and feed trees	IS	Assumed presence on unsurveyed lands.	76_Thinned	0.30
							266_Moderate-good	0.16
							266_Thinned	0.02
							277_Thinned	3.01
							277_Moderate-good	0.19
							319_Thinned	0.83
							343_Moderate-good	0.01
					MF		2_SVTM	0.12
							7_Moderate-good	4.67
							10_Moderate-good	13.47
							10_Thinned	12.66
							10_SVTM	1.39
							11_Moderate-good	0.48
							13_Moderate-good	58.66
							13_Thinned	21.96
							13_SVTM	14.35
							15_Moderate-good	12.44
							15_Thinned	2.63
							15_SVTM	1.58
							237_Moderate-good	0.84

Common name	Scientific name	Biodiversity risk weighting (BAM-C & TBDC*)	SAII entity** (BAM-C & TBDC)	Habitat constraints / microhabitats present on the subject land / vegetation zone	TBDC species specific recommendations e.g. buffers, general comments (where relevant)		Condition class	Extent (ha) of suitable habitat present in the subject land (flora or fauna with unit of measure of area)
					IBRA subregion[1]	Presence on subject land		
Superb Parrot	*Polytelis swainsonii*	High (2)	No	Habitat constraint: must be living or dead E. blakelyi, E. melliodora, E. albens, E. camaldulensis, E. microcarpa, E. polyanthemos, E. mannifera, E. intertexta, E. bridgesiana with hollows greater than 5 cm diameter that are greater than 4 m above ground or trees with a DBH of greater than 30 cm	IS	Assumed presence on unsurveyed lands	76_Thinned	0.30
							266_Moderate-good	0.16
							266_Thinned	0.02
							277_Thinned	3.01
							277_Moderate-good	0.19
							343_Moderate-good	0.01
					MF		7_Moderate-good	1.11
							10_Moderate-good	2.22
							10_Thinned	9.65
							PCT 13_Moderate-good	2.91
							PCT 13_Planted Native Vegetation	0.20
							PCT 13_Thinned	9.11
					MU		28_SVTM	0.92
Masked Owl	*Tyto novaehollandiae*	High (2)	No	Habitat constraint: must be a living or dead tree with a hollow greater than 20 cm diameter that occurs greater than 4 m above the ground	MF	Assumed presence on unsurveyed lands	7_Moderate-good	1.11
							10_Moderate-good	1.39
							10_Thinned	9.98
							10_SVTM	1.04
							13_Moderate-good	14.3
							13_Thinned	14.91
							13_SVTM	12.88
					MU		26_Moderate-good	6.09
							26_Thinned	1.11
							70_SVTM	0.16

(1) IBRA subregions: IS – Inland Slopes; Mu – Murrumbidgee and MF – Murray Fans

* There may be occasions when the TBDC has been updated with new listings or new information for a listed species that is not yet reflected in BAM-C. At all times, the data in the BAM-C is to be used in an assessment and is considered correct; however, the TBDC could provide more up to date data/information that should be considered as part of the assessment.

** A list of SAII entities is also available on the department's website.

5.6 Listed aquatic threatened species

A database search of the subject land was conducted in January 2025 using the EPBC Act (Cth) protective matters search tool (DCCEEW, 2025) and the Fisheries Spatial Data Portal (DPI, 2025).

The search identified that a total of six threatened fish species listed under the EPBC Act (Cth) may occur in the subject land. One species (Flathead Galaxias) is listed as critically endangered, four species (Silver Perch, Murray Hardyhead, Trout Cod and Macquarie Perch) are listed as endangered, and one species (Murray Cod) is listed as vulnerable under the EPBC Act (Cth).

Five of the six EPBC (Cth) listed species are also listed under the FM Act (NSW) with two (Flathead Galaxias and Murray Hardyhead) being critically endangered, two (Murray Cod and Macquarie Perch) being endangered and one (Silver Perch) being vulnerable. One crustacean (Murray Spiney Crayfish) is listed as vulnerable under the FM Act (NSW) and has the potential to occur within the subject land.

A total of 22 named watercourses within the subject land for the NSW/Victorian border to the Dinawan substation component are mapped as Key Fish Habitat or are within the indicative distribution of a threatened aquatic species (see Table 5.14).

Table 5.14 Named watercourses crossed by the subject land

Watercourse name	Strahler order	Mapped Key Fish Habitat	Indicative distribution of threatened species	Number of times the watercourse crosses through the project footprint	Project feature
Berambong Creek	10	Yes	Silver Perch and Murray Hardyhead	1	Project transmission line corridor
Bullockhide Creek	10	Yes	Murray Hardyhead	1	Project transmission line corridor
Carroonboon Creek	1, 2 and 3	Yes (Strahler order 3 only)	Murray Hardyhead	3	Project transmission line corridor, including 3 watercourse crossings (2 existing, 1 new)
Coleambally Outfall Drain	9	Yes	Silver Perch and Murray Hardyhead	1	Project transmission line corridor, 1 watercourse crossing (existing)
Cunninyeuk Creek	3	Yes	Murray Hardyhead, Silver Perch and Flathead Galaxias	1	Project transmission line corridor, including 1 break and winch site within buffer
Deadmans Creek	10	No	Murray Hardyhead	1	Project transmission line corridor, including watercourse crossings (1 existing, 1 new)
Delta Creek	1 and 2	No	Silver Perch and Flathead Galaxias	5	Project transmission line corridor, including 5 watercourse crossings

Watercourse name	Strahler order	Mapped Key Fish Habitat	Indicative distribution of threatened species	Number of times the watercourse crosses through the project footprint	Project feature
Edward River	10	Yes	Murray Hardyhead, Silver Perch and Flathead Galaxias	1	Project transmission line corridor
Jaffrey Creek	10	Yes	Silver Perch, Murray Spiney Crayfish and Flathead Galaxias	1	Project transmission line corridor, including 1 watercourse crossing (existing)
Larrys Creek	10	Yes	Murray Hardyhead	2	Project transmission line corridor, including 2 watercourse crossings (existing)
Magpie Creek	2	Yes	Murray Hardyhead	2	Project transmission line corridor, including 2 watercourse crossing (1 new, 1 existing) and break and winch site within buffer
Mallan Branch Canal	0[1]	No	Murray Hardyhead	3	Project transmission line corridor
Merran Creek	10	Yes	Murray Hardyhead	1	Project transmission line corridor, including 1 watercourse crossing (existing) and 500 kV transmission line structure pad within buffer
Moore Creek	1	No	Murray Hardyhead	1	Project transmission line corridor, including 1 watercourse crossing (existing)
Murray River	10	Yes	Silver Perch, Murray Spiney Crayfish and Flathead Galaxias	1	Project transmission line corridor
Niemur River	10	Yes	Silver Perch, Murray Spiney Crayfish and Flathead Galaxias	1	Project transmission line corridor
Northern Branch Canal	0[1]	No	Murray Hardyhead	1	Project transmission line corridor

Watercourse name	Strahler order	Mapped Key Fish Habitat	Indicative distribution of threatened species	Number of times the watercourse crosses through the project footprint	Project feature
Southern No 26 Channel	0[1]	No	Murray Hardyhead	1	Project transmission line corridor, including 1 watercourse crossing (new)
Southern No 26 (A) Channel	0[1]	Yes	Murray Hardyhead	2	Project transmission line corridor
Wakool River	10	Yes	Murray Hardyhead, Silver Perch, Murray Spiney Crayfish and Flathead Galaxias	1	Project transmission line corridor
Wyam Creek	10	Yes	Murray Hardyhead Silver Perch, Murray Spiney Crayfish and Flathead Galaxias	1	Project transmission line corridor, including 1 watercourse crossing (existing)
Yarrein Creek	10	Yes	Murray Hardyhead Silver Perch, and Flathead Galaxias	1	Project transmission line corridor

(1) Watercourses assigned the Strahler Order "0" were assessed as being an independent watercourse that does not flow into a larger hydrological system. These watercourses are typically man-made for agricultural and social uses.

The likelihood of occurrence assessment completed for the above species determined that the Silver Perch and Murray Cod had a 'high' likelihood of occurrence, while the Murray Hardyhead, Flathead Galaxias, Murray Spiney Crayfish and Trout Cod had a 'moderate' likelihood of occurrence (see Appendix M). Macquarie Perch was also assessed for likelihood of occurrence, However, was deemed to have a low likelihood of occurrence based on the subject land being outside the known range.

It is anticipated that the likelihood of impacts to these species would be minimised direct impacts to the watercourses which contain mapped species habitat. The proposed mitigation and management measures outlined in (Appendix M) have been recommended to manage impacts to fish habitat and help prevent any direct or indirect impacts to these watercourses and their habitats. It is considered unlikely that temporary impacts associated with the construction of the project would result in any long-term degradation of mapped key fish habitat areas. The use of existing watercourse crossings for construction and operation would be prioritised to further avoid or minimise impacts. In the event additional watercourse crossings are required for the project, all watercourse crossing would be designed and installed in accordance with relevant NSW Guidelines as listed in *Technical Paper 9 – Hydrology, flooding and water quality impact assessment* (WSP, 2025), including:

- NSW Water Quality and River Flow Objectives (Office of Environment and Heritage, 2006)
- *Controlled activities – Guidelines for riparian corridors on waterfront land* (DPE, 2022)
- *Controlled activities – Guidelines for watercourse crossings on waterfront land* (DPE 2002)
- *Managing Urban Stormwater – Soils Construction* (Landcom, 2004)
- *Why do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings* (DPI, 2003)
- *Policy and Guidelines for Fish Habitat Conservation and Management* (Update 2013) (DPI, 2013).

As a result, the risk of impacts on aquatic threatened species is considered minor.

With the implementation of mitigation measures included in Table 8.1 of Technical Paper 9 (WSP, 2025), there would be limited residual water quality risk to watercourses as a result of any watercourse crossings used during construction and operation of the project. The highest risk of impact to aquatic species results from the construction and upgrading of access roads as this could result in direct impacts to aquatic habitats from spills, sedimentation, riparian vegetation removal and if required, instream works.

It is noted that various unnamed drainage lines and wetland areas would also be impacted by construction of access roads. The area surrounding Dillons Swamp appears to have favourable habitat for various species of fish, specifically for breeding and juvenile rearing, as it provides ample food supply and protection from larger fish species (refer to Appendix M). Pre-construction surveys would be carried out for any watercourse connected to Dillons Swamp, identified as being Key Fish Habitat and/or indicative distribution for threatened species that would be directly impacted by project infrastructure. These aim to determine:

- the Type and Class of watercourses in accordance with *Policy and guidelines for fish habitat conservation and management (Update 2013)* (DPI, 2013)
- the presence/absence or likelihood of threated aquatic species occurring
- determine any additional mitigation measures e.g. timing of works
- recommendations as to micro-siting and design in order to minimise potential impacts to threatened aquatic species.

A specific mitigation measures such as the use of rig matting or amphibious heavy equipment during construction.

5.6.1 Listed aquatic endangered ecological communities

There are three endangered ecological communities (EEC) listed in Schedule 4 Part 3 of the FM Act. Of these EEC, one overlaps with the entire subject land, which is the Aquatic Ecological Community in the Natural Drainage System of the Lower Murray River Catchment (Lower Murray River Catchment EEC).

The Lower Murray River Catchment EEC spans a large area and includes all native fish and aquatic invertebrates within all natural creeks, rivers and associated lagoons, billabongs and lakes of the regulated portions of the Murray, Murrumbidgee and Tumut rivers, as well as all their tributaries and branches (Fisheries Scientific Committee, N.D).
A list of watercourses containing the EEC include:

- Murray River downstream of Hume Weir
- Murrumbidgee River downstream of Burrinjuck Dam
- Tumut River downstream of Blowering Dam and all their tributaries' anabranches and effluents including Billabong Creek, Yanco Creek, Colombo Creek, and their tributaries
- Edward River and the Wakool River and their tributaries, anabranches and effluents
- Frenchmans Creek
- Rufus River and Lake Victoria.

6 Matters of National Environmental Significance

This section describes Matters of National Environmental Significance (MNES) relating to Commonwealth legislation under the EPBC Act. Further details of MNES matters are available in Appendix C.

6.1 Introduction

A number of Commonwealth listed threatened entities and protected matters have been identified as being subject to impact by the proposed project. Following a background search to identify the threatened species potentially occurring within the subject land (section 2.3.1), a search of EPBC listed protected matters was further undertaken to identify other matters of national environmental significance which may be impacted. Table 6.1 identifies the MNES likely to occur within a 10 kilometre radius of the subject land based on the EPBC protected matters tool search (PMST) completed in May 2025, relevant to this assessment.

Table 6.1 Matters of national environmental significance relevant to this assessment

Matter of National Environmental Significance	Summary of PMST results
World Heritage properties (s12 &s15A)	None
National heritage places (s158 & s15C)	None
Wetlands of international importance (RAMSAR) (s16 & s17B)	Hattah-Kulkyne Lakes Riverland The Coorang, and Lakes Alexandrina and Albert wetland Kerang Wetlands Banrock Station wetland complex NSW Central Murray State Forests
Migratory species (s20 &s20A)	15
Commonwealth marine environment (s23 & s24A)	None
Great Barrier Reef Marine Park	None
Threatened species and ecological communities	Seven listed ecological communities 61 listed threatened species

On 4 September 2024, the Commonwealth DCCEEW decided that the project is a controlled action under section 75 of the EPBC Act due to the impact on listed threatened species and communities under sections 18 and 18A of the EPBC Act (EPBC 2020/8673). This decision identified that the project is likely to have a significant impact to:

- Natural Grasslands of the Murray Valley Plains – Critically Endangered
- Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains – Critically Endangered
- Weeping Myall Woodlands – Endangered
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland – Critically Endangered.

The decision also stated that there is some risk of significant impact to the following matters and that the assessment is to determine if the following communities and species are present and if so, the extent to which they may be impacted by the project:

- Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions – Endangered
- Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia – Endangered
- Plains mallee box woodlands of the Murray Darling Depression, Riverina and Naracoorte Coastal Plain Bioregions – Critically Endangered
- *Austrostipa metatoris* (a perennial spear grass) – Vulnerable
- Blue-winged Parrot (*Neophema chrysostoma*) – Vulnerable
- Chariot Wheels (*Maireana cheelii*) – Vulnerable
- Diamond Firetail (*Stagonopleura guttata*) – Vulnerable
- Grey Snake (*Hemiaspis damelii*) – Endangered
- Grey-headed Flying Fox (*Pteropus poliocephalus*) – Vulnerable
- Major Mitchell's Cockatoo (*Lophochroa leadbeateri leadbeateri*) – Endangered
- Painted Honeyeater (*Stagonopleura guttata*) – Vulnerable
- Pink Tailed Worm Lizard (*Aprasia parapulchella*) – Vulnerable
- Plains-wanderer (*Pedionomus torquatus*) – Critically Endangered
- Red Darling-pea (*Swainsona plagiotropis*) – Vulnerable
- Slender Darling-pea (*Swainsona murrayana*) – Vulnerable
- Southern Bell Frog (*Litoria raniformis*) – Vulnerable
- Superb Parrot (*Polytelis swainsonii*) – Vulnerable
- Winged Pepper-cress (*Lepidium monoplocoides*) – Endangered.

The Commonwealth DCCEEW also determined that under section 87 of the EPBC Act that the project would be subject to the Assessment Bilateral Agreement between the Commonwealth of Australia and the State of NSW (dated 26 February 2015 and amended on 24 March 2020 (entered into pursuant to section 45 of the EPBC Act)). In accordance with the requirements of the Assessment Bilateral Agreement, the Commonwealth's assessment requirements were included in Appendix A of the SEARs issued for the project. These requirements have been addressed as part of this BDAR.

The remaining MNES were not identified as relevant controlling provisions and therefore are not considered further in this assessment. For those species that are listed as both threatened and migratory under the EPBC Act, they have only been considered in regard to their threatened species listing status.

A summary of the relevant listed threatened species and ecological communities relevant to this project is provided below. Avoidance and minimisation measures taken for the project are outlined in Chapter 8. The residual adverse impacts likely to occur to EPBC Act listed threatened flora and fauna species after avoidance and mitigation have been calculated in accordance with the BAM (in the form of biodiversity credits) and are presented in section 9.1.1.

6.2 Threatened species and ecological communities

6.2.1 EPBC listed threatened ecological communities

Based on database searches and detailed vegetation surveys, a total of seven candidate threatened ecological communities listed under the EPBC Act were considered to possibly occur within the subject land. These are:

- Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions - Endangered
- Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia – Endangered
- Natural Grasslands of the Murray Valley Plains – Critically Endangered
- Plains mallee box woodlands of the Murray Darling Depression, Riverina and Naracoorte Coastal Plain Bioregions – Critically Endangered
- Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains – Critically Endangered
- Weeping Myall Woodlands – Endangered
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland – Critically Endangered.

Vegetation associated with each candidate threatened ecological community (TEC) has been assessed to determine the presence, extent and location of the community and is provided in (section 6.2.1.1 – section 6.2.1.7). Table 6.2 outlines associated vegetation and impact to each TEC with the location and extent shown on Figure 15.9.

Table 6.2 TECs listed under the EPBC Act within the subject land

TEC name	Profile ID (from TBDC)	EPBC Act status	IBRA subregion	Associated vegetation zones within the subject land	Area within subject land (ha)
Buloke woodlands of the Riverina and Murray Darling Depression bioregions	20397	Endangered	Murrumbidgee	PCT 20_Thinned	0.16
				PCT 20_Derived	2.11
				PCT 20_Derived – low conservation value	1.23
Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	20395	Endangered	Murray Fans	PCT 237_Moderate-good	0.84
Natural Grasslands of the Murray Valley Plains	20371	Critically Endangered	Murrumbidgee	PCT 44_Moderate-good	14.77
				PCT 44_SVTM	18.96
				PCT 45_Moderate-good	3.58
				PCT 45_SVTM	5.96
				PCT 46_Moderate-good	39.35
				PCT 46_SVTM	19.07

TEC name	Profile ID (from TBDC)	EPBC Act status	IBRA subregion	Associated vegetation zones within the subject land	Area within subject land (ha)
Plains mallee box woodlands of the Murray Darling Depression, Riverina and Naracoorte Coastal Plain Bioregions	20411	Critically Endangered	Vegetation within the subject land does not meet listing criteria – no impact to this TEC would occur.		
Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains	20372	Critically Endangered	Murrumbidgee	PCT 47_Moderate-good	0.17
Weeping Myall Woodlands	20415	Endangered	Murrumbidgee	PCT 26_Moderate-good	91.32
				PCT 26_SVTM	1.33
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	20392	Critically Endangered	Inland Slopes	PCT 266_Moderate-good	0.16
				PCT 266_Thinned	0.02
				PCT 277_Moderate-good	0.19
				PCT 277_Thinned	3.01

6.2.1.1 Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions - Endangered

Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions (hereafter referred to as Buloke Woodlands) is listed Endangered under the EPBC Act.

Buloke Woodlands is an ecological community where Buloke (*Allocasuarina luehmannii*) is usually the dominant or co-dominant tree. This community occurs from north-western and northern central Victoria into south central New South Wales within the in the Riverina and Murray-Darling Depression bioregions.

Within the subject land, one vegetation type, PCT 20 – Buloke - Moonah - Black Box open woodland on sandy rises of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion), was considered likely to associate with Buloke Woodlands TEC.

A summary of relevant Commonwealth guidelines and policy statements available for this TEC is as follows:

- *Conservation Advice for the Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions*. (DCCEEW, 2023) In effect under the EPBC Act from 31 August 2023.
- *Commonwealth Listing Advice on Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions*. (Endangered species Scientific Subcommittee, 2000). In effect under the EPBC Act from 16-July-2000
- *National recovery plan for the Buloke Woodlands of the Riverina and Murray Darling Depression Bioregions*. (Department of Sustainability and Environment 2011). In effect under the EPBC Act from 12-Feb-2012.

A comparison of the listing advice for Buloke Woodlands threatened ecological community and candidate PCT is provided in Table 6.3. Each criterion of the listing advice including locality, species composition, characteristic species and resilience is compared to each condition class for the candidate PCT to determine if vegetation recorded is consistent with the listing criteria. Within the subject land, PCT 20 was recorded to occur in Thinned, Derived and Derived - low conservation value condition states.

A summary of Buloke Woodlands threatened ecological community, associated PCT and extent within the disturbance area for each IBRA subregion is summarized in Table 6.4. The location of Buloke Woodlands threatened ecological community in relation to the subject land is provided in Figure 15.9.

Table 6.3 Assessment of EPBC Act – listed Buloke Woodlands and associated PCT

Key diagnostic characteristics	PCT 20
Occur within the Riverina and/or Murray-Darling Depression IBRA bioregions?	Meets criteria. Vegetation associated with PCT 20 occurs within the Riverina IBRA bioregion.
Structure is typically open woodland to woodland but can be a forest (including high stem density), particularly temporarily following disturbance. Following disturbance, *A. luehmannii* and other trees can be sparse or disappear, and the ecological community may develop as a low shrubland or grassland. In these instances, evidence for the occurrence of the ecological community may include the presence of dead *A. luehmannii* trees or stumps or previous records of *A. luehmannii* trees in the landscape; or that, or other characteristic species were present.	Meets criteria. Vegetation associated with PCT 20 generally occurs as an open woodland with evidence of historic clearing reducing patches of vegetation to low shrubland or grassland.
Typically has a canopy of trees dominated by *Allocasuarina luehmannii* (Buloke or Bull Oak), and sometimes other tree species are prominent such as *Callitris gracilis* (Slender Cypress Pine), *Callitris glaucophylla* (White/Murray pine), *Eucalyptus largiflorens* (Black Box), *E. leucoxylon* subsp. *pruinosa* (Yellow/Blue Gum) and *E. microcarpa* (Grey Box).	Meets criteria. Individuals of *Allocasuarina luehmannii, Callitris gracilis* and *Callitris glaucophylla* recorded. Due to historic clearing of vegetation, *A. luehmanii* cover has been reduced and sections of this PCT occur as a derived grassland.
Contain any of the following native species: for grasses – *Austrostipa* spp., *Rytidosperma* spp. and other grasses including *Anthosachne scabra* (syn. *Elymus scaber*) and *Chloris truncata.* for subshrubs – *Brachyscome lineariloba* (hard-headed daisy), *Calandrinia eremaea* (small purslane), *Calocephalus citreus* (lemon beauty-heads), *Calotis hispidula* (bogan flea, bindy eye), *Convolvulus remotus* (grassy bindweed), *Crassula colorata* (dense crassula), *Crassula sieberiana* (Australian stonecrop), *Daucus glochidiatus* (wild carrot), *Einadia nutans* (nodding saltbush), *Enchylaena tomentosa* (ruby saltbush), *Eutaxia microphylla* (common eutaxia), *Senecio pinnatifolius* (variable groundsel), *Sida corrugata* (variable sida), *Maireana enchylaenoides* (wingless bluebush), *Oxalis perennans, Ptilotus nobilis* subsp. *semilanatus* (syn. *Ptilotus exaltatus* var. *semilanatus*), *Sida corrugata* (corrugated sida), *Sclerolaena diacantha* (grey copperburr), *Swainsona procumbens* (Darling pea), *Vittadinia* spp. (New Holland daisies) and *Wahlenbergia luteola*.	Meets criteria. For grasses – *Austrostipa scabra* subsp. *scabra* and *Chloris truncata* For subshrubs – *Enchylaena tomentosa, Sclerolaena diacantha, Crassula sieberiana, Einadia nutans* subsp. *nutans,* and *Oxalis perennans*.

Key diagnostic characteristics	PCT 20
There is no condition threshold described for this community in the determination. Vegetation with abundant weeds, but with the characteristic trees also present, should be considered as part of the ecological community amenable to rehabilitation.	Any vegetation in which characteristic native species dominate any structural layer present is considered to constitute the community.
Outcome	**Meets key characteristics – forms part of the ecological community**

Table 6.4 Summary of Buloke Woodland within the subject land

Threatened ecological community	Vegetation type	IBRA subregion	Veg zone name (BAM-C)	Impact (ha)
Buloke woodlands of the Riverina and Murray Darling Depression bioregions	PCT 20 – Buloke - Moonah - Black Box open woodland on sandy rises of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Murrumbidgee	VZ #6 Thinned	0.16
			VZ #12 Derived	2.11
			VZ #12 Derived – low conservation value	1.23
Total				**3.50**

6.2.1.2 Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia – Endangered

Grey Box (*Eucalyptus microcarpa*) grassy woodlands and derived native grasslands of south-eastern Australia (hereafter Grey Box woodlands) is described in the EPBC Listing Advice as a woodland to open forest with a mid-high to tall, up to 25 metres, canopy of predominately eucalypts. The tree canopy of this TEC is usually dominated by Grey Box (*Eucalyptus microcarpa*). Widespread tree associations include Buloke (*Allocasuarina luehmannii*), Kurrajong (*Brachychiton populneus*), White Cypress Pine (*Callitris glaucophylla*), White Box (*Eucalyptus albens*), River Red Gum (*E. camaldulensis*), Fuzzy Box (*E. conica*), Yellow Gum (*E. leucoxylon*), Yellow Box (*E. melliodora*) and Bimble Box (*E. populnea*). A moderately dense to sparse shrub-layer and species-rich ground layer of grasses and herbs comprise the understorey. Widespread shrubs include species of *Acacia*, *Bursaria*, *Cassinia*, *Dodonaea*, *Eremophila* and *Maireana.* Common grasses include Wallaby Grasses (*Rytidosperma*), Spear Grasses (*Austrostipa*), Wheatgrass (*Elymus*), Windmill Grasses (*Enteropogon*), Flax-lilies (*Dianella*) and Mat-rushes (*Lomandra*). More common compared to other temperate grassy woodlands are chenopod species, including Saloop (*Einadia hastata*), Nodding Saltbush (*E. nutans subsp. nutans*), Ruby Saltbush (E*nchylaena tomentosa*), Wingless Bluebush (*Maireana enchylaenoides*) and Grey Copperbur (*Sclerolaena diacantha*). Patches of derived grassland are included within this ecological community, where the native groundlayer is still largely intact and a tree canopy of Grey Box was known to have been removed. Evidence of former canopy or mid layer may include tree stumps or fallen logs, nearby native remnant vegetation types, historic records and images, and pre-European vegetation modelling.

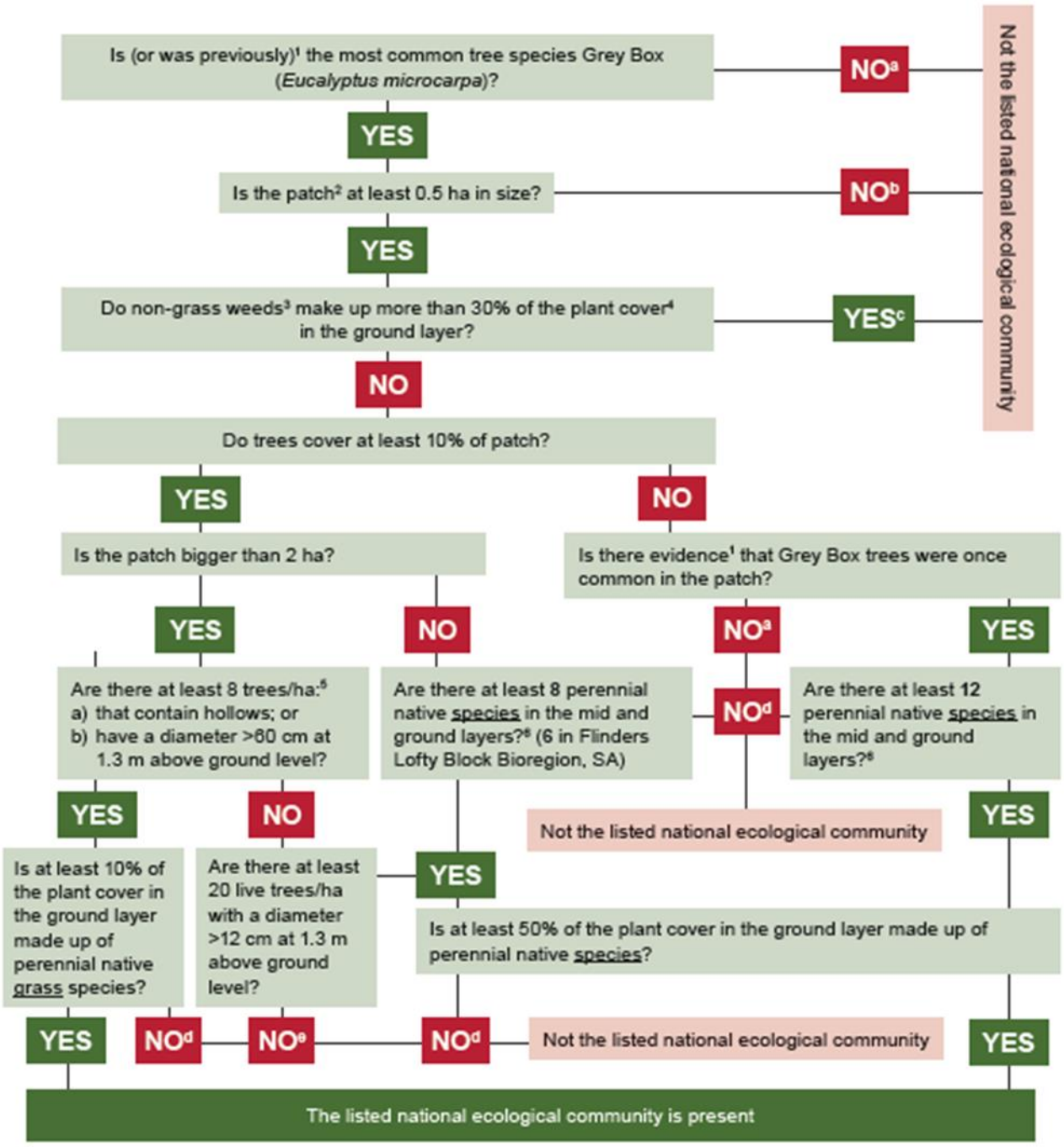
The community predominantly occurs on the drier edge of the temperate grassy eucalypt woodland belt, which was formerly a widespread area on the lower slopes and plains of mainland eastern Australia, and ranges from central NSW through northern and central Victoria into South Australia. Typically occurring in low-relief landscapes on alluvial or colluvial productive soils, occupying drier sites of the belt, with a mean average rainfall of 375 to 700 millimetres annually. South of the Great Dividing Range in Victoria, around Melton and Sunbury to the west of Melbourne, are disjunct patches, as well as areas to the west of the Murray River coastal plain in South Australia, around the Flinders and Mount Lofty Ranges near Adelaide.

This ecological community occupies a complex position within the landscape. Within NSW it can be transitional between the temperate lower slopes and tablelands occupied by, e.g. the EPBC Act-listed White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland ecological community, and the semi-arid floodplain communities.

Within the subject land two vegetation types were identified as being likely associated with this threatened ecological community being, PCT 76 – Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions and PCT 237 - Riverine Western Grey Box grassy woodland of the semi-arid (warm) climate zone.

For a vegetation patch to meet the threatened ecological listing of Grey Box (*Eucalyptus microcarpa*) grassy woodlands and derived native grasslands of south-eastern Australia it must meet specific EPBC listing advice key characteristics and condition threshold criteria as outlined in Figure 6.1. An assessment of this key diagnostic characteristics and condition threshold criteria against recorded plot data is presented in Table 6.5.

A summary of Grey Box woodlands threatened ecological community, associated PCT and extent within the indicative disturbance area for each IBRA subregion is presented in Table 6.6.



1 Evidence that Grey Box was originally present might include stumps, historical records or presence in nearby vegetation.
2 When considering a patch it is important to note that a patch may extend beyond a property or development site boundary. For the purposes of determining whether or not a patch meets the minimum patch size of the condition thresholds for the ecological community, the entire patch should be considered, not just the area occurring on a property or development site.
3 A weed is defined here as a plant species that is not native to Australia and the species has established viable self-sustaining populations in a region.
4 Plant cover excludes mosses and lichens. Patches of bare ground or leaf litter are also not included.
5 Dead trees are included if present, up to 50% of the total tree count.
6 Relevant growth-forms to include are: grasses, other graminoids, forbs and shrubs less than 4 metres tall. Shrubs that are 4 metres or more in height and non-vascular plants (mosses and lichens) are not included.

Figure 6.1 Listing advice key characteristics and condition thresholds for Grey Box (*Eucalyptus microcarpa)* grassy woodlands and derived native grasslands of south-eastern Australia

Table 6.5 Assessment against Grey Box (*Eucalyptus microcarpa*) grassy woodlands and derived native grasslands of south-eastern Australia EPBC Act listing advice criteria

Key diagnostic characteristics and condition threshold	**PCT 76 - Thinned**	**PCT 237 – Moderate-good**	
	VNI_DR112	**VNI_DR47**	**NM034**
The ecological community occurs on low slopes and plains from central NSW, through northern and central Victoria into South Australia.	Yes This PCT was recorded to occur in the NSW South Western Slopes IBRA Bioregion (Inland Slopes subregion).	Yes This PCT was recorded to occur in the NSW Riverina IBRA Bioregion (Murray Fans subregion).	Yes This PCT was recorded to occur in the NSW Riverina IBRA Bioregion (Murray Fans subregion).
The tree canopy is dominated (greater than 50 per cent canopy crown cover) by *Eucalyptus microcarpa* (Grey Box). Other tree species may be present in the canopy and, in certain circumstances may be co-dominate with Grey Box but are never dominant on their own. These associated species are listed in Appendix A of the listing advice.	Yes Whilst the canopy cover is sparse (5%), Eucalyptus macrocarpa accounted for 100% of the canopy.	Yes *Eucalyptus microcarpa* accounted for 70 per cent canopy cover.	Yes *Eucalyptus microcarpa* accounted for 95 per cent canopy cover.
Broad criteria 1a. The minimum patch size is 0.5 ha. AND 1b. The canopy layer contains Grey Box (*Eucalyptus microcarpa)* as the dominant or co-dominant tree species. AND 1c. The vegetative cover of non-grass weed species in the ground layer is less than 30 per cent at any time of the year AND Meets criteria in either section 2., 3., 4. or 5. (see below)	1a. Meets criteria. The BAM plot was undertaken in a patch <0.5 ha in size, however the same vegetation occurs to the north along the road verge with a patch size >0.5 ha (roughly 2.0 ha). 1b. Meets criteria. *Eucalyptus microcarpa* is the dominant tree species recorded. 1c. Does not meet criteria with >30 per cent vegetative cover of non-grass weed species in the ground layer (cover recorded at 46.6 per cent).	1a. Meets criteria with patch size >0.5 ha (patch size roughly 3.8 ha). 1b. Meets criteria. *Eucalyptus microcarpa* is the dominant tree species recorded. 1c. Meets criteria with <30 per cent vegetative cover of non-grass weed species in the ground layer (cover recorded at 3.3 per cent of total ground cover).	1a. Meets criteria with patch size >0.5 ha (patch size roughly 1.0 ha). 1b. Meets criteria. *Eucalyptus microcarpa* is the dominant tree species recorded. 1c. Meets criteria with <30 per cent vegetative cover of non-grass weed species in the ground layer (cover recorded at 0 per cent of total ground cover).

Key diagnostic characteristics and condition threshold	PCT 76 - Thinned	PCT 237 – Moderate-good	
	VNI_DR112	VNI_DR47	NM034
Smaller woodland patches – 0.5 to <2 ha in area with tree crown cover >10 per cent 2a. At least 50 per cent of the vegetative cover in the ground layer comprises perennial native species at any time of the year AND 2b. 8 or more perennial native species are present in the mid and ground layers at any time of the year.	Patch size is >2 ha.	Patch size is >2 ha.	2a. Meets criteria. >50 per cent vegetative cover in the ground layer comprises perennial native species. (Cover recorded at 87 per cent). 2b. Meets criteria. >8 perennial native species are present in the mid and ground layer. (Recorded 12 perennial native species present).
Larger woodland patches – 2 ha or more in area 3a. At least 8 trees/ha are hollow bearing or have a diameter at breast height of 60 cm or more AND 3b. at least 10 per cent of the vegetative ground cover comprises perennial native grasses at any time of the year. OR 4a. At least 20 trees/ha have a diameter at breast height of 12 cm or more. AND 4b. at least 50 per cent of vegetative cover in the ground layer comprises perennial native species	The area of PCT 76 subject to impact has a patch size of approximately 2 ha and occurs in close proximity to BAM VI plot VNI_DR112 which is considered to be representative of this vegetation type and has been assessed further. 3a. Does not meet criteria. No hollow bearing trees were recorded. Only 4 trees were recorded with a diameter >50 cm. 3b. Meets criteria. >10% of the vegetative ground cover comprises perennial native grasses (recorded at 25.2%). OR 4a. Meet criteria. Aerial imagery and further field verification confirms mature tree density to be greater than 20 trees/ha. 4b. Does not meet criteria. <50% of the vegetative ground cover comprises perennial native species (recorded at 25.7%).	3a. Meets criteria. Plot contains 3 hollow bearing trees which averages 30 hollow bearing trees per hectare. Plot contains 3 trees with a breast height >60 cm. 3b. Does not meet criteria. Plot recorded in May. Perennial native grass cover comprises 4.9 per cent of total vegetative ground cover. 4a. Meets criteria. Plot contains 4 trees with diameter >12 cm at breast height. This averages to 40 trees/ha. 4b. Meets criteria. 89.3 per cent of vegetative cover in the ground layer comprises of perennial native species.	Patch size is <2 ha.

Key diagnostic characteristics and condition threshold	PCT 76 - Thinned	PCT 237 – Moderate-good	
	VNI_DR112	VNI_DR47	NM034
Derived native grasslands – the canopy is less developed or absent (at least 0.5 ha in area) 5a. Woodland density does not meet criteria 3a or 4a or is derived grassland with clear evidence that the site formerly was a woodland with a tree canopy dominated or co-dominated by *E. microcarpa.* AND 5b. At least 50 per cent of the vegetative cover in the ground layer is made up of perennial native species at any time of the year. AND 5c. 12 or more native species are present in the ground layer at any time of the year	Is not a derived native grassland.	Is not a derived native grassland.	Is not a derived native grassland.
Outcome	**Does not meet listing criteria. Does not form part of the ecological community**	**Meets key characteristics and condition threshold – forms part of the ecological community**	**Meets key characteristics and condition threshold – forms part of the ecological community**

Table 6.6 Summary of Grey Box TEC within the subject land

Threatened ecological community	Vegetation type	IBRA subregion	Veg zone name (BAM-C)	Impact (ha)
Inland Grey Box Woodlands in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions	PCT 237 - Riverine Western Grey Box grassy woodland of the semi-arid (warm) climate zone	Murray Fans	VZ #11 Moderate-good	0.84
Total				**0.84**

6.2.1.3 Natural Grasslands of the Murray Valley Plains – Critically Endangered

The Natural Grasslands of the Murray Valley Plains TEC (hereafter Natural Grasslands) listed as Critically Endangered under the EPBC Act and is described in the Listing Advice as an open to closed tussock grassland. Trees and large shrubs are generally absent from this community. Less than 10 per cent projective foliage cover may be present from this stratum, with common species including *Eucalyptus spp*., Umbrella Wattle (*Acacia oswaldii*), Nitre-bush (*Nitraria billardierei*) and Weeping Myall (*A. pendula*) (in NSW). The ground layer is dominated by *Rytidosperma spp*., Spear Grasses (*Austrostipa spp.*) and/or Curly Windmill Grass (*Enteropogon sp.*). Herbland / forbland may be a better description for areas where grasses are sparse, with common species including Vanilla Lilies (*Arthropodium spp*.), Bulbine Lilies (*Bulbine spp*.), Pale Beauty Heads (*Calocephalus sonderi*), Common Everlasting (*Chrysocephalum apiculatum*), Scaly Buttons (*Leptorhynchos squamatus*), Minnie Daisy (*Minuria leptophylla*), Grassland Wood-sorrel (*Oxalis perennans*), Paper Sunray (*Rhodanthe corymbiflora*) and Variable Sida (*Sida corrugata*). Some sites may see a gradation into open grassy shrubland with co-dominant low chenopod shrubs and grasses. Chenopods commonly include Creeping Saltbush (*Atriplex semibaccata*), Common Bluebush (M*airena decalvans*), Wingless Bluebush (*M. enchylaenoides*), Bottle Bluebush (*M. excavata*), Dwarf Bluebush (*M. humillima*) and Slender Bluebush (*M. pentagona*).

Occurring predominately across the southern Riverina bioregion, this ecological community extends into parts of the Murray Darling Depression and NSW South-Western Slopes bioregions on a landscape of flat alluvial plains. The climatic zone for Natural Grasslands of the Murray Valley Plains being the transition from temperate to semi-arid, and a strong influence on species composition alongside soils. Quaternary alluvial sediments of calcareous clay loams and clays, including self-mulching / cracking clays, are associated with this community (Department of Sustainability, Environment, Water, Population and Communities 2012).

Within the subject land, three vegetation types were considered likely to associate with this threatened ecological community. These are:

- PCT 44 – Forb-rich Speargrass – Windmill Grass – White Top grassland of the Riverina Bioregion
- PCT 45 – Plains Grass grassland on alluvial mainly clay soils in the Riverina Bioregion and NSW South Western Slopes Bioregion
- PCT 46 – Curly Windmill Grass – speargrass – wallaby grass grassland on alluvial clay and loam on the Hay plain, Riverina Bioregion.

For a vegetation patch to meet the threatened ecological listing of Natural Grasslands of the Murray Valley Plains, it must meet specific EPBC listing advice for both the key characteristics and condition threshold criteria as outlined in Figure 6.2. An assessment of the two-step key diagnostic characteristics and condition threshold criteria for this ecological community against recorded PCTs and associated plot data is presented in Table 6.7 to Table 6.10.

Where candidate PCTs have been identified by State Vegetation Type Mapping, vegetation has been assumed to meet benchmark conditions outlined in BioNet Vegetation Classification system for the purposes of this assessment and are considered to meet minimum requirements for the Natural Grasslands TEC. Where candidate PCTs have been identified as part of EnergyConnect (NSW – Eastern section) project, data has been extracted from the BDAR and utilised in this assessment (WSP, 2022).

The first of the key diagnostic criteria states the approximate northern limit of the ecological community to be within the Murrumbidgee subregion approximately near the northern boundary of the Murray Catchment Management Authority (CMA) in NSW. The subject land sits within Murrumbidgee IBRA subregion and within 10 kilometres north of this CMA boundary therefore all plots within the subject land are considered to occur within the distribution of the Native Grasslands of the Murray Valley Plains TEC.

A summary of Natural Grasslands threatened ecological community, associated PCT and extent within the subject land for each IBRA subregion is summarised in Table 6.11. Lastly, specific mitigation measures including a Special Biodiversity Protection Zone have been identified in section 9.4.2 and Table 9.28 to reduce impacts to this community.

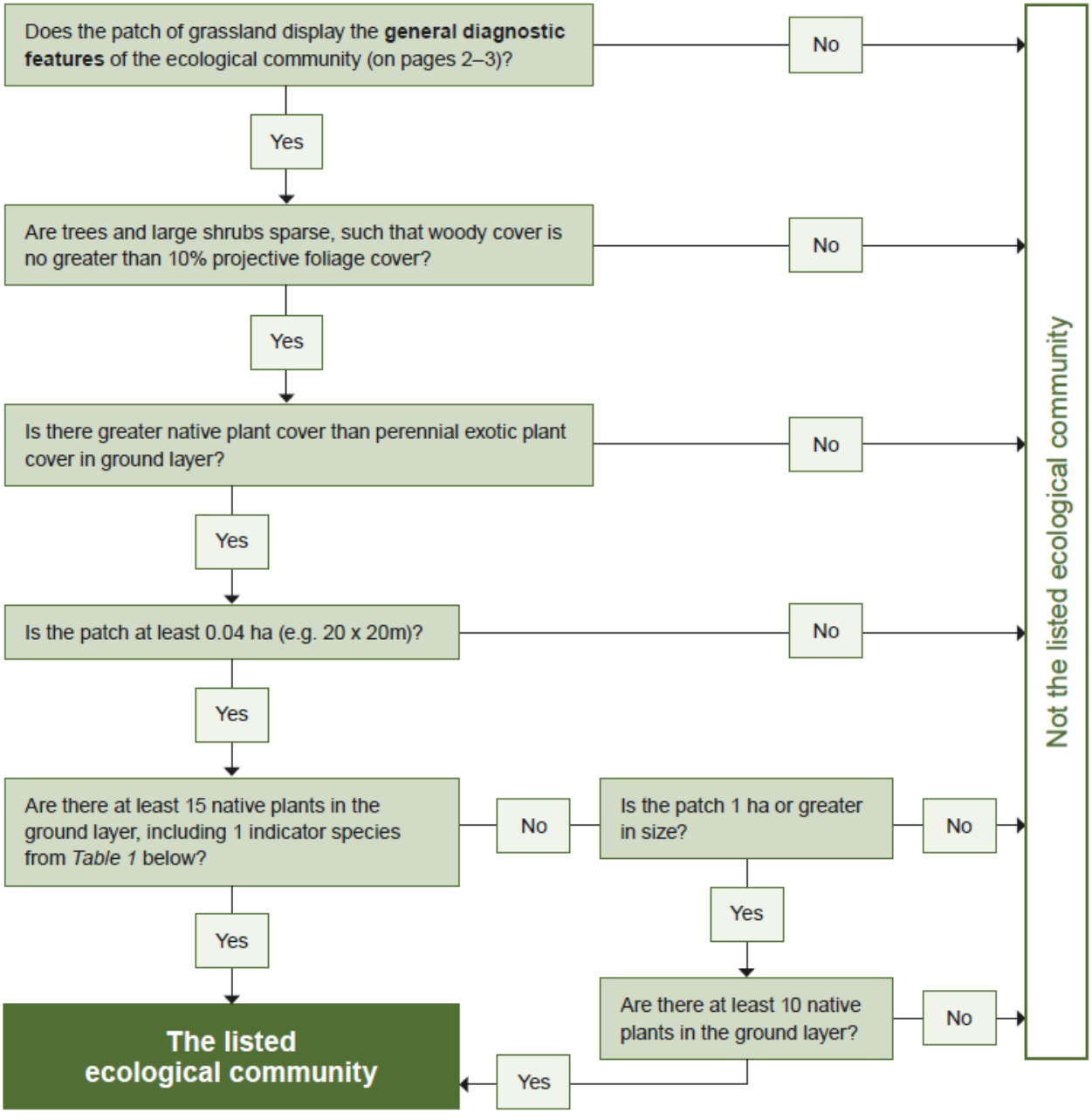


Figure 6.2 Listing advice key characteristic and condition thresholds for Natural Grasslands TEC

Table 6.7 Assessment Step 1: use key diagnostic characteristics to identify if the ecological community is present for representative patches assigned to PCT 44 – Forb-rich speargrass – Windmill Grass – White Top grassland of the Riverina Bioregion

Key diagnostic characteristics	**PCT 44 – Moderate-good**						
	VNI_DR14	**VNI_DR32**	**VNI_DR34**	**VNI_DR63**	**VNI_DR89**	**VNI_DR99**	**VNI_DR100**
Distribution is primarily in the Riverina Bioregion and the Wimmera plains of the Murray Darling Depression Bioregion. Other outlying occurrences are also in the Murray Darling Depression Bioregion and the NSW South Western Slopes Bioregion. The approximate northern limit of the ecological community is in the Murrumbidgee subregion (IBRA RIV2), approximately near the northern boundary of the Murray Catchment Management Authority (CMA) in NSW.	Occurs in the Murrumbidgee subregion (IBRA RIV2) of the Riverina Bioregion. Patch is approximately 6 km north of the northern boundary of the Murray CMA.	Occurs in the Murrumbidgee subregion (IBRA RIV2) of the Riverina Bioregion. Patch is approximately 6 km north of the northern boundary of the Murray CMA.	Occurs in the Murrumbidgee subregion (IBRA RIV2) of the Riverina Bioregion. Patch is approximately 7 km north of the northern boundary of the Murray CMA.	Occurs in the Murrumbidgee subregion (IBRA RIV2) of the Riverina Bioregion. Patch is approximately 7 km north of the northern boundary of the Murray CMA.	Occurs in the Murrumbidgee subregion (IBRA RIV2) of the Riverina Bioregion. Patch is approximately 6 km north of the northern boundary of the Murray CMA.	Occurs in the Murrumbidgee subregion (IBRA RIV2) of the Riverina Bioregion. Patch is approximately 2 km north of the northern boundary of the Murray CMA.	Occurs in the Murrumbidgee subregion (IBRA RIV2) of the Riverina Bioregion. Patch is approximately 5 km north of the northern boundary of the Murray CMA.
It typically occurs on a landscape of flat alluvial lowland plains with heavy-textured grey, brown and red clays.	Occurs on and alluvial plain with red to red-brown clay loam soil.	Occurs on an alluvial plain with grey-brown clay soil.	Occurs on and alluvial plain with red clay loam soil.	Occurs on and alluvial plain with red-brown sandy clay soil.	Occurs on and alluvial plain with red-brown clay soil.	Occurs on and alluvial plain with light brown clay soil.	Occurs on an alluvial plain with red clay soil.
The ecological community is typically dominated by a range of perennial grasses and/or forbs or co-dominated by small shrubs. Sites are not necessarily dominated by any particular plant species. Characteristic genera present typically include: — for grasses – *Rytidosperma, Austrostipa, Chloris* and *Enteropogon*, — for forbs – *Arthropodium, Bulbine, Calotis, Chrysocephalum, Leptorhynchos, Minuria, Ptilotus, Rhodanthe, Sida* and *Swainsona*, — for small shrubs – *Atriplex* and *Maireana*.	For grasses – *Rytidosperma*, *Austrostipa*, *Chloris* and *Enteropogon* were recorded. For forbs – *Chrysocephalum* and *Sida* were recorded. For shrubs – *Maireana* was recorded.	For grasses –*Enteropogon, Rytidosperma* and *Chloris* were recorded. For forbs – None recorded. For shrubs –*Maireana* and *Atriplex* were recorded.	For grasses – *Rytidosperma, Chloris and Austrostipa* were recorded. For forbs – *Chrysocephalum* and *Sida* were recorded. For shrubs –*Maireana* and *Atriplex* were recorded.	For grasses – *Rytidosperma, Enteropogon and Austrostipa* were recorded. For forbs – *Calotis*, *Ptilotus, Rhodanthe,* and *Swainsona* were recorded. For shrubs –*Maireana* was recorded.	For grasses – *Rytidosperma, Enteropogon and Austrostipa* were recorded. For forbs – *Bulbine*, *Chrysocephalum, Rhodanthe, Sida* and *Swainsona* were recorded. For shrubs –*Maireana* was recorded.	For grasses – *Rytidosperma* was recorded. For forbs – *Rhodanthe* was recorded. For shrubs –*Maireana* was recorded.	For grasses – *Rytidosperma* and *Austrostipa* were recorded. For forbs – *Chrysocephalum*, *Rhodanthe* and *Sida* were recorded. For shrubs –*Maireana* and *Atriplex* were recorded.
Trees and large shrubs (>1m tall) are generally absent to sparse, amounting to less than 10 per cent projective foliage cover. Where woodlands overlap or adjoin with the ecological community an outer boundary of two times the canopy width of the dominant tree species is applied.	Trees and large shrubs were absent.	Trees and large shrubs were absent.	Trees and large shrubs were absent	Trees and large shrubs were absent	Trees and large shrubs were absent	Trees and large shrubs were absent	Trees and large shrubs were absent
The patch should contain at least as many, preferably more, of the species in Table 1(A) than in Table 1(B) of the listing advice, when assessed at an appropriate time (e.g. late winter-spring and not soon after disturbance such as grazing). The species in Table 1(A) are characteristic of the natural grassland ecological community and not derived grasslands, and the opposite applies to Table 1(B). Note this generally only applies to grasslands occurring in the Lachlan (RIV 1) and Murrumbidgee (RIV 2) IBRA subregions.	The plot was not recorded during an appropriate time of year for assessment (recorded in Feb). Associated patch of vegetation retained for assessment.	The plot was not recorded during an appropriate time of year for assessment (recorded in May). Associated patch of vegetation retained for assessment.	The plot was not recorded during an appropriate time of year for assessment (recorded in May). Associated patch of vegetation retained for assessment.	Plot recorded in August. Of the 22 native species recorded 4 occur in Table 1 (A) and 2 occur in Table 1 (B).	Plot recorded in October. Of the 24 native species recorded 5 occur in Table 1 (A) and 5 occur in Table 1 (B).	Plot recorded in October. Of the 14 native species recorded 0 occur in Table 1 (A) and 4 occur in Table 1 (B).	Plot recorded in October. Of the 23 native species recorded 3 occur in Table 1 (A) and 4 occur in Table 1 (B). However, vegetation was subject to active grazing by domestic livestock reducing the abundance of annual herbs. Associated patch of vegetation retained for assessment.
If there is reliable evidence (e.g. historical records, photographs) that a patch was once woodland or shrubland with >10 per cent cover (of trees, shrubs >1m), then the patch is not considered to be part of the ecological community.	There is no evidence that the patch was once a woodland or shrubland	There is no evidence that the patch was once a woodland or shrubland	There is no evidence that the patch was once a woodland or shrubland	There is no evidence that the patch was once a woodland or shrubland	There is no evidence that the patch was once a woodland or shrubland	There is no evidence that the patch was once a woodland or shrubland	There is no evidence that the patch was once a woodland or shrubland

Key diagnostic characteristics	PCT 44 – Moderate-good						
	VNI_DR14	VNI_DR32	VNI_DR34	VNI_DR63	VNI_DR89	VNI_DR99	VNI_DR100
Soil type and landscape position (e.g. Alluvial soils, plains) that correspond with the ecological community and no other vegetation types may also assist in identifying the likely occurrence of natural grasslands ecological community.	The patch occurs on alluvial soils associated with a broad plain.	The patch occurs on alluvial soils associated with a broad plain.	The patch occurs on alluvial soils associated with a broad plain.	The patch occurs on alluvial soils associated with a broad plain.	The patch occurs on alluvial soils associated with a broad plain.	The patch occurs on alluvial soils associated with a broad plain.	The patch occurs on alluvial soils associated with a broad plain.
Outcome	**Meets Step 1 – key diagnostic characteristics**	**Meets Step 1 – key diagnostic characteristics**	**Meets Step 1 – key diagnostic characteristics**	**Meets Step 1 – key diagnostic characteristics**	**Meets Step 1 – key diagnostic characteristics**	**Meets Step 1 – key diagnostic characteristics**	**Meets Step 1 – key diagnostic characteristics**

Table 6.8 Assessment Step 2: Determine condition of the ecological community for representative patches assigned to PCT 44 Forb-rich Speargrass – Windmill Grass – White Top grasslands of the Riverina Bioregion that meet Step 1 key diagnostic characteristics

PCT & Condition	**44 Moderate-good**						
Condition thresholds	**VNI_DR14**	**VNI_DR32**	**VNI_DR34**	**VNI_DR63**	**VNI_DR89**	**VNI_DR99**	**VNI_DR100**
For all patches of the ecological community. The percentage cover of native vascular plants (annual and perennial) in the patch is greater than the percentage cover of perennial exotic species. AND Either category A or category B thresholds are met as below	Meets threshold. Native vascular cover was recorded at 99.9 % with perennial exotic cover recorded at 0 %.	Meets threshold. Native vascular cover was recorded at 99.7 % with perennial exotic cover recorded at 0 %.	Meets threshold. Native vascular cover was recorded at 99.9 % with perennial exotic cover recorded at 0 %.	Meets threshold. Native vascular cover was recorded at 96.3 % with perennial exotic cover recorded at 0.4 %.	Meets threshold. Native vascular cover was recorded at 94.8 % with perennial exotic cover recorded at 0.15 %.	Meets threshold. Native vascular cover was recorded at 100 % with perennial exotic cover recorded at 0 %.	Meets threshold. Native vascular cover was recorded at 98.1 % with perennial exotic cover recorded at 0 %.
Category A. For patches with high diversity or that are relatively undisturbed. This recognises that many patches of the ecological community can maintain their diversity despite the highly fragmented nature of the community or small patch sizes: A1. 15 or more vascular plant species are present in the patch. AND A2. The patch contains one or more indicator species in Table2, characteristic of sites that are relatively undisturbed (e.g. have little to no history of cultivation). AND Patch size: A3. The size of the grassland patch is at least 0.04 ha or more in size (i.e. at least 400 m^2 or a 20 m x 20 m square or equivalent area in any shape.	A1. Meets condition threshold with 18 native vascular plant species recorded. A2. Meets condition threshold with 2 indicator species recorded being: *Maireana aphylla and Maireana excavata.* A3. Meets condition threshold with patch size exceeding 0.04 ha (patch size >30 ha).	A1. Does not meet condition threshold with only 10 native vascular plant species recorded. A2. Meets condition threshold with 1 indicator species recorded being: Leucochrysum molle.	A1. Meets condition threshold with 16 native vascular plant species recorded. A2. Meets condition threshold with 5 indicator species recorded being: *Eriochlamys behrii, Maireana pentagona, Leiocarpa panaetioides, Maireana aphylla and Maireana excavata.* A3. Meets condition threshold with patch size exceeding 0.04 ha (patch size >6 ha).	A1. Meets condition threshold with 22 native vascular plant species recorded. A2. Meets condition threshold with 11 indicator species recorded being: *Calotis scabiosifolia, Daucus glochidiatus*, *Goodenia pusilliflora, Hyalosperma glutinosum, Leiocarpa panaetioides, Leucochrysum molle, Maireana aphylla, Maireana excavata, Ptilotus spathulatus, Rhodanthe pygmaea* and *Wurmbea dioica.* A3. Meets condition threshold with patch size exceeding 0.04 ha (patch size >2 ha).	A1. Meets condition threshold with 25 native vascular plant species recorded. A2. Meets condition threshold with 4 indicator species recorded being: *Bulbine bulbosa, Daucus glochidiatus, Hyalosperma glutinosum, Maireana aphylla, Maireana humillima, Maireana pentagona, Swainsona murrayana, Wurmbea dioica.* A3. Meets condition threshold with patch size exceeding 0.04 ha (patch size >5 ha).	A1. Does not meet condition threshold with only 13 native vascular plants species recorded.	A1. Meets condition threshold with 23 native vascular plant species recorded. A2. Meets condition threshold with 2 indicator species recorded being: *Eriochlamys behrii, Hyalosperma glutinosum, Maireana aphylla and Maireana humillima, Maireana pentagona and Wurmbea dioica.* A3. Meets condition threshold with patch size exceeding 0.04 ha (patch size >1.5 ha).

PCT & Condition	44 Moderate-good						
Condition thresholds	**VNI_DR14**	**VNI_DR32**	**VNI_DR34**	**VNI_DR63**	**VNI_DR89**	**VNI_DR99**	**VNI_DR100**
Category B. For larger patches that have good ground layer diversity: This applies where patches of the ecological community do not meet the high diversity or lack or disturbance criteria in Category A but still retain sufficient elements of their natural diversity. Ground layer diversity: B1. 10 or more native vascular plant species are present in the patch. AND Patch size: B2. The size of the grassland patch is at least 1 ha or more in size (i.e. at least 10,000 m^2 or a 100 m x 100 m square or equivalent area in any shape).	Meets Category A.	B1. Meets condition threshold with only 10 native vascular plant species recorded. B2. Meets condition threshold with patch size exceeding 1.0 ha (patch size >14 ha).	Meets Category A.	Meets Category A.	Meets Category A.	B1. Meets condition threshold with 13 native vascular plant species recorded. B2. B2. Meets condition threshold with patch size exceeding 1.0 ha.	Meets Category A.
Outcome	**Meets Step 2 (Category A) – condition threshold and forms part of the ecological community.**	**Meets Step 2 (Category B) – condition threshold and forms part of the ecological community.**	**Meets Step 2 (Category A) – condition threshold and forms part of the ecological community.**	**Meets Step 2 (Category A) – condition threshold and forms part of the ecological community.**	**Meets Step 2 (Category A) – condition threshold and forms part of the ecological community.**	**Meets Step 2 (Category B) – condition threshold and forms part of the ecological community.**	**Meets Step 2 (Category A) – condition threshold and forms part of the ecological community.**

Table 6.9 Assessment Step 1: use key diagnostic characteristics to identify if the ecological community is present for representative patches assigned to PCT 45 - Plains Grass grassland on alluvial mainly clay soils in the Riverina Bioregion and NSW South Western Slopes Bioregion and PCT 46 - Curly Windmill Grass - speargrass - wallaby grass grassland on alluvial clay and loam on the Hay Plain, Riverina Bioregion

PCT & Condition	**PCT 45 – Moderate-good**		**PCT 46 – Moderate-good**				
Key diagnostic characteristics	**Q193E (PEC)**	**Q196E (PEC)**	**VNI_DR10**	**VNIOZ_11**	**VNI_NM018**	**VNI_DR64**	**VNI_DR88**
Distribution is primarily in the Riverina Bioregion and the Wimmera plains of the Murray Darling Depression Bioregion. Other outlying occurrences are also in the Murray Darling Depression Bioregion and the NSW South Western Slopes Bioregion. The approximate northern limit of the ecological community is in the Murrumbidgee subregion (IBRA RIV2), approximately near the northern boundary of the Murray Catchment Management Authority (CMA) in NSW.	Occurs in the Murrumbidgee subregion (IBRA RIV2) of the Riverina Bioregion. Patch is approximately 5 km north of the northern boundary of the Murray CMA.	Occurs in the Murrumbidgee subregion (IBRA RIV2) of the Riverina Bioregion. Patch is approximately 5 km north of the northern boundary of the Murray CMA.	Occurs in the Murrumbidgee subregion (IBRA RIV2) of the Riverina Bioregion. Patch is approximately 5 km north of the northern boundary of the Murray CMA.	Occurs in the Murrumbidgee subregion (IBRA RIV2) of the Riverina Bioregion. Patch is approximately 8.5 km north of the northern boundary of the Murray CMA.	Occurs in the Murrumbidgee subregion (IBRA RIV2) of the Riverina Bioregion. Patch is approximately 9 km north of the northern boundary of the Murray CMA.	Occurs in the Murrumbidgee subregion (IBRA RIV2) of the Riverina Bioregion. Patch is approximately 8.8 km north of the northern boundary of the Murray CMA.	Occurs in the Murrumbidgee subregion (IBRA RIV2) of the Riverina Bioregion. Patch is approximately 7.5 km north of the northern boundary of the Murray CMA.
It typically occurs on a landscape of flat alluvial lowland plains with heavy-textured grey, brown and red clays.	Occurs on grey clay loam.	Occurs on grey clay loam.	Occurs on grey clay.	Occurs on grey clay loam.	Occurs on grey clay.	Occurs on grey clay.	Occurs on brown clay.
The ecological community is typically dominated by a range of perennial grasses and/or forbs or co-dominated by small shrubs. Sites are not necessarily dominated by any particular plant species. Characteristic genera present typically include: — for grasses – *Rytidosperma, Austrostipa, Chloris* and *Enteropogon*, — for forbs – *Arthropodium, Bulbine, Calotis, Chrysocephalum, Leptorhynchos, Minuria, Ptilotus, Rhodanthe, Sida* and *Swainsona*, — for small shrubs – *Atriplex* and *Maireana*.	For grasses – *Enteropogon* and *Austrostipa* were recorded For forbs – *Calotis, Chrysocephalum* and *Rhodanthe* were recorded For shrubs –*Maireana* was recorded.	For grasses – *Austrostipa, Enteropogon* and *Rytidosperma* were recorded For forbs – *Rhodanthe* was recorded For shrubs –*Maireana* was recorded.	For grasses – *Austrostipa, Enteropogon* and *Rytidosperma* were recorded For forbs – *Calotis*, *Rhodanthe and Sida* were recorded For shrubs –*Maireana* and *Atriplex* were recorded.	For grasses – *Enteropogon* and *Rytidosperma* were recorded For forbs – *Calotis* and *Rhodanthe* were recorded For shrubs –*Maireana* and *Atriplex* were recorded.	For grasses – *Austrostipa, Enteropogon, Rytidosperma* and *Chloris* were recorded For forbs – *Bulbine, Rhodanthe and Sida* were recorded For shrubs –*Maireana* was recorded.	For grasses – *Austrostipa, Enteropogon* and *Rytidosperma* were recorded For forbs – *Calotis, Rhodanthe and Sida* were recorded For shrubs –*Maireana* and *Atriplex* were recorded.	For grasses – *Austrostipa, Enteropogon* and *Rytidosperma* were recorded For forbs – *Calotis* and *Rhodanthe* were recorded. For shrubs- For shrubs –*Maireana* and *Atriplex* were recorded.
Trees and large shrubs (>1m tall) are generally absent to sparse, amounting to less than 10 per cent projective foliage cover. Where woodlands overlap or adjoin with the ecological community an outer boundary of two times the canopy width of the dominant tree species is applied.	Trees and large shrubs were absent.	Trees and large shrubs were absent.	Trees and large shrubs were absent.	Trees and large shrubs were absent.	Trees and large shrubs were absent.	Trees and large shrubs were absent.	Trees and large shrubs were absent.
The patch should contain at least as many, preferably more, of the species in Table 1(A) than in Table 1(B) of the listing advice, when assessed at an appropriate time (e.g. late winter-spring and not soon after disturbance such as grazing). The species in Table 1(A) are characteristic of the natural grassland ecological community and not derived grasslands, and the opposite applies to Table 1(B). Note this generally only applies to grasslands occurring in the Lachlan (RIV 1) and Murrumbidgee (RIV 2) IBRA subregions.	Plot recorded in October. Of the 9 native species recorded 4 occur in Table 1 (A) and 1 occurs in Table 1 (B).	Plot recorded in August. Of the 18 native species recorded 4 occur in Table 1 (A) and 3 occur in Table 1 (B).	The plot was not recorded during an appropriate time of year for assessment (recorded in February). Associated patch of vegetation retained for assessment.	Plot recorded in October. Of the 16 native species recorded 1 occurs in Table 1 (A) and 3 occur in Table 1 (B). However, vegetation was subject to recent grazing in August by domestic livestock, reducing the abundance of annual herbs. Associated patch of vegetation retained for assessment.	Plot recorded in October. Of the 19 native species recorded 0 occur in Table 1 (A) and 4 occur in Table 1 (B).	Plot recorded in August. Of the 20 native species recorded 2 occur in Table 1 (A) and 5 occur in Table 1 (B). However, vegetation was subject to active grazing by domestic livestock reducing the abundance of annual herbs. Associated patch of vegetation retained for assessment.	Plot recorded in October. Of the 12 native species recorded 1 occur in Table 1 (A) and 2 occur in Table 1 (B). However, vegetation was subject to active grazing by domestic livestock reducing the abundance of annual herbs. Associated patch of vegetation retained for assessment.
If there is reliable evidence (e.g. historical records, photographs) that a patch was once woodland or shrubland with >10 per cent cover (of trees, shrubs >1m), then the patch is not considered to be part of the ecological community.	There is no evidence that the patch was once a woodland or shrubland	There is no evidence that the patch was once a woodland or shrubland	There is no evidence that the patch was once a woodland or shrubland	There is no evidence that the patch was once a woodland or shrubland	There is no evidence that the patch was once a woodland or shrubland	There is no evidence that the patch was once a woodland or shrubland	There is no evidence that the patch was once a woodland or shrubland

PCT & Condition	PCT 45 – Moderate-good		PCT 46 – Moderate-good				
Key diagnostic characteristics	**Q193E (PEC)**	**Q196E (PEC)**	**VNI_DR10**	**VNIOZ_11**	**VNI_NM018**	**VNI_DR64**	**VNI_DR88**
Soil type and landscape position (e.g. Alluvial soils, plains) that correspond with the ecological community and no other vegetation types may also assist in identifying the likely occurrence of natural grasslands ecological community.	The patch occurs on alluvial soils associated with a broad plain.	The patch occurs on alluvial soils associated with a broad plain.	The patch occurs on alluvial soils associated with a broad plain.	The patch occurs on alluvial soils associated with a broad plain.	The patch occurs on alluvial soils associated with a broad plain.	The patch occurs on alluvial soils associated with a broad plain.	The patch occurs on alluvial soils associated with a broad plain.
Outcome	**Meets Step 1 – key diagnostic characteristics**	**Meets Step 1 – key diagnostic characteristics**	**Meets Step 1 – key diagnostic characteristics**	**Meets Step 1 – key diagnostic characteristics**	**Does not meet Step 1- key diagnostic characteristics**	**Meets Step 1 – key diagnostic characteristics**	**Meets Step 1 – key diagnostic characteristics**

Table 6.10 Assessment Step 2: Determine condition of the ecological community for representative patches assigned to PCT 45 - Plains Grass grassland on alluvial mainly clay soils in the Riverina Bioregion and NSW South Western Slopes Bioregion and PCT 46 - Curly Windmill Grass - speargrass - wallaby grass grassland on alluvial clay and loam on the Hay Plain, Riverina Bioregion that meet Step 1 key diagnostic characteristics

PCT & Condition	**PCT 45 – Moderate-good**		**PCT 46 – Moderate-good**			
Condition thresholds	**Q193E (PEC)**	**Q196E (PEC)**	**VNI_DR10**	**VNIOZ_11**	**VNI_DR64**	**VNI_DR88**
For all patches of the ecological community. The percentage cover of native vascular plants (annual and perennial) in the patch is greater than the percentage cover of perennial exotic species. AND Either category A or category B thresholds are met as below	Meets threshold. Native vascular cover was recorded at 79.5 % with perennial exotic cover recorded at 0 %.	Meets threshold. Native vascular cover was recorded at 75.6 % with perennial exotic cover recorded at 0 %.	Meets threshold. Native vascular cover was recorded at 72.5 % with perennial exotic cover recorded at 0 %.	Meets threshold. Native vascular cover was recorded at 85 % with perennial exotic cover recorded at 0 %.	Meets threshold. Native vascular cover was recorded at 77.8 % with perennial exotic cover recorded at 0 %.	Meets threshold. Native vascular cover was recorded at 76.8 % with perennial exotic cover recorded at 0 %.
Category A. For patches with high diversity or that are relatively undisturbed. This recognises that many patches of the ecological community can maintain their diversity despite the highly fragmented nature of the community or small patch sizes: A1. 15 or more vascular plant species are present in the patch. AND A2. The patch contains one or more indicator species in Table2, characteristic of sites that are relatively undisturbed (e.g. have little to no history of cultivation). AND Patch size: A3. The size of the grassland patch is at least 0.04 ha or more in size (i.e. at least 400 m^2 or a 20 m x 20 m square or equivalent area in any shape.	A1. Meets condition threshold with 19 native vascular plant species recorded. A2. Meets condition threshold with seven indicator species recorded being*: Calotis anthemoides, Goodenia pusilliflora, Maireana enchylaenoides, Maireana excavata, Maireana humillima, Maireana pentagona* and *Rhodanthe pygmaea.* A3. Meets condition threshold with patch size exceeding 0.04 ha (patch size >4 ha).	A1. Meets condition threshold with 18 native vascular plant species recorded. A2. Meets condition threshold with six indicator species recorded being: *Goodenia pusilliflora, Maireana excavata, Maireana humillima, Maireana pentagona Triptilodiscus pygmaeus* and *Rhodanthe pygmaea.* A3. Meets condition threshold with patch size exceeding 0.04 ha (patch size >20 ha).	A1. Meets condition threshold with 20 native vascular plant species recorded. A2. Meets condition threshold with four indicator species recorded being*: Sida trichopoda, Asperula conferta, Maireana aphylla* and *Calotis scabiosifolia.* A3. Meets condition threshold with patch size exceeding 0.04 ha (patch size >30 ha).	A1. Meets condition threshold with 20 native vascular plant species recorded. A2. Meets condition threshold with four indicator species recorded being*: Sida trichopoda, Asperula conferta, Maireana aphylla* and *Calotis scabiosifolia.* A3. Meets condition threshold with patch size exceeding 0.04 ha (patch size >150 ha).	A1. Meets condition threshold with 19 native vascular plant species recorded. A2. Meets condition threshold with four indicator species recorded being: *Leucochrysum molle and Maireana aphylla.* A3. Meets condition threshold with patch size exceeding 0.04 ha (patch size >40 ha).	A1. Does not meet condition threshold with only 12 native vascular plant species. A2. Meets condition threshold with four indicator species recorded being: *Leiocarpa panaetioides, Maireana pentagona, Maireana aphylla* and *Calotis scabiosifolia*. A.3. Meets condition threshold with patch size exceeding 0.04 ha (patch size >40 ha).
Category B. For larger patches that have good ground layer diversity: This applies where patches of the ecological community do not meet the high diversity or lack or disturbance criteria in Category A but still retain sufficient elements of their natural diversity. Ground layer diversity: B1. 10 or more native vascular plant species are present in the patch. AND Patch size: B2. The size of the grassland patch is at least 1 ha or more in size (i.e. at least 10,000 m^2 or a 100 m x 100 m square or equivalent area in any shape).	Already meets Category A.	Already meets Category A.	Already meets Category A.	Already meets Category A	Already meets Category A.	B1. Meets condition threshold with 12 native vascular plant species. B2. Meets condition threshold. Size of grassland patch exceeds 1.0 ha (patch size >40ha)
Outcome	**Meets Step 2 (Category A) – condition threshold and forms part of the ecological community.**	**Meets Step 2 (Category A) – condition threshold and forms part of the ecological community.**	**Meets Step 2 (Category A) – condition threshold and forms part of the ecological community.**	**Meets Step 2 (Category A) – condition threshold and forms part of the ecological community.**	**Meets Step 2 (Category A) – condition threshold and forms part of the ecological community.**	**Meets Step 2 (Category B) – condition threshold and forms part of the ecological community.**

Table 6.11 Summary of Natural Grasslands TEC within the subject land

Threatened ecological community	Vegetation type	IBRA subregion	Veg zone name (BAM-c)	Impact (ha)
Natural Grasslands of the Murray Valley Plains	PCT 44	Murray Fans	VZ 27 SVTM	10.17
		Murrumbidgee	VZ 19 Moderate-good	14.77
			VZ 36 SVTM	8.79
	PCT 45	Murrumbidgee	VZ 20 Moderate-good	3.58
			VZ 37 SVTM	5.96
	PCT 46	Murrumbidgee	VZ 21 Moderate-good	39.35
			VZ 44 SVTM	19.07
Total				**101.69**

6.2.1.4 Plains mallee box woodlands of the Murray Darling Depression, Riverina and Naracoorte Coastal Plain Bioregions

PCT 170 is aligned with the Plains mallee box woodlands of the Murray Darling Depression, Riverina and Naracoorte Coastal Plain Bioregions TEC (hereafter Plains Box woodlands) listed as Critically Endangered under the EPBC Act.

This TEC is described in the Conservation Advice as a medium (five to 10 metres) to tall (15 metres) open mallee eucalypt woodland with a sparse or open Mallee box-barked eucalypt dominant canopy. Black Mallee Box (*Eucalyptus porosa*) and Bull Mallee (*E. behriana*) being most common, however they are rarely sympatric. A very sparse small tree or large - medium shrub layer may be present. A sub-shrub layer of low chenopods can be a distinguishing feature of this community, with species including Bitter Saltbush (*Atriplex stipitate subsp. stipitata*), Frosted Goosefoot *(Chenopodium desertorum*), Nodding Saltbush (*Einadia nutans subsp. nutans*), Ruby Saltbush (*Enchylaena tomentosa*), Bluebush species (*Maireana spp.*), Hedge Saltbush *(Rhagodia spinescens*), Grey Copperburr (*Sclerolaena diacantha*) and Tangled Copperburr (*S. muricata*). During relatively wet years the understorey is also dominated by tussock grasses including Speargrass (*Austrostipa* spp.), Common Wallaby Grass (*Rytidosperma caespitosum*), Brown-back Wallaby Grass (*R. duttonianum*), Curly Windmill Grass (*Enteropogon acicularis*) and Knottybutt Grass (*Paspalidium constrictum*).

Occurring within the Murray Darling Depression bioregion, Riverina bioregion and Naracoorte Coastal Plain, this ecological community is found on near-level or gently sloping plains. It is associated with medium-heavy textured soils, typically clay loams and occasionally sandy clay loams or light clays. Distributed within semi-arid to arid regions, the mean annual rainfall associated with this community is 260-450 millimetres. A functionally important component of this community, the biological soil crust can reach up to 60 per cent ground cover of mosses, lichens, liverworts, cyanobacteria, algae and fungi.

The ecological community can be broadly categorised into three variants. Variant 1 is structurally dominated by *E. behriana*, Variant 2 by *E, porosa* and Variant 3 by *E. dumosa*. Condition classes, indicators and thresholds are outlined within the TEC Conservation Advice (Department of Agriculture, Water and the Environment 2021).

Within the project subject land patches of PCT 170 – Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones were inspected to determine if the ecological community occurred.

A comparison of the listing advice for Plains mallee box woodland and candidate PCT patches is provided in Table 6.12. Each element of the listing advice including locality, species composition, characteristic species and resilience is compared to each condition class for the candidate PCT to determine if vegetation recorded is consistent with the listing criteria. No patches of PCT 170 have been determined to meet the listing criteria.

Table 6.12 Assessment of EPBC Act listed Plains mallee box woodland and associated recorded vegetation

PCT 170 Condition:	**Thinned**		**Derived**		
Listing advice	**NM019**	**NM020**	**VNI MP 28**	**VNI MP 29**	**VNI MP 30**
Does the PCT occur in south-west NSW, north-west Victoria and south-east South Australia including the following bioregions, Murray Darling Depression, Riverina and Naracoorte Coastal Plain Bioregions?	Yes This PCT was recorded to occur in the Murray Darling Depression IBRA Bioregion in south-west NSW (Murrumbidgee IBRA subregion).	Yes This PCT was recorded to occur in the Murray Darling Depression IBRA Bioregion in south-west NSW (Murrumbidgee IBRA subregion).	Yes This PCT was recorded to occur in the Murray Darling Depression IBRA Bioregion in south-west NSW (Murrumbidgee IBRA subregion).	Yes This PCT was recorded to occur in the Murray Darling Depression IBRA Bioregion in south-west NSW (Murrumbidgee IBRA subregion).	Yes This PCT was recorded to occur in the Murray Darling Depression IBRA Bioregion in south-west NSW (Murrumbidgee IBRA subregion).
Does the PCT occur as a medium to tall open mallee eucalypt woodland with a canopy typically dominated by 'mallee box' *Eucalyptus* species and an understorey in which tussock grasses may be prominent in relatively wet years, low chenopod shrubs occur in variable densities, and taller shrubs are typically sparse?	No. PCT is not comprised of 'mallee box' Eucalyptus species.	No. PCT is not comprised of 'mallee box' Eucalyptus species.	No. Lacking a canopy therefore excluded from further assessment.	No. Lacking a canopy therefore excluded from further assessment.	No. Lacking a canopy therefore excluded from further assessment.
Does the PCT occur in association with relatively medium-heavy textured soils on near-level to gently sloping plains? Typically, soils are heavier in texture than soils that support most other mallee communities but have a lower fraction of clay than soils supporting saltbush shrublands and black box woodlands.	Not assessed due to not meeting above criteria.	Not assessed due to not meeting above criteria.	Excluded from further assessment.	Excluded from further assessment.	Excluded from further assessment.
Canopy species and composition Is the canopy between 5–15 m tall with a typical cover ranging from 10-15 per cent (spare to open canopy)? AND Variant 1 – dominated by *Eucalyptus behriana* Variant 2 – dominated by *Eucalyptus porosa* Variant 3 – dominated by *Eucalyptus dumosa* in areas where the understorey or other characteristics are consistent with the ecological community (i.e. would not occur on sand dunes where *Triodia scariosa* subsp. *scariosa* is prominent). Note: *Eucalyptus odorata* may be codominant in some areas. *Allocasuarina luehmannii* and *Casuarina pauper* can also be locally abundant, but not dominant across an entire patch.	No. Canopy does not consist of any of the key variant Eucalyptus species.	No. Canopy does not consist of any of the key variant Eucalyptus species.	Excluded from further assessment. Absence of trees therefore excluded from further assessment.	Excluded from further assessment. Absence of trees therefore excluded from further assessment.	Excluded from further assessment. Absence of trees therefore excluded from further assessment.
Small tree and large shrub canopy species and composition Does the patch contain a typically low (3-4m) small tree and/or shrub layer that is very sparse (<5 per cent cover)? A medium shrub layer may also be present but is normally very sparse (<10 per cent). AND Contain characteristic species provided in paragraph 2.1.4.2 of the listing advice?	No. Absence of trees therefore excluded from further assessment.	No. Absence of trees therefore excluded from further assessment.	No. Absence of trees therefore excluded from further assessment.	No. Absence of trees therefore excluded from further assessment.	No. Absence of trees therefore excluded from further assessment.

PCT 170 Condition:	Thinned		Derived		
Listing advice	**NM019**	**NM020**	**VNI MP 28**	**VNI MP 29**	**VNI MP 30**
Low shrub and ground layer species Does the patch have a distinct low to decumbent chenopod sub-shrub layer with a ground layer that is dominated by tussock grasses (possibly inconspicuous depending on drought conditions and grazing pressures)? AND Contain characteristic species provided in paragraph 2.1.4.3 of the listing advice?	Not assessed due to not meeting above criteria.	Not assessed due to not meeting above criteria.	Not assessed due to not meeting above criteria.	Not assessed due to not meeting above criteria.	Not assessed due to not meeting above criteria.
Outcome	**Does not meet key characteristics and condition threshold. Does not form part of the ecological community**	**Does not meet key characteristics and condition threshold. Does not form part of the ecological community**	**Does not meet key characteristics and condition threshold. Does not form part of the ecological community**	**Does not meet key characteristics and condition threshold. Does not form part of the ecological community**	**Does not meet key characteristics and condition threshold. Does not form part of the ecological community**

6.2.1.5 Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains – Critically Endangered

Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains (hereafter referred to as Seasonal Herbaceous Wetlands) is listed Critically Endangered under the EPBC Act.

Seasonal Herbaceous Wetlands is the name given to the ecological community comprising of wetland species that have adapted to seasonal drying and wetting or waterlogged conditions. This ecological community occurs on the lowland plains of temperate south-eastern Australia from Victoria, south-eastern South Australia and southern New South Wales.

Within the subject land, one vegetation type was considered likely to associate with this threatened ecological community being, PCT 47 – Swamp grassland wetland of the Riverine Plain. Vegetation associated with this PCT has been mapped during field validation surveys undertaken for the project, during field validation surveys undertaken for EnergyConnect (NSW – Eastern section) project (WSP, 2022) and as part of the SVTM.

A summary of relevant Commonwealth guidelines and policy statements available for this TEC is as follows:

- *Approved Conservation Advice for the Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains.* (DSEWPC, 2012a). In effect under the EPBC Act from 27 March 2012.
- *Commonwealth Listing Advice on Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains.* (TSSC, 2012b). In effect under the EPBC Act from 27-Mar-2012.

A comparison of the listing advice for Seasonal Herbaceous Wetlands and candidate PCT is provided in Table 6.13 and Table 6.14. Each element of the listing advice including locality, species composition, characteristic species and resilience is compared to each condition class for the candidate PCT to determine if vegetation recorded is consistent with the listing criteria. For areas not subject to field verification survey (SVTM), vegetation is assumed to meet both the key characteristics and condition thresholds for the community excluding Part C: Minimum Wetland Size of the condition thresholds. An analysis of Part C: Minimum Wetland Size has been undertaken for all areas of SVTM has been undertaken and is provided below in Table 6.15. Where candidate PCTs have been identified as part of EnergyConnect (NSW – Eastern section), data has been extracted from the BDAR and utilised in this assessment (WSP, 2022).

The location of Seasonal Herbaceous Wetlands in relation to the subject land is provided in Figure 15.9. A summary of Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains, associated PCT and extent within the disturbance area for each IBRA subregion is presented in Table 6.16.

Table 6.13 Assessment Step 1: use key diagnostic characteristics to identify if the ecological community is present for representative patches assigned to PCT 47 – Swamp grassland wetland of the Riverine Plain

Key diagnostic characteristics	PEC - Q194E
Landscape	Meets key diagnostic characteristics:
Limited to the temperate zones of mainland south – eastern Australia. The ecological community occurs in south – east SE, Victoria and southern NSW	Located in the Riverina (Murrumbidgee subregion) IBRA bioregion which occurs in southern NSW.
On flat plains grading into slopes, below 500 m asl	Occurs on a flat plain at <500 m elevation (about 125 m in elevation).
Associated soils are generally fertile but poorly draining clays derived from arrange of geologies	Occurs on poorly draining grey cracking clay.
Typically, in rainfall zones with a Winter seasonal rainfall pattern, extending into uniform seasonal rainfall pattern at the edge of its range. The mean annual rainfall is usually 400 to 800 mm/year but can be lower at the northern edge of its range.	Locality falls within a winter seasonal rainfall period which accumulates an average of about 400 mm of rain per annum.

Key diagnostic characteristics	PEC - Q194E
Hydrology On isolated drainage lines or depressions which are seasonally inundated (typically during winter-spring) and subsequently dry (typically by late summer) Rainfall is the main water source. These wetlands are not dependant on overbank flooding from riverine systems.	Meets key diagnostic characteristics: Occurs in isolated drainage lines and depressions that inundate with water following periods of winter rain. Rainfall is the main water source.
Biota Trees and shrubs are sparse to absent. When present, they mostly occur as fringing or scattered individuals. The cover of woody species accounts for no more than 10 per cent projective foliage cover across the wetland. The vegetative cover of the ecological community is dominated by a ground layer of native wetland graminoids and/or native wetland forbs A range of graminoids is often present and typically includes one or more of the following taxa: *Amphibromus* spp., *Carex tereticaulis, Deyeuxia* spp., *Glyceria* spp., *Lachnagrostis* spp., *Poa labillardieri* and *Rytidosperma duttonianum*. Note that other graminoid taxa may also occur, though are not necessarily common – refer to Appendix A of the listing advice for a plant species list. Freshwater algae often are present when the wetland is, or recently has been, wet.	Meets key diagnostic characterises: Trees were absent with scattered occurrences of *Duma florulenta* which did not exceed 10 per cent projected foliage cover (recorded as 1 per cent cover). Five native wetland graminoid species listed in Appendix A were recorded with a cover of 58.2 per cent and included *Juncus flavidus, Juncus radula, Lachnagrostis filiformis, Rytidosperma duttonianum* and *Walwhalleya proluta*; while 1 native wetland forb, *Swainsona procumbens*, was recorded with a cover of 0.1. Note sampling occurred prior to inundation by winter rains causing a reduction in forb richness. No algae was recorded; however, sampling occur prior to inundation by winter rains.
Modified wetlands Modifications to other types of wetland may result in the ecological community being present where it was formerly absent. These modified wetland sites are included as part of the national ecological community, if they remain a functional natural wetland and conform to the description of the ecological community	N/A – there is no evidence of modification to the sample site
Outcome	**Meets step 1 – key diagnostic characteristics**

Table 6.14 Assessment Step 2: Determine condition of the ecological community for representative patches assigned to PCT 47 – Swamp grassland wetland of the Riverine Plain

Condition thresholds	PEC - Q194E
Part A: Condition during 'typical' wet cycles. This is likely to occur in most years. It is best applied when the wetlands are inundated, or recently wet within a season, noting that some taxa may not have become apparent after recent filling. A1. Is the wetland consistent with the key diagnostics, noted above? AND A2. Is 50 per cent or more of the total cover of plants in the ground layer of the wetland dominated by native species characteristic of the Seasonal Herbaceous Wetlands ecological community?	A1. Meets condition threshold as sample meets the key diagnostic characteristics A2. Six native wetland graminoid and forb species were recorded with a cover of 79.3 per cent
Part B: To determine if the ecological community occurs at sites where there has been a prolonged dry period (e.g. drought of longer than a year)	Sample not taken during prolonged dry period; Part A conditions apply.
Part C: Minimum wetland size. The ecological community is naturally fragmented and occurs as discrete, often small wetlands. Figure 1 of the listing advice should be considered when assessing minimum size requirements. The following conditions apply. — Isolated wetland in a landscape – size must be at least 0.5 ha — Wetland occurs as a cluster of many small wetlands in reasonably close proximity (e.g. gilgais) – the collective area of wetlands within the cluster must be at least 0.5 ha AND the total area of the wetland proper accounts for 10 per cent or more of the total cluster area — Wetland is connected to, or part of, a native vegetation remnant and wetland or wetland cluster is < 0.5 ha – the actual wetland or wetland cluster is at least 0.1 ha AND the wetland is contiguous with a native vegetation remnant AND the total area of the wetland plus other native vegetation is at least 1 ha	Meets condition threshold. Occurs as an isolated wetland with a patch size > 0.5 ha (patch size is about 2 ha)
Part D: Very high-quality wetlands. Used to determine whether the wetland is of very high quality based on presence of three or more indicator plant species listed in Table 1 of the listing advice. Not used to determine whether the community occurs.	One species listed in Table 1 was recorded, *Swainsona procumbens*, however the sample was recorded before inundation by winter rains causing a reduction in species richness.
Outcome	**Meets Step 2 (Category A) – condition threshold and forms part of the ecological community**

Table 6.15 Analysis of Part C: Minimum wetland size for areas not subject to survey

Condition threshold	SVTM – Dinawan substation
Part C: Minimum wetland size. The ecological community is naturally fragmented and occurs as discrete, often small wetlands. Figure 1 of the listing advice should be considered when assessing minimum size requirements. The following conditions apply. — Isolated wetland in a landscape – size must be at least 0.5 ha — Wetland occurs as a cluster of many small wetlands in reasonably close proximity (e.g. gilgais) – the collective area of wetlands within the cluster must be at least 0.5 ha AND the total area of the wetland proper accounts for 10 per cent or more of the total cluster area — Wetland is connected to, or part of, a native vegetation remnant and wetland or wetland cluster is < 0.5 ha – the actual wetland or wetland cluster is at least 0.1 ha AND the wetland is contiguous with a native vegetation remnant AND the total area of the wetland plus other native vegetation is at least 1 ha	Meets condition threshold. Wetland is connected to native vegetation remnant with a collective wetland cluster size of approximately 60 ha and accounting for approximately 12 per cent of the total cluster area.
Outcome	**Meets Step 2 Part C – condition threshold and forms part of the ecological community**

Table 6.16 Summary of Seasonal Herbaceous Wetlands threatened ecological community within the subject land

Threatened ecological community	Vegetation type	IBRA subregion	Veg zone name (BAM-C)	Impact (ha)
Seasonal Herbaceous Wetlands	PCT 47 - Swamp grassland wetland of the Riverine Plain	Murrumbidgee	VZ 22 Mod-good	0.17
Total				0.17

6.2.1.6 Weeping Myall Woodlands

Weeping Myall Woodlands TEC is listed as Endangered under the EPBC Act.

Weeping Myall Woodlands TEC is described in the Listing Advice as an open woodland to woodland, with a sole or dominant overstorey, four to 12 metres high, of Weeping Myall (*Acacia pendula*) featuring commonly occurring Grey Mistletoe (*Amyema quandang*). Other trees that may occur, although would not dominate, include Western Rosewood (*Alectryon oleifolius* subsp. *elongatus*), Poplar Box (*Eucalyptus populnea*) and Blackbox (*E. largiflorens*). An open shrub layer and open ground layer of grasses and herbs is common. While this community can be a shrubby woodland, disturbance and dieback have led to a primarily grassy understorey.

This ecological community occurs on the inland alluvial plains west of the Great Dividing Range in NSW and Queensland, and one patch in northern Victoria. It occurs in the Riverina, NSW South Western Slopes, Darling Riverine Plains, Brigalow Belt South and North, Murray-Darling Depression, Nandewar and Cobar Peneplain bioregions. Associated with flat areas, shallow depressions or gilgais on raised alluvial plains that are rarely if ever flooded, this community occurs on arable land of black, brown, red-brown, or grey clay or clay loam soils.

Regular cycles of senescence and regeneration are a feature of Weeping Myall, which is also susceptible to defoliation by Bag-shelter Moth (*Ochrogaster lunifer*) contributing to the potential for a living, defoliated or dead state of this dominant tree. The death of canopy trees is therefore not considered to be an indicator of poor condition. Derived grasslands are not included in this listing, as it is not possible to determine whether existing grasslands and shrublands were previously associated with Weeping Myall.

Within the subject land one vegetation type was considered likely to associate with this threatened ecological community being, PCT 26 – Weeping Myall open woodland of the Riverina Bioregion and NSW South Western Slopes Bioregion. Vegetation associated with this PCT has been mapped during field validation surveys undertaken for the project, during field validation surveys undertaken for EnergyConnect (NSW – Eastern section) project (WSP, 2022) and as part of the SVTM.

A summary of relevant Commonwealth guidelines and policy statements available for this TEC is as follows:

- *Approved Conservation Advice for Weeping Myall Woodlands ecological community*. (DEWHA, 2008). In effect under the EPBC Act from 07 January 2009.
- *Commonwealth Listing Advice on Weeping Myall Woodlands*. (Threatened Species Scientific Committee, 2009). In effect under the EPBC Act from 07 January 2009.

For a vegetation patch to meet the threatened ecological listing of Weeping Myall Woodlands it must meet specific listing advice key characteristics and condition threshold criteria as outlined in Figure 6.3. An assessment of this key diagnostic characteristics and condition threshold criteria against recorded plot data is presented in Table 6.17. Where candidate PCTs have been identified by SVTM, vegetation has been assumed to meet benchmark conditions outlined in BioNet Vegetation Classification system for the purposes of this assessment and are considered to meet minimum requirements for Myall Woodlands TEC. Where candidate PCTs have been identified as part of EnergyConnect (NSW – Eastern section) project, data has been extracted from the BDAR and utilised in this assessment (WSP, 2022).

The location of Weeping Myall Woodlands in relation to the project subject land is provided in Figure 15.9. A summary of Weeping Myall Woodlands associated PCT and extent within the disturbance area for each IBRA subregion is presented in Table 6.18.

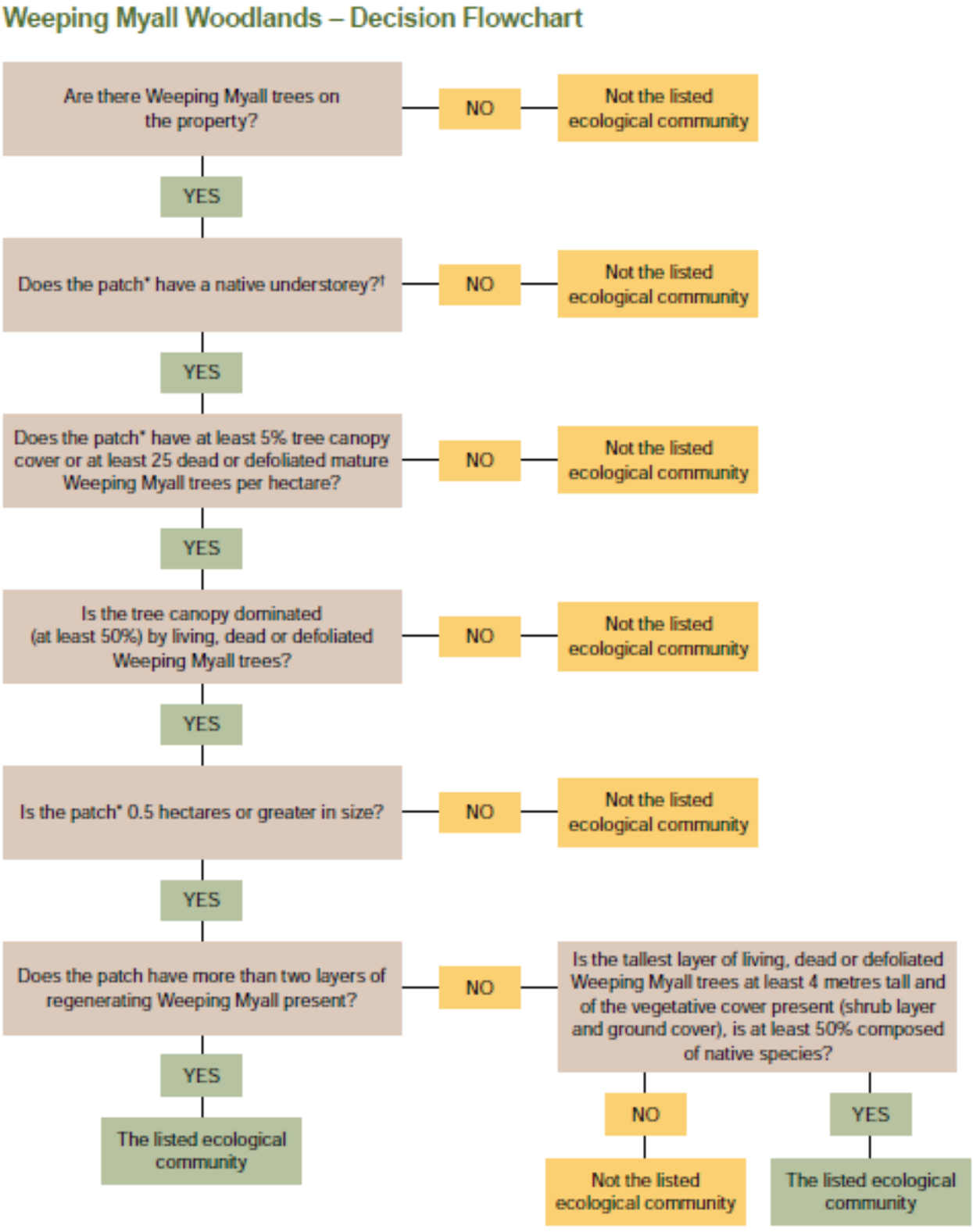


Figure 6.3 Listing advice key characteristics and condition threshold criteria for Weeping Myall Woodlands

Table 6.17 Assessment of EPBC Act listed Weeping Myall Woodlands and associated recorded vegetation in PCT 26

Listing advice	PCT 26 Moderate-good							PCT 26 Thinned				
	VNI_DR02	VNI_DR07	VNI_DR08	VNI_DR62	VNI_DR73	VNI_DR85	PEC – Q197E	VNI_DR29	VNI_DR30	VNI_DR61	VNI_DR83	VNI_DR84
The tree canopy is dominated (at least 50 % of trees present) by living, dead or defoliated Weeping Myall trees	Meets criteria. *Acacia pendula* was the only recorded tree species.	Meets criteria. *Acacia pendula* was the only recorded tree species.	Meets criteria. *Acacia pendula* comprise 70 % of the tree canopy cover.	Meets criteria. *Acacia pendula* was the only recorded tree species.	Meets criteria. *Acacia pendula* was the only recorded tree species.	Meets criteria. *Acacia pendula* was the only recorded tree species.	Meets criteria. *Acacia pendula* was the only recorded tree species.	Meets criteria. *Acacia pendula* was the only recorded tree species.	Meets criteria. *Acacia pendula* was the only recorded tree species.	Does not meet criteria. *Eucalyptus camaldulensis* was the only recorded tree species	Meets criteria. *Acacia pendula* was the only recorded tree species.	Meets criteria. *Acacia pendula* was the only recorded tree species.
The patch has a predominantly native understorey (>50 %).	Meets criteria. The patch has >50 % native cover in the understorey (native cover recorded at 97 %)	Meets criteria. The patch has >50 % native cover in the understorey (native cover recorded at 100 %)	Meets criteria. The patch has >50 % native cover in the understorey (native cover recorded at 89.1 %)	Meets criteria. The patch has >50 % native cover in the understorey (native cover recorded at 99.4 %)	Meets criteria. The patch has >50 % native cover in the understorey (native cover recorded at 88.3%)	Meets criteria. The patch has >50 % native cover in the understorey (native cover recorded at 91.4 %)	Meets criteria. The patch has >50 % native cover in the understorey (native cover recorded at 71 %)	Meets criteria. The patch has >50 % native cover in the understorey (native cover recorded at 96.2 %)	Meets criteria. The patch has >50 % native cover in the understorey (native cover recorded at 98 %)	Does not meet criteria. The patch has <50 % native cover in the understorey (native cover recorded at 30.9 %)	Meets criteria. The patch has >50 % native cover in the understorey (native cover recorded at 52.2 %)	Meets criteria. The patch has >50 % native cover in the understorey (native cover recorded at 60.8 %)
The overstorey must have at least 5 % tree canopy cover or at least 25 dead or defoliated mature Weeping Myall trees/ha	Meets criteria. >5 % tree canopy cover (recorded to be 5 %)	Meets criteria. >5 % tree canopy cover (recorded to be 20 %)	Meets criteria. >5 % tree canopy cover (recorded to be 7 %)	Meets criteria. >5 % tree canopy cover (recorded to be 20 %)	Meets criteria. <5 % tree canopy cover, however area subject to Bag Moth infestation. Tree canopy cover reviewed based on aerial imagery and deemed >5 % cover at patch level.	Meets criteria. >5 % tree canopy cover (recorded to be 5 %)	Meets criteria. >5 % tree canopy cover (recorded to be 5 %)	Does not meet criteria. <5 % tree canopy cover (recorded to be 2 % with <25 mature trees/ha). However, area subject to Bag Moth infestation. Tree canopy cover reviewed based on aerial imagery and deemed <5 % cover at patch level.	Does not meet criteria. <5 % tree canopy cover (recorded to be 2 % with <25 mature trees/ha). However, area subject to Bag Moth infestation. Tree canopy cover reviewed based on aerial imagery and deemed <5 % cover at patch level.	Meets criteria. >5 % tree canopy cover (recorded to be 5 %)	Does not meet criteria. <5 % tree canopy cover (recorded to be 2 % with <25 mature trees/ha). However, area subject to Bag Moth infestation. Tree canopy cover reviewed based on aerial imagery and deemed <5 % cover at patch level.	Does not meet criteria. <5 % tree canopy cover (recorded to be 3 % with no mature trees/ha). However, area subject to Bag Moth infestation. Tree canopy cover reviewed based on aerial imagery and deemed <5 % cover at patch level.
The area is at least 0.5 ha in size	Meets criteria. Patch size >4 ha.	Meets criteria. Patch size >4 ha.	Meets criteria. Patch size >15 ha.	Meets criteria. Patch size >60 ha.	Meets criteria. Patch size >30 ha.	Meets criteria. Patch size >100 ha.	Meets criteria. Patch size >40 ha.	Meets criteria. Patch size >200 ha.	Meets criteria. Patch size >20 ha.	Meets criteria. Patch size >5 ha.	Meets criteria. Patch size >80 ha.	Meets criteria. Patch size >10 ha.

Listing advice	PCT 26 Moderate-good							PCT 26 Thinned				
	VNI_DR02	VNI_DR07	VNI_DR08	VNI_DR62	VNI_DR73	VNI_DR85	PEC – Q197E	VNI_DR29	VNI_DR30	VNI_DR61	VNI_DR83	VNI_DR84
The patch has either: more than two layers of regeneration of Weeping Myall present OR the tallest layer of living, dead or defoliated Weeping Myall trees is at least 4 m tall and of the vegetative cover present, 50 % is comprised of native species	Meets criteria More than two layers of regeneration of Weeping Myall recorded.	Meets criteria More than two layers of regeneration of Weeping Myall recorded.	Meets criteria More than two layers of regeneration of Weeping Myall recorded.	Meets criteria More than two layers of regeneration of Weeping Myall recorded.	Meets criteria More than two layers of regeneration of Weeping Myall recorded.	Meets criteria More than two layers of regeneration of Weeping Myall recorded.	Meets criteria. The tallest layer of Weeping Myall was recorded to be 8 m tall and of all the vegetation cover present, 56.3 % is native.	Meets criteria No layers of regenerating Weeping Myall present. Tallest layer of Weeping Myall trees is >4m (recorded at 5m) and vegetation cover is >50 % native (recorded at 96.4 %).	Meets criteria More than two layers of regeneration of Weeping Myall recorded.	Does not meet criteria. No layers of regenerating Weeping Myall present. Vegetation cover is <50 % native.	Meets criteria More than two layers of regeneration of Weeping Myall recorded.	Meets criteria More than two layers of regeneration of Weeping Myall recorded.
Outcome	**Meets condition criteria – forms part of the ecological community**	**Meets condition criteria – forms part of the ecological community**	**Meets condition criteria – forms part of the ecological community**	**Meets condition criteria – forms part of the ecological community**	**Meets condition criteria – forms part of the ecological community**	**Meets condition criteria – forms part of the ecological community**	**Meets condition criteria – forms part of the ecological community**	**Does not meet condition criteria – does not form part of the ecological community.**	**Does not meet condition criteria – does not form part of the ecological community.**	**Does not meet condition criteria – does not form part of the ecological community.**	**Does not meet condition criteria – does not form part of the ecological community.**	**Does not meet condition criteria – does not form part of the ecological community.**

Table 6.18 Summary of Weeping Myall woodlands threatened ecological community within the indicative disturbance area

Threatened ecological community	Vegetation type	IBRA subregion	Veg zone name (BAM-C)	Impact (ha)
Weeping Myall woodlands	PCT 26 – Weeping Myall open woodland of the Riverina Bioregion and NSW South Western Slopes Bioregion	Murrumbidgee	VZ #13 Moderate-good	91.32
			VZ #34 SVTM	1.33
Total				**92.65**

6.2.1.7 White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland

PCTs 266 - White Box grassy woodland in the upper slopes subregion of the NSW South Western Slopes Bioregion and 277 - Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion are considered to form part of the White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland TEC (hereafter Box Gum Woodland) listed as Critically Endangered under the EPBC Act.

This TEC is described as a medium height open grassy woodland, with typical tree height of 30 metres, lower (15 metres) in more arid areas. In a mature and relatively undisturbed state, individual tree canopies are separate with a projected foliage cover rarely exceeding 30 per cent. Dominant tree species include White Box (*Eucalyptus albens*), Yellow Box (*E. melliodora*) and Blakely's Red Gum (*E. blakelyi*). Scattered to sparse shrubs are characteristic of undisturbed sites. High condition sites feature Western Wattle (*Acacia decora*) and Silver Wattle (*Acacia dealbata*). These species may be replaced by Cassinia (*Cassinia spp*.) after prolonged grazing. Native Blackthorn (*Bursaria spinosa*) and peas (*Dillwynia, Eutaxia, Pultenaea and Templetonia*) are commonly present. A diverse mix of ground layer tussocky grasses and herbs are common in sites with minimal degradation. Species include: *Austrostipa, Bothriochloa, Chloris, Cymbopogon, Dichanthium, Microlaena, Poa, Themeda, Rytidosperma* or *Sorghum.* A range of broad-leaved forbs and petaloid monocots are additional major components to the ground layer diversity of this community.

The ecological community is broadly distributed in an arc along the western slopes and tablelands of the Great Dividing Range from Southern Queensland through NSW and ACT, to Victoria. It is known to occur on hilly to undulating landscapes, in areas with soils of moderate fertility derived from a range of lithologies, including alkaline and acid volcanics, granites, sediments, serpentinites and metamorphics. Average rainfall is generally between 400 and 900 millimetres annually, on moderate to highly fertile soils at altitudes between 170 metres to 1200 metres. This community grades into shrubby woodlands on decreasingly fertile soils.

Derived native grassland may remain in the absence of trees, due to their removal. Conversely, some sites experience a highly modified ground layer in the presence of a remnant tree layer. Sites lacking a predominantly native ground layer are not considered to be part of this TEC. Condition class criteria are outlined within the Approved Conservation Advice (Cth DCCEEW 2023).

PCT 266 and PCT 277 are found within the Wagga to Gugaa component of the project within the Inland Slopes IBRA subregion and are associated with Box Gum Woodland CEEC. Both PCT 266 and PCT 277 have been assessed against key criteria outlined in the listing advice for Box Gum Woodland (DEH, 2006). Areas of PCT 277 in moderate-good condition state have not been subject to detailed survey effort and are subject to benchmark condition outlined in BioNet Vegetation Classification system. As such, all patches of PCT 277 moderate-good are considered to meet the minimum requirement for the community and have not been assessed below. Additionally, vegetation associated with PCT 277 in derived - low conservation value condition state were not retained for further assessment due to their low vegetation integrity score, high percentage of exotic cover, lack of canopy trees, and lack of native overstorey regeneration.

The remaining condition states of PCT 266 and PCT 277 have been assessed for suitability against the key criteria in Table 6.19 and Table 6.20.

Table 6.19 Assessment of PCT 266

Listing advice	PCT 266 – Moderate-good	PCT 266 – Thinned
	VNI_DR108	VNI_DR110
1. Is, or was previously, at least one of the most common overstorey species; White Box, Yellow Box or Blakely's Red Gum (or Western Grey Box or Coastal Grey Box in the Nandewar Bioregion)?	Yes White Box and Blakley's Red Gum are the only overstorey species present.	Yes White Box is the dominant overstorey species alongside *Callitris glaucophylla*.
2. Does the 'patch' have a predominantly native understorey (>50 % perennial native cover)?	Yes The understorey is predominantly perennial native (recorded at 24.9% perennial native and 11.5% exotic.	No The understorey is predominantly exotic (recorded at 27.4% perennial native and 37.9% Exotic).
3. Is the patch 0.1 ha or greater in size?	Yes The patch size is roughly 0.89 ha in size.	Yes The patch size is roughly 0.6 ha in size.
4(a). Are there 12 or more native understorey species present (excluding grasses)?	No The patch contained <12 native species excluding grasses (6 native species were recorded, a further 8 species were native grasses).	No The patch contained <12 native species excluding grasses (6 native species were recorded, a further 8 species were native grasses).
4(b). There must be at least one important species.	No No important species were recorded within this patch of vegetation.	No No important species were recorded within this patch of vegetation.
For condition classes that do not meet criteria 1-4:		
5. Where patches do not meet the criteria 4a and 4b, is the patch 2 ha or greater in size?	Yes The patch is approximately 6 ha in size.	No The patch size is roughly 0.6 ha in size.
6. Does the 2-ha patch have 40 or more trees with a DBH >40cm? (ie 20 per ha) or is there natural regeneration of the dominant overstorey Eucalypts?	Yes Regeneration of the dominant overstorey Eucalyptus has been recorded.	N/A
Does the PCT meet the criteria for this TEC?	**Does meet condition criteria – forms part of the ecological community.**	**Does not meet condition criteria – does not form part of the ecological community.**

Table 6.20 Assessment of PCT 277

Listing advice	PCT 277 - Thinned	
	VNI_OZ19	**VNI_DR113**
1. Is, or was previously, at least one of the most common overstorey species; White Box, Yellow Box or Blakely's Red Gum (or Western Grey Box or Coastal Grey Box in the Nandewar Bioregion)?	Yes Yellow Box and Blakely's Red Gum were the only overstorey species present.	Yes Blakely's Red Gum was the only overstorey species present.
2. Does the 'patch' have a predominantly native understorey (>50 % perennial native cover)?	No The patch of vegetation has a predominantly exotic understorey (recorded at 31.6% exotic and 19.3% perennial native).	Yes The patch of vegetation has a predominantly perennial native understorey (recorded at 53.2% perennial native and 6.6% exotic).
3. Is the patch 0.1 ha or greater in size?	Yes The patch size is roughly 3.6 ha in size.	Yes The patch size is roughly 1.0 ha in size.
4(a). Are there 12 or more native understorey species present (excluding grasses)?	No There are 3 native species in the understorey excluding grasses. Survey done in February 2025.	No There are 2 native species in the understorey excluding grasses. Survey done in February 2025.
4(b). There must be at least one important species.	No No important species were recorded within this patch of vegetation.	No No important species were recorded within this patch of vegetation.
For condition classes that do not meet criteria 1-4:		
5. Where patches do not meet the criteria 4a and 4b, is the patch 2 ha or greater in size?	Yes The patch size is roughly 3.6 ha in size.	Yes The patch size is roughly 8.5 ha in size.
6. Does the 2-ha patch have 40 or more trees with a DBH >40cm? (ie 20 per ha) or is there natural regeneration of the dominant overstorey Eucalypts?	Yes The patch has natural regeneration of the dominant overstorey Eucalypt species (*Eucalyptus melliodora*).	Yes The patch has more than 40 trees with a DBH >40 cm within a 2-ha patch (17 trees with a DBH >50 cm have been identified in a 20 x 50 m BAM VI plot).
Does the PCT meet the criteria for this TEC?	**Does meet condition criteria – does form part of the ecological community.**	**Does meet condition criteria – does form part of the ecological community.**

Table 6.21 Summary of Box Gum Woodlands threatened ecological community within subject land

Threatened ecological community	Vegetation type	IBRA subregion	Veg zone name (BAM-C)	Impact (ha)
White Box – Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grasslands	PCT 266 - White Box grassy woodland in the upper slopes subregion of the NSW South Western Slopes Bioregion	Inland Slopes	VZ #2 Moderate-good	0.16
			Thinned	0.02
	PCT 277 - Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	Inland Slopes	VZ #05 Thinned	3.01
			VZ #09 Moderate-good	0.19
Total				**3.38**

6.2.2 EPBC listed threatened flora species

Database searches (BioNet, BAM-C and PMST) alongside Appendix A of the SEARs identified a list of 27 threatened flora species under the EPBC Act with predicted habitat or identified known habitat within the subject land.

Five threatened flora species were have been recorded within the subject land, being:

- *Brachyscome papillosa* (Mossgiel daisy) - Vulnerable
- *Eleocharis obicis* (A spike rush) – Vulnerable
- *Lepidium monoplocoides* (Winged Peppercress) – Endangered
- *Maireana cheelii* (Chariot Wheels) – Vulnerable
- *Swainsona murrayana* (Slender Darling Pea) – Vulnerable.

In addition, a further eight threatened flora species were identified as having as having a moderate or high likelihood of occurrence:

- *Ammobium craspedioides* (Yass Daisy) - Vulnerable
- *Amphibromus fluitans* (Floating Swamp Wallaby-grass) – Vulnerable
- *Austrostipa metatoris* – Vulnerable
- *Austrostipa wakoolica* - Endangered
- *Brachyscome muelleroides* (Mueller Daisy) -Vulnerable
- *Sclerolaena napiformis* (Turnip Copperburr) – Endangered
- *Swainsona plagiotropis* (Red Darling-pea) – Vulnerable
- *Swainsona recta* (Small Purple-pea) – Vulnerable.

The potential impacts to EPBC Act listed threatened flora species were identified in accordance with the BAM and are outlined in section 5.5. For threatened flora species listed under the EPBC Act, significance assessments have been completed in accordance with the EPBC Act Policy Statement 1.1 Significant Impact Guidelines (Department of the Environment 2013) which are provided in Appendix C. Avoidance and minimisation measures are outlined in Chapter 8. The residual adverse impacts likely to occur to EPBC Act listed threatened flora species after avoidance and mitigation have been calculated in accordance with the BAM (in the form of biodiversity credits) and are presented in section 9.1.1.

6.2.3 EPBC listed threatened fauna species

Appendix A of the SEARs outlines an initial list of EPBC Act listed threatened fauna species likely to be impacted by the action. Combined with database searches (BioNet, BAM-C and PMST), there is predicted habitat or identified known habitat within the subject land for 45 threatened fauna species listed under the EPBC Act.

Seven listed threatened fauna species were recorded within the subject land:

- Southern Bell Frog (*Litoria raniformis)* – Vulnerable
- Southern Whiteface *(Aphelocephala leucopsis*) – Vulnerable
- Brown Treecreeper (south-eastern) (*Climacteris picumnus victoriae*) – Vulnerable
- Blue-winged Parrot (*Neophema chrysostoma)* – Vulnerable
- Plains-wanderer (*Pedionomus torquatus*) – Critically endangered
- Grey Falcon (*Falco hypoleucos*) – Vulnerable
- Diamond Firetail (*Stagonopleura guttata*) – Vulnerable.

In addition, 18 listed threatened fauna species were identified as having a moderate to high likelihood of occurrence within the subject land, including:

- Australasian Bittern (*Botaurus poiciloptilus*) – Endangered
- Sharp-tailed Sandpiper (*Calidris acuminata*) – Vulnerable
- Gang-gang Cockatoo (*Callocephalon fimbriatum*) – Vulnerable
- Latham's Snipe (*Gallinago hardwickii*) – Vulnerable
- Hooded Robin (*Melanodryas cucullata cucullata*) – Endangered
- Common Greenshank (*Tringa nebularia*) – Endangered
- Corben's Long-eared Bat (*Nyctophilus corbeni*) –Vulnerable
- Pink-tailed Worm-lizard (*Aprasia parapulchella*) – Vulnerable
- Grey Snake (*Hemiaspis damelii*) – Endangered
- Painted Honeyeater (*Grantiella picta*) – Vulnerable
- White-throated Needletail (*Hirundapus caudacutus*) – Vulnerable
- Pink Cockatoo (*Lophochroa leadbeateri*) – Endangered
- Superb Parrot (*Polytelis swainsonii*) – Vulnerable
- Koala (*Phascolarctos cinereus*) – Endangered
- Silver Perch (*Bidyanus bidyanus*) – Endangered
- Murray Hardyhead (*Bidyanus bidyanus*) – Endangered
- Flathead Galaxias (*Galaxias rostratus*) – Critically Endangered
- Murray Cod (*Maccullochella peelii*) – Vulnerable.

The potential impacts to EPBC Act listed threatened fauna species were identified in accordance with the BAM and are outlined in section 5.5. For threatened fauna species listed under the EPBC Act, significance assessments have been completed in accordance with the EPBC Act Policy Statement 1.1 Significant Impact Guidelines (Department of the Environment 2013) which are provided in Appendix C. Avoidance and minimisation measures are outlined in Chapter 8.

The residual adverse impacts likely to occur to EPBC Act listed threatened fauna species after avoidance and mitigation have been calculated in accordance with the BAM (in the form of biodiversity credits) and are presented in section 9.1.1.

6.2.4 EPBC listed migratory species

EPBC listed migratory species have not been identified as a relevant controlling provision as part of Attachment A of the SEARs and, thus, are not assessed further. Despite this, migratory species were considered through the route selection process where direct and associated impacts were limited in areas of wetland habitats. The Murray Valley National Park (including the Wetuppa Forest within the Noorong-Wetuppa area) is one area of wetland habitat that was considered during the route selection process to alleviate impacts to wetland habitats used by migratory species.

Additional mitigation measures associated with migratory species are also to be implemented, as seen in section 9.4.2. Bird diverters would be installed and maintained during the construction and early operation phase. The placement of such diverters would be focused on areas within one kilometre of wetland and riverine habitats, such as the Wakool Wetland Complex. This would decrease the risk of bird strike for migratory species, alongside contributing to the Connectivity Strategy.

6.2.5 Offsets for EPBC Act listed species

Any offsets proposed for impacts to EPBC Act listed threatened species have been identified in accordance with the NSW BOS, the NSW Assessment Bilateral Agreement – Amending Agreement No. 1, and NSW BC Regulation. Further details on required offsets is provided in section 11.3.

7 Identifying prescribed impacts

Prescribed impacts are those that may affect biodiversity values in addition to, or instead of, impacts from clearing vegetation. These impacts may be difficult to quantify or offset as they often affect biodiversity values that are irreplaceable. Prescribed additional biodiversity impacts (prescribed impacts) must be assessed as per clause 6.1 of the BC Regulation. The BC Regulation (clause 6.1) identifies actions that are prescribed as impacts to be assessed under the biodiversity offsets scheme as follows:

a) impacts of development on the habitat of threatened species or ecological communities associated with:

(i) karst, caves, crevices, cliffs and other geological features of significance, or

(ii) rocks, or

(iii) human made structures, or

(iv) non-native vegetation

b) impacts of development on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range

c) impacts of development on movement of threatened species that maintains their life cycle

d) impacts of development on water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities (including from subsidence or upsidence resulting from underground mining)

e) impacts of wind turbine strikes on protected animals

f) impacts of vehicle strikes on threatened species or on animals that are part of a TEC.

A summary of the relevant prescribed impacts associated with the project is provided in Table 7.1.

The location of the potential prescribed impacts associated with the project are illustrated in the Figure 15.1 Site Map and Figure 15.2 Location Map.

The list of threatened entities likely to use the habitats and feature/s identified as a prescribed impact was generated by considering the list of threatened species auto-generated by the BAM-C for the subject land, BioNet records within the vicinity of the subject land, information on threatened species and TECs occurrence from previous surveys (e.g. from existing BDARs) and data layers, and the results of field surveys.

Wind farm impacts are not applicable. The impacts of wind turbine strike on protected animals is only applicable for wind farm developments. The project does not include development of wind turbines, so an assessment of wind turbine strike is not required.

Potential impacts from vehicle strike are addressed with regard to identifying a list of threatened fauna or protected fauna species that are part of a TEC and at risk of vehicle strike due to the project, and illustrating potential areas of vehicle strike on a map (see Figure 15.1 Site Map and Figure 15.2 Location Map).

The impacts and mitigation for prescribed impacts are discussed in section 9.3 and section 9.3.7.

Table 7.1 Prescribed impacts identified

Feature	Present	Description of feature characteristics and location	Threatened entities that use, are likely to use, or are part of the habitat feature. Where relevant, threatened species or fauna that are part of a TEC or EC, that are at risk of vehicle strike
Karst, caves, crevices, cliffs, rocks or other geological features of significance	☒Yes / ☐No	No karst, caves, crevices or cliffs considered to be relevant to prescribed impacts are present. An area with rocky substrate occurs near the eastern end of the project has been mapped.	Pink-tailed Worm Lizard potential habitat.
Human-made structures	☐Yes / ☒No	No substantial human-made structures (such as old farm buildings, mine infrastructure etc) are present in the subject land.	N/A
Non-native vegetation	☒Yes / ☐No	See detailed description of non-native vegetation in section 4.1.2. Potentially used by some threatened species for movement or foraging. Unlikely to be a limiting feature of the habitat for these species in the locality due to the extensive areas of agricultural paddocks. The location of these features are illustrated in Figure 15.4 and Figure 15.6.	Koala (*Phascolarctos cinereus*) – Koalas do utilise agricultural land and would cross fences and cleared paddocks (see Kavanagh & Stanton, 2012) and there are documented interactions of Koalas and cattle (see Hill *et al.,* 2019). Use of scattered trees in paddocks is also documented (see Barth *et al.,* 2019). May potentially occur in the assessment area.
Habitat connectivity	☒Yes / ☐No	The corridor alignment crosses areas of habitat connectivity (see section 3.2.3). These habitat corridors are likely to be important components of the habitat and facilitate species movement and genetic exchange. The location of these features are illustrated in Figure 15.16.	These corridors would link habitat for the threatened species (see section 3.2.3). The project may impact the movement aerial species such as birds and bats due to the placement of transmission lines and transmission line structures. Movement corridors between nature reserves may be affected, potentially impacting threatened species such as the Grey-crowned Babbler, Large Bent-wing Bat, Large-eared Pied Bat, Diamond Firetail, Dusky Woodswallow, Brown Treecreeper, and Speckled Warbler. However, the project would be highly permeable and is unlikely to result in substantial impacts to local or regional connectivity. Remnant linear roadside reserves are important habitats for species such as the Squirrel Glider, and their long-term viability is likely to remain post-construction.

Feature	Present	Description of feature characteristics and location	Threatened entities that use, are likely to use, or are part of the habitat feature. Where relevant, threatened species or fauna that are part of a TEC or EC, that are at risk of vehicle strike
Waterbodies, water quality and hydrological processes	☒Yes / ☐No	The corridor alignment crosses or is near several waterways (see section 3.2.2). Substantial impacts to water quality to these water bodies are not expected to occur, with all permanent disturbance areas located outside core riparian zone areas. All construction and operation impacts would be managed to ensure ground disturbance is minimised and managed and direct impacts to the waterbodies themselves and related hydrological processes are not expected to occur. All waterway crossing would be designed in accordance with DPI *Guidelines for Controlled Activities on Waterfront Land* (2018), *Why Do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings* (Fairfull and Witheridge, 2003) and *Policy & Guidelines for Fish Habitat Conservation & Management (2013 update)* (Department of Primary Industries, 2013). The location of these features are illustrated in the Figure 15.1 – Figure 15.3.	Amphibians, terrestrial species, and aerial species identified in Chapter 5 and threatened fish species. However, as substantial impacts to these water bodies are not expected to occur (all permanent disturbance areas located outside core riparian zone) species that use these habitat features would not be detrimentally impacted.
Wind turbine strikes (wind farm development only)	☐Yes / ☒No	The project is not a wind farm development	N/A

Feature	Present	Description of feature characteristics and location	Threatened entities that use, are likely to use, or are part of the habitat feature. Where relevant, threatened species or fauna that are part of a TEC or EC, that are at risk of vehicle strike
Vehicle strikes	☒Yes / ☐No	The corridor alignment is located adjoining to or crosses multiple regional and local roads. The project is likely to generate additional vehicular movements along these roads, mostly during construction but also during operation. The location of where the alignment crosses major roads is illustrated in the Figure 15.1 Site Map.	Threatened species to be impacted are identified in section 5.5. Protected fauna species that are most at risk from vehicle strikes based on observations of roadkill made in the locality and database records are: — Mammals including Eastern Grey Kangaroo, Red-necked Wallaby, Common Wallaroo, Swamp Wallaby, Common Wombat, Short-beaked Echidna, Common Brushtail Possum, Common Ringtail Possum, Sugar Glider, Squirrel Glider, Koala. — Reptiles including Common Bearded Dragon, Jacky Lizard, Nobbi Dragon, Red-bellied Black Snake, Eastern Brown Snake, Eastern Bluetongue, Shingleback Lizard (Boggi), Lace Monitor, Snake-necked Turtle. — Amphibians including Ornate Burrowing Frog, Common Froglet, Eastern Sign-bearing Froglet, Brown Toadlet, Striped Marsh Frog, Spotted Grass Frog, Eastern Banjo Frog, Peron's Tree Frog, Broad-palmed Frog, Green Tree Frog, Tyler's Tree Frog, Eastern Dwarf Tree Frog. — Birds including Wedge-tailed Eagle, Whistling Kite, Australian Wood Duck, Pacific Black Duck, Masked Lapwing, Australian Magpie, Pied Currawong, White-winged Chough, Apostlebird, Australian Raven, Red-browed Finch, Double-barred Finch, Zebra Finch, Superb Fairy-wren, Variegated Fairy-wren, Noisy Miner, Australian Pipit, Willie Wagtail, Grey Fantail, Sulphur-crested Cockatoo, Little Corella, Gang-gang Cockatoo, Galah, Cockatiel, Yellow-tailed Black-cockatoo, Australian King-parrot, Red-winged Parrot, Musk Lorikeet, Swift Parrot, Budgerigar, Turquoise Parrot, Bluebonnet, Eastern Rosella, Crimson Rosella, Red-rumped Parrot, Scaly-breasted Lorikeet, Rainbow Lorikeet, Southern Boobook, Barn Owl, Emu.

Stage 2: Impact assessment (biodiversity values and prescribed impacts)

8 Avoid and minimise impacts

The following provides information on avoiding and minimising impacts on biodiversity values through the planning and design phase of the project. This information is provided to directly address Section 7 of the BAM.

8.1 Avoid and minimise direct and indirect impacts

8.1.1 Background

The Australian Energy Market Operator (AEMO) estimates that around 90 per cent of Australia's coal-fired generation would withdraw from the market by 2035 (AEMO, 2024). This would increase pressure on energy supply, particularly as energy consumption continues to increase in NSW. To reduce this pressure, the National Electricity Market (NEM) is currently transitioning from a system dominated by coal-fired generation to one of diverse renewable and distributed energy generation, supported by energy storage and network solutions. However, areas with greater renewable energy potential are often remote from the existing transmission network.

As part of the infrastructure required to meet this ongoing transition, Transgrid and Transmission Company Victoria (TCV) are jointly developing a new electrical connection collectively referred to as the Victoria NSW Interconnector West project (VNI West). TCV is a new company created by AEMO Victorian Planning (the Victorian transmission planner) to progress the VNI West transmission project. VNI West would form a new transmission link between NSW and Victoria to harness clean, low-cost electricity from Renewable Energy Zones (REZ) in both states (including the declared South West REZ (in NSW) and Murray River REZ (in Victoria)) and improve the reliability and security of electricity supply. Overall, VNI West proposes around 480 kilometres of new high voltage, 500 kilovolt (kV) double-circuit overhead transmission line that would connect the high voltage electricity grids in NSW and Victoria. The VNI West project would connect the Western Renewables Link project (at Bulgana in Victoria) with EnergyConnect (NSW Eastern Section) at the future Dinawan substation in NSW (currently in construction) via a new substation near Kerang (in Victoria).

8.1.2 Approach to VNI West corridor development

The VNI West corridor and route selection followed a transparent and consistent process throughout a number of phases to identify the final easement. In terms of biodiversity values steps were taken to avoid impacts to biodiversity at each phase including the corridor and route identification phases. The phases identified include (refer to Appendix C (Options report) of the EIS):

- identify project need
- identify strategic feasible options
- identify the 10 kilometre width corridor based on Technical (land use, engineering, tenure, bushfire), Environment (ecology, heritage tenure, hydrology and soils) and Social and Community (land use, visual and landscape)
- refining the corridor to a single preferred route up to around one kilometre in width
- environmental assessment – narrowing the preferred route to a transmission line corridor of around 200 metres in width
- identify the easement for the transmission line for the preferred route.

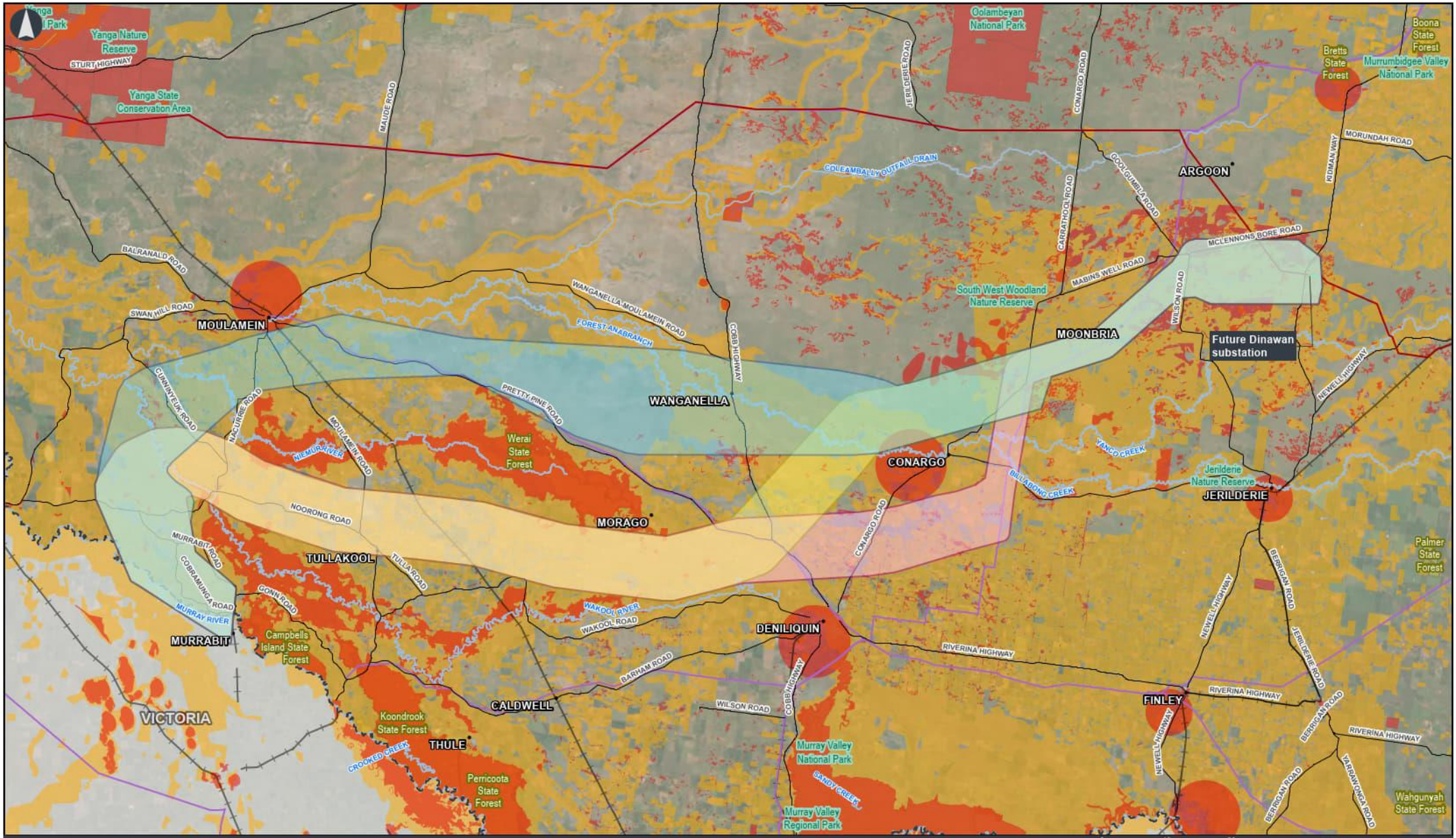
8.1.3 Summary of options assessment

Three preliminary corridors were considered within the final identified area of interest (refer to Figure 8.1). These corridors consisted of the following:

- *Swan Hill North*: The corridor provides a crossing of the Victoria/NSW border to the east of the town of Swan Hill. The initial section would provide a northern alignment, within a widened area to the west of Moulamein to provide flexibility to minimise potential impacts to the Murray Valley National Park (including the Wetuppa Forest within the Noorong-Wetuppa area). East of Moulamein, the corridor would then travel south-east to run parallel along a section of Pretty Pine Road. From this point, the corridor traverses generally east within an expanded section of corridor (to provide flexibility in the area crossing the Cobb Highway and north of Wanganella). The corridor would traverse north of Conargo before aligning north-east to the future Dinawan substation.
- *Swan Hill Central*: This corridor provides a crossing of the Victoria/NSW border to the east of Swan Hill and would provide a similarly aligned corridor direction north towards Moulamein. The corridor would turn east, generally at a point where it crosses the Murray Valley National Park (including the Wetuppa Forest within the Noorong-Wetuppa area), and traverses north of Campbells Island State Forest. From this point, the corridor traverses a primarily east alignment towards Deniliquin, to the south of the former Werai State Forest and along the alignment of townships including Nooroong, Tullakool, Burraboi, Wakool and Calimo. At Pretty Pine (located at the junction of Pretty Pine Road and the Cobb Highway north-west of Deniliquin) the corridor would travel in a north-east alignment to the north of Conargo, continuing north-east towards the future Dinawan substation, aligning with the localities of Wandook, Conargo and Moonbria.
- *Swan Hill Central (alternative*): This corridor would follow the same alignment as the Swan Hill Central option until it reaches Pretty Pine, north-west of Deniliquin. At this point, the corridor would continue east, traversing to the south of Conargo before turning directly north and then north-east, generally parallel with the existing 132 kV transmission line, to reach the future Dinawan substation.

Following identification of the preliminary corridors, the following steps for the corridor assessment were completed:

- geo-spatial mapping of the identified high, medium and low constraints and taking into consideration potential opportunities
- a full comparative and multi-criteria analysis (MCA) scoring assessment of the options
- a range of workshops and stakeholder discussions including a series of workshops/sessions with the Regional Reference Group.



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VNI West (NSW)

Figure 8.1
Initial corridor options considered within the final area of interest

Legend

- Main road
- Rail line
- Named waterway
- EnergyConnect (NSW - Eastern section) project transmission line (under construction)
- Existing transmission line
- Substation
- National park
- State forest

Corridor options

- Swan Hill North
- Swan Hill Central (Alternative)
- Swan Hill Central

Constraints

- High
- Moderate
- NSW/Victorian border



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Data sources: NSW EPI, DELWP, WSP, EnergyConnect

8.1.4 Final preferred corridor

Multiple refinements were made to produce the final preferred corridor as detailed in the *VNI West (NSW) Final Corridor Report* (Transgrid, 2023b). The technical, environmental, and social and community constraints, and community and stakeholder input refinements include:

- expanding (widening) the recommended draft corridor to the north. This supported potential future route options that would:
  - minimise impact to productive irrigation land and dwellings near Moulamein
  - further avoid areas of mapped Plains-wanderer habitat
  - maximise the potential to follow public land corridors including travelling stock routes
  - broadly align with road corridors including Wanganella Road and Mabins Well Road
  - minimise conflict with current renewable developments to the west of the future Dinawan substation
  - removing constraints around the Moulamein airport following feedback on the current use of the site
  - modifying the western section of the corridor to align the border crossing based on ongoing discussion with TCV to align the preferred corridor with the former (disused) Stony Crossing Railway line.

8.2 Micro siting process

As identified in Section 3 (Project description) of the EIS, micro siting would be utilised where practicable during finalisation of the design and construction methodology for the project to avoid impacts to matters of biodiversity conservation significance. Micro siting of the transmission line infrastructure and associated construction working areas and other areas of disturbance would occur to avoid impacts wherever practicable. Site features with the highest biodiversity conservation significance would be given the highest priority. In particular threatened species recorded and their habitat such as Important Habitat Map areas for Plains-wanderer.

8.3 Avoid and minimise prescribed impacts

8.3.1 Project location

The VNI West project includes the main transmission line extending from the NSW/Victorian border to the future Dinawan substation (currently under construction as part of the EnergyConnect (NSW – Eastern section) project). An additional area of the project footprint is located between the existing Wagga 330 kV substation and the future Gugaa 500 kV substation (construction of which is subject to separate planning approval as part of the HumeLink project) to accommodate the network augmentation works.

The new transmission line extending from the NSW/Victorian border to the future Dinawan substation is a new 500 kV double-circuit transmission that crosses the border near Murrabit passing to the north of Moulamein and then travels east to the future Dinawan substation. The nominal distance would be around 240 kilometres.

The network augmentation between the existing Wagga 330 kV substation and the future Gugaa 500 kV substation includes replacing nine kilometres of an existing 330 kV single circuit transmission line (Line 51) generally between Ivydale Road (south of the existing Wagga 330 kV substation) and the future Gugaa 500 kV substation with a new double circuit 330 kV transmission line.

In accordance with Section 7.1 of the BAM, efforts to avoid and minimise impact on native vegetation and habitat through design of the project are addressed in Table 8.1.

Table 8.1 Efforts to avoid and minimise impacts on native vegetation and habitat during project design

Principles	Proposal consistency
Designing a proposal to avoid and minimise impact on native vegetation, threatened species, threatened ecological communities and their habitat (section 7.2.1 of BAM)	
a. locate surface works to avoid direct impacts on the habitat features identified in Chapter 6	The approach outlined in section 9.3 has ensured that: – impacts to rocky habitats have been avoided or minimised – impacts to habitat connectivity and species movement have been avoided and minimised – impacts to water-related values have been avoided and minimised – impacts of vehicle strikes have been avoided and minimised.
b. locate subsurface works, in both the horizontal and vertical planes, to avoid and minimise operations beneath the habitat features identified in Chapter 6. For example, locating longwall panels away from geological features of significance, groundwater-dependent plant communities and their supporting aquifers	The approach outlined in section 9.3 has ensured that: — impacts to rocky habitats have been avoided and minimised — impacts to habitat connectivity and species movement have been avoided and minimised — impacts to water-related values have been avoided and minimised — impacts of vehicle strikes have been avoided and minimised. Subsurface works are expected to be minor.
c. locate the proposal to avoid severing or interfering with corridors connecting different areas of habitat and migratory flight paths, to important habitat or local movement pathways	The approach outlined in section 9.3 has ensured that: — impacts to rocky habitats have been avoided and minimised — impacts to habitat connectivity and species movement have been avoided and minimised — impacts to water-related values have been avoided and minimised — impacts of vehicle strikes have been avoided and minimised. Connectivity may be impacted to some degree, particularly for avifauna, waterbirds, woodland birds, arboreal mammals, southern myotis, however such impacts are not expected to be significant. It is not possible to avoid some impact on connectivity given that the project is long and linear, and needs to be located in the general area and in a manner that is functional.
d. optimise the proposal layout to minimise interactions with threatened entities; for example, design a wind farm that has i. 100 m turbine-free buffers around features that attract and support aerial species, such as forest edges, riparian corridors, wetlands, ridgetops and gullies ii. turbine-free corridors in zones of regular movement for species of concern, to avoid a barrier effect	The approach outlined in section 9.3.7 has ensured that: — impacts to rocky habitats have been avoided and minimised — impacts to habitat connectivity and species movement have been avoided and minimised — impacts to water-related values have been avoided and minimised — impacts of vehicle strikes have been avoided and minimised. The EIS outlines the approach to the identification and refinement of the project corridor. A hierarchy of constraints and opportunities was used to define and refine the preliminary and preferred transmission line corridors.
e. locate the proposal to avoid impacts on water bodies or hydrological processes.	No waterbodies would be directly impacted. The approach outlined in section 9.3.5 has ensured that impacts to water-related values have been avoided and minimised.

8.3.2 *Project design*

Section 7.1.2 of the BAM deals with designing the project to avoid or minimise direct and indirect impacts on native vegetation, threatened species, threatened ecological communities and their habitat. Section 8.1 and the EIS identified and evaluated three corridor options to avoid and minimise impacts on biodiversity values.

There are no alternatives to the project and the 'do nothing' is discussed in section 8.4 and the project has been designed in a sympathetic manner and impacts to biodiversity have been avoided and minimised where possible. There are no alternative modes or technologies, alternative routes, alternative locations, or alternative sites that would reduce prescribed biodiversity impacts.

8.4 Other measure considered

As outlined in Chapter 2 (Strategic context, need and project development) of the EIS, not proceeding with the project (or a 'do nothing' option) was considered as part of the overall development of the project. The 'do nothing' option would however not meet NSW needs for future energy transmission. The 'do nothing' option would also lead to missed opportunity to harness the energy generated by current and future renewable developments within the South West REZ and to reduce Australia's dependency on fossil fuels for energy, which create GHG emissions. In particular, AEMO has identified VNI West as a key 'actionable' transmission project in the 2024 ISP (AEMO, 2024).

Based on the above, the 'do nothing' option was not considered to be a feasible option for the project.

8.5 Summary of measures to avoid and minimise impacts

Table 8.2 documents the measures to avoid and minimise direct, indirect and prescribed impacts.

Table 8.2 Avoidance and minimisation measures for direct, indirect and prescribed impacts

Action	**Outcome** **(Describe the outcome of implementing the measure, with reference to specific entities identified in Chapters 4 and 5)**	**Timing**
Identified and evaluated a range of alignment corridor options.	Three options considered include: — Swan Hill North — Swan Hill Central — Swan Hill Central (alternative)	Planning Design Phase – complete
Locating the project to avoid high biodiversity values.	The project has avoided or minimised impacts to the following biodiversity values: — Important Habitat Map areas for the Plains-wanderer — NSW threatened ecological communities such as *Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregion* — EPBC threatened ecological communities —*Natural Grasslands of the Murray Valley Plains and Weeping Myall Woodlands and White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland.*	Planning Design Phase – complete

Action	Outcome (Describe the outcome of implementing the measure, with reference to specific entities identified in Chapters 4 and 5)	Timing
Locating ancillary facilities to avoid high biodiversity values.	The development of the location of ancillary facilities included locating sites in disturbed locations with lower biodiversity value or likely to be disturbed as part of the construction of the project to limit impacts on threatened species (or their habitats) or threatened ecological communities (within the meaning of the BC Act or the EPBC Act) particularly in locations where species have been recorded during targeted surveys.	Planning Design Phase – complete
Vegetation and habitat removal minimised through implementation of a varied disturbance regime.	The design of the project incorporates a variety of disturbance areas of varying impact intensity as opposed to a single disturbance area where complete vegetation and habitat removal would occur. This approach is outlined in detail in Chapter 9. Opportunities exist in the detailed design phase to micro-site project features away from areas of high biodiversity values.	Design Phase
Avoiding and minimising prescribed impacts	The approach outlined in section 9.3.7 has ensured that: — impacts to rocky habitats have been avoided or minimised — impacts to habitat connectivity and species movement have been avoided or minimised such as the Edward and Wakool rivers. — impacts to water-related values have been avoided and/or minimised — impacts of vehicle strikes have been avoided and minimised. Opportunities exist in the detailed design phase to micro-site project features away from prescribed impact matters.	Design Phase

9 Impact assessment

Assessment of direct impacts unable to be avoided has been carried out in accordance with Section 8 of the BAM. To assess the construction impacts from each stage, a disturbance area (as defined in section 1.2.4) has been used. For this report, the disturbance area has the same meaning as 'development site' as defined in the BAM.

It should be noted that final design the project has not been completed and as a result the disturbance area is based on a reference design. It has been applied to this assessment to enable assessment of the likely quantum and type of impacts of the project. These would be confirmed following the completion of the final design.

9.1 Direct impacts

9.1.1 Residual direct impacts to plant community types

The overall direct impacts to PCTs and habitat for the various threatened species is 1,432.61 hectares, with 1,234.08 hectares located within disturbance area A (see Table 9.1). Within this area of direct impact:

- 269.68 hectares is within the Murray Fans IBRA subregion.
- 1,102.08 hectares is within the Murrumbidgee IBRA subregion.
- 60.83 hectares is within the Inland Slopes IBRA subregion.

Table 9.2 to Table 9.4 document the impacts likely to occur in the subject land after steps taken to avoid and minimise impacts. The final impacts likely to occur on the subject land are illustrated in Figure 15.12.

For derived vegetation conditions, the impacts are limited to Disturbance area A where there would be complete vegetation removal and potential sub-surface impacts through construction activities such as grading, excavation, and full tree removal. The impacts from Disturbance area B4, B10 and HZ are not applicable to vegetation zones that do not contain vegetation growth forms over four metres in height.

Table 9.1 Summary of residual direct impacts to PCTs identified within the subject land

PCT ID number and name	Disturbance area A impact (ha)	Disturbance area B4 impact (ha)	Disturbance area B10 (ha)	Disturbance area HZ impact (ha)	Total impact (ha)
2 - River Red Gum-sedge dominated very tall open forest in frequently flooded forest wetland along major rivers and floodplains in south-western NSW	0.02	0.10	0.00	0.00	0.12
7 - River Red Gum - Warrego Grass - herbaceous riparian tall open forest wetland mainly in the Riverina Bioregion	1.46	2.17	0.00	1.04	4.67
10 - River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	19.63	10.97	0.00	5.64	36.24
11 - River Red Gum - Lignum very tall open forest or woodland wetland on floodplains of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	0.13	0.26	0.00	0.10	0.49

PCT ID number and name	Disturbance area A impact (ha)	Disturbance area B4 impact (ha)	Disturbance area B10 (ha)	Disturbance area HZ impact (ha)	Total impact (ha)
13 - Black Box - Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	116.23	48.12	0.00	0.00	164.36
15 - Black Box open woodland wetland with chenopod understorey mainly on the outer floodplains in south-western NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	58.84	40.88	0.00	0.00	99.72
17 - Lignum shrubland wetland of the semi-arid (warm) plains (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	15.01	0.00	0.00	0.00	15.01
19 - Cypress Pine woodland of source-bordering dunes mainly on the Murray and Murrumbidgee River floodplains	0.54	1.05	0.00	0.00	1.59
20 - Buloke - Moonah - Black Box open woodland on sandy rises of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	1.79	0.13	0.07	0.00	1.99
23 - Yarran tall open shrubland of the sandplains and plains of the semi-arid (warm) and arid climate zones	8.21	1.65	0.18	0.00	10.04
24 - Canegrass swamp tall grassland wetland of drainage depressions, lakes and pans of the inland plains	7.02	0.00	0.00	0.00	7.02
26 - Weeping Myall open woodland of the Riverina Bioregion and NSW South Western Slopes Bioregion	239.87	77.06	15.66	0.00	332.59
28 - White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone	36.43	4.37	0.92	0.00	41.72
44 - Forb-rich Speargrass - Windmill Grass - White Top grassland of the Riverina Bioregion	33.73	0.00	0.00	0.00	33.73
45 - Plains Grass grassland on alluvial mainly clay soils in the Riverina Bioregion and NSW South Western Slopes Bioregion	9.54	0.00	0.00	0.00	9.54
46 - Curly Windmill Grass - speargrass - wallaby grass grassland on alluvial clay and loam on the Hay Plain, Riverina Bioregion	58.42	0.00	0.00	0.00	58.42
47 - Swamp grassland wetland of the Riverine Plain	0.17	0.00	0.00	0.00	0.17

PCT ID number and name	Disturbance area A impact (ha)	Disturbance area B4 impact (ha)	Disturbance area B10 (ha)	Disturbance area HZ impact (ha)	Total impact (ha)
58 - Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion	0.57	0.39	0.01	0.00	0.97
70 - White Cypress Pine woodland on sandy loams in central NSW wheatbelt	0.16	0.00	0.00	0.00	0.16
76 - Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	0.30	0.00	0.00	0.00	0.30
86 - Yellow Gum tall woodland of the Murray River floodplain, Riverina Bioregion	0.05	0.00	0.00	0.00	0.05
157 - Bladder Saltbush shrubland on alluvial plains in the semi-arid (warm) zone including Riverina Bioregion	99.46	0.00	0.00	0.00	99.46
159 - Old Man Saltbush shrubland mainly of the semi-arid (warm) climate zone (south western NSW)	0.05	0.00	0.00	0.00	0.05
160 - Nitre Goosefoot shrubland wetland on clays of the inland floodplains	16.87	0.00	0.00	0.00	16.87
163 - Dillon Bush (Nitre Bush) shrubland of the semi-arid and arid zones	79.02	0.00	0.00	0.00	79.02
164 - Cotton Bush open shrubland of the semi-arid (warm) zone	357.73	0.00	0.00	0.00	357.73
170 - Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones	3.51	2.08	0.02	0.00	5.61
216 - Black Roly Poly low open shrubland of the Riverina Bioregion and Murray Darling Depression Bioregion	10.46	0.00	0.00	0.00	10.46
237 - Riverine Western Grey Box grassy woodland of the semi-arid (warm) climate zone	0.21	0.48	0.00	0.15	0.84
266 - White Box grassy woodland in the upper slopes subregion of the NSW South Western Slopes Bioregion	0.10	0.04	0.00	0.04	0.18
277 - Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	42.87	0.79	0.00	0.40	44.06
319 - Tumbledown Red Gum - White Cypress Pine hill woodland in the southern part of the NSW South Western Slopes Bioregion	12.41	0.04	0.00	0.04	12.49

PCT ID number and name	Disturbance area A impact (ha)	Disturbance area B4 impact (ha)	Disturbance area B10 (ha)	Disturbance area HZ impact (ha)	Total impact (ha)
343 - Mugga Ironbark - Red Box - Red Stringybark - Western Grey Box grass/shrub woodland on metamorphic substrates in the Tarcutta - Gundagai region, NSW South Western Slopes Bioregion	3.79	0.00	0.00	0.01	3.80
Totals	**1,234.08**	**191.10**	**16.86**	**7.42**	**1432.60**

Disturbance type:

- Disturbance area A (including TLCL) = Includes vegetation (including tree) removal and potential sub-surface impacts through construction activities such as grading, excavation, and full tree removal.
- Disturbance area B4 = Refers to an area between transmission line structures in which it is assumed vegetation removal would be required to meet the vegetation clearance heights of 4 metres. Trees within this area that would or have the potential to exceed growth heights greater than 4 metres would be removed.
- Disturbance area B10 = Refers to an area between transmission line structures in which it is assumed vegetation removal would be required to meet the vegetation clearance heights of 10 metres. Trees within this area that would or have the potential to exceed growth heights greater than 10 metres would be removed. For the purposes of this assessment, areas of impact to vegetation with a growth height potential of 10 metres or above have been amalgamated into Disturbance area B4, while vegetation with a growth height potential of 10 metres or less would be retained as part of the partial clearing model and have not been included in the overall impact calculations.
- Disturbance area HZ = Refers to an area adjacent to Disturbance area B which is known as a hazard tree zone. The hazard tree zone is inspected for trees within the risk category height range 20 to 30 metres. Then those that meet the height category are considered for structural stability. A structurally sound tree with no obvious risk of falling is left standing. Trees with obvious defects that pose a risk of falling on conductors or other infrastructure are removed.

Table 9.2 Summary of residual direct impacts for the Murray Fans IBRA subregion

BAM-C Veg Zone Number	BAM-C – Vegetation zone name	PCT ID number and name	Condition/other defining feature	Disturbance area A impact (ha)	Disturbance area B4 impact (ha)	Disturbance area B10 impact (ha)	Disturbance area HZ impact (ha)	Total impact (ha)
22	2_SVTM	2 - River Red Gum-sedge dominated very tall open forest in frequently flooded forest wetland along major rivers and floodplains in south-western NSW	Benchmark	0.02	0.10	0.00	0.00	0.12
1	7_Moderate-good	7 - River Red Gum - Warrego Grass - herbaceous riparian tall open forest wetland mainly in the Riverina Bioregion	Moderate-good	1.46	2.17	0.00	1.04	4.67
3	10_Moderate-good	10 - River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Moderate-good	5.23	5.47	0.00	2.77	13.47
4	10_Thinned		Thinned	5.31	4.88	0.00	2.47	12.66
23	10_SVTM		Benchmark	0.37	0.62	0.00	0.40	1.39
2	10_Derived		Derived	3.52	0.00	0.00	0.00	3.52
33	10_Derived_LCV		Derived - Low Conservation Value	5.20	0.00	0.00	0.00	5.20

BAM-C Veg Zone Number	BAM-C – Vegetation zone name	PCT ID number and name	Condition/other defining feature	Disturbance area A impact (ha)	Disturbance area B4 impact (ha)	Disturbance area B10 impact (ha)	Disturbance area HZ impact (ha)	Total impact (ha)
5	11_Moderate-good	11 - River Red Gum - Lignum very tall open forest or woodland wetland on floodplains of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Moderate-good	0.13	0.26	0.00	0.10	0.49
7	13_Moderate-good	13 - Black Box - Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Moderate-good	28.82	30.83	0.00	0.00	59.65
8	13_Thinned		Thinned	13.31	8.65	0.00	0.00	21.96
24	13_SVTM		Benchmark	8.09	6.26	0.00	0.00	14.35
34	13_Planted_ NatVeg		Planted Native Vegetation	0.06	0.14	0.00	0.00	0.20
31	13_Derived		Derived	15.11	0.00	0.00	0.00	15.11
6	13_Derived_LCV		Derived - Low Conservation Value	49.33	0.00	0.00	0.00	49.33

BAM-C Veg Zone Number	BAM-C – Vegetation zone name	PCT ID number and name	Condition/other defining feature	Disturbance area A impact (ha)	Disturbance area B4 impact (ha)	Disturbance area B10 impact (ha)	Disturbance area HZ impact (ha)	Total impact (ha)
10	15_Moderate-good	15 - Black Box open woodland wetland with chenopod understorey mainly on the outer floodplains in south-western NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Moderate-good	6.49	5.95	0.00	0.00	12.44
11	15_Thinned		Thinned	1.40	1.24	0.00	0.00	2.64
25	15_SVTM		Benchmark	0.68	0.90	0.00	0.00	1.58
32	15_Derived		Derived	5.23	0.00	0.00	0.00	5.23
9	15_Derived_LCV		Derived - Low Conservation Value	6.38	0.00	0.00	0.00	6.38
12	17_Moderate-good	17 - Lignum shrubland wetland of the semi-arid (warm) plains (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Moderate-good	0.14	0.00	0.00	0.00	0.14
26	19_SVTM	19 - Cypress Pine woodland of source-bordering dunes mainly on the Murray and Murrumbidgee River floodplains	Benchmark	0.54	1.05	0.00	0.00	1.59
13	28_Derived	28 - White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone	Derived	0.20	0.00	0.00	0.00	0.20
14	28_Derived_TS		Tall Shrubland	0.19	0.48	0.00	0.00	0.67

BAM-C Veg Zone Number	BAM-C – Vegetation zone name	PCT ID number and name	Condition/other defining feature	Disturbance area A impact (ha)	Disturbance area B4 impact (ha)	Disturbance area B10 impact (ha)	Disturbance area HZ impact (ha)	Total impact (ha)
27	44_SVTM	44 - Forb-rich Speargrass - Windmill Grass - White Top grassland of the Riverina Bioregion	Benchmark	10.17	0.00	0.00	0.00	10.17
35	86_Moderate-good	86 - Yellow Gum tall woodland of the Murray River floodplain, Riverina Bioregion	Moderate-good	0.05	0.00	0.00	0.00	0.05
15	160_Moderate-good	160 - Nitre Goosefoot shrubland wetland on clays of the inland floodplains	Moderate-good	0.14	0.00	0.00	0.00	0.14
29	163_SVTM	163 - Dillon Bush (Nitre Bush) shrubland of the semi-arid and arid zones	Benchmark	1.02	0.00	0.00	0.00	1.02
17	163_Moderate-good		Moderate-good	14.08	0.00	0.00	0.00	14.08
28	160_SVTM		Benchmark	0.04	0.00	0.00	0.00	0.04
16	163_Derived_LCV		Derived - Low Conservation Value	0.68	0.00	0.00	0.00	0.68
19	164_Moderate-good	164 - Cotton Bush open shrubland of the semi-arid (warm) zone	Moderate-good	3.46	0.00	0.00	0.00	3.46
30	164_SVTM		SVTM	0.09	0.00	0.00	0.00	0.09
18	164_Derived_LCV		Derived - Low Conservation Value	5.48	0.00	0.00	0.00	5.48

BAM-C Veg Zone Number	BAM-C – Vegetation zone name	PCT ID number and name	Condition/other defining feature	Disturbance area A impact (ha)	Disturbance area B4 impact (ha)	Disturbance area B10 impact (ha)	Disturbance area HZ impact (ha)	Total impact (ha)
20	216_Moderate-good	216 - Black Roly Poly low open shrubland of the Riverina Bioregion and Murray Darling Depression Bioregion	Moderate-good	0.66	0.00	0.00	0.00	0.66
21	237_Moderate-good	237 - Riverine Western Grey Box grassy woodland of the semi-arid (warm) climate zone	Moderate-good	0.21	0.48	0.00	0.15	0.84
Totals				**193.29**	**69.48**	**0.00**	**6.93**	**269.68**

Table 9.3 Summary of residual direct impacts for the Murrumbidgee IBRA subregion

BAM-C Veg Zone Number	BAM-C – Vegetation zone name	PCT ID number and name	Condition/other defining feature	Disturbance area A impact (ha)	Disturbance area B4 impact (ha)	Disturbance area B10 impact (ha)	Disturbance area HZ impact (ha)	Total impact (ha)
1	13_Moderate-good	13 - Black Box - Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Moderate-good	1.51	2.23	0.00	0.00	3.75
31	13_SVTM		Benchmark	0.00	0.01	0.00	0.00	0.01
3	15_Moderate-good		Moderate-good	29.84	32.61	0.00	0.00	62.45
46	15_Thinned	15 - Black Box open woodland wetland with chenopod understorey mainly on the outer floodplains in south-western NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Thinned	0.54	0.18	0.00	0.00	0.72
32	15_SVTM		Benchmark	0.33	0.00	0.00	0.00	0.33
2	15_Derived		Derived	7.95	0.00	0.00	0.00	7.95
4	17_Moderate-good	17 - Lignum shrubland wetland of the semi-arid (warm) plains (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Moderate-good	12.49	0.00	0.00	0.00	12.49
33	17_SVTM		Benchmark	2.38	0.00	0.00	0.00	2.38

BAM-C Veg Zone Number	BAM-C – Vegetation zone name	PCT ID number and name	Condition/other defining feature	Disturbance area A impact (ha)	Disturbance area B4 impact (ha)	Disturbance area B10 impact (ha)	Disturbance area HZ impact (ha)	Total impact (ha)
5	20_Derived	20 - Buloke - Moonah - Black Box open woodland on sandy rises of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Derived	0.99	0.00	0.00	0.00	0.99
47	20_Derived_LCV		Derived - Low Conservation Value	0.77	0.00	0.00	0.00	0.77
6	20_Thinnned		Thinned	0.03	0.13	0.07	0.00	0.16
7	23_Derived	23 - Yarran tall open shrubland of the sandplains and plains of the semi-arid (warm) and arid climate zones	Derived	2.71	0.00	0.00	0.00	2.71
8	23_Derived_LCV		Derived - Low Conservation Value	3.54	0.00	0.00	0.00	3.54
9	23_Moderate-good		Moderate-good	1.83	1.58	0.18	0.00	3.41
49	23_Thinned		Thinned	0.13	0.07	0.00	0.00	0.20
10	24_Moderate-good	24 - Canegrass swamp tall grassland wetland of drainage depressions, lakes and pans of the inland plains	Moderate-good	7.02	0.00	0.00	0.00	7.02
11	26_Derived	26 - Weeping Myall open woodland of the Riverina Bioregion and NSW South Western Slopes Bioregion	Derived	138.90	0.00	0.00	0.00	138.90
12	26_Derived_LCV		Derived - Low Conservation Value	1.29	0.00	0.00	0.00	1.29
13	26_Moderate-good		Moderate-good	49.73	41.59	8.74	0.00	91.32
14	26_Thinned		Thinned	48.62	35.47	6.92	0.00	84.09
34	26_SVTM		Benchmark	1.33	0.00	0.00	0.00	1.33

BAM-C Veg Zone Number	BAM-C – Vegetation zone name	PCT ID number and name	Condition/other defining feature	Disturbance area A impact (ha)	Disturbance area B4 impact (ha)	Disturbance area B10 impact (ha)	Disturbance area HZ impact (ha)	Total impact (ha)
48	28_Moderate-good	28 - White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone	Moderate-good	1.36	1.58	0.37	0.00	2.94
15	28_Derived		Derived	19.63	0.00	0.00	0.00	19.63
16	28_Tall Shrubland		Tall Shrubland	0.45	0.19	0.00	0.00	0.64
17	28_Derived _LCV		Derived - Low Conservation Value	5.03	0.00	0.00	0.00	5.03
18	28_Thinned	28 - White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone	Thinned	3.53	2.12	0.55	0.00	5.65
35	28_SVMT		Benchmark	6.04	0.00	0.00	0.00	6.04
36	44_SVTM	44 - Forb-rich Speargrass - Windmill Grass - White Top grassland of the Riverina Bioregion	Benchmark	8.79	0.00	0.00	0.00	8.79
19	44_Moderate-good		Moderate-good	14.77	0.00	0.00	0.00	14.77
37	45_SVTM	45 - Plains Grass grassland on alluvial mainly clay soils in the Riverina Bioregion and NSW South Western Slopes Bioregion	Benchmark	5.96	0.00	0.00	0.00	5.96
20	45_Moderate-good		Moderate-good	3.58	0.00	0.00	0.00	3.58

BAM-C Veg Zone Number	BAM-C – Vegetation zone name	PCT ID number and name	Condition/other defining feature	Disturbance area A impact (ha)	Disturbance area B4 impact (ha)	Disturbance area B10 impact (ha)	Disturbance area HZ impact (ha)	Total impact (ha)
44	46_SVTM	46 - Curly Windmill Grass - speargrass - wallaby grass grassland on alluvial clay and loam on the Hay Plain, Riverina Bioregion	Benchmark	19.07	0.00	0.00	0.00	19.07
21	46_Moderate-good		Moderate-good	39.35	0.00	0.00	0.00	39.35
22	47_Moderate-good	47 - Swamp grassland wetland of the Riverine Plain	Moderate-good	0.17	0.00	0.00	0.00	0.17
24	58_Thinned	58 - Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion	Thinned	0.38	0.32	0.01	0.00	0.70
23	58_Moderate-good		Moderate-good	0.19	0.07	0.00	0.00	0.26
38	70_SVTM	70 - White Cypress Pine woodland on sandy loams in central NSW wheatbelt.	Benchmark	0.16	0.00	0.00	0.00	0.16
25	157_Moderate-good	157 - Bladder Saltbush shrubland on alluvial plains in the semi-arid (warm) zone including Riverina Bioregion	Moderate-good	91.91	0.00	0.00	0.00	91.91
39	157_SVTM		Benchmark	7.55	0.00	0.00	0.00	7.55
40	159_SVTM	159 - Old Man Saltbush shrubland mainly of the semi-arid (warm) climate zone (south western NSW)	Benchmark	0.05	0.00	0.00	0.00	0.05

BAM-C Veg Zone Number	BAM-C – Vegetation zone name	PCT ID number and name	Condition/other defining feature	Disturbance area A impact (ha)	Disturbance area B4 impact (ha)	Disturbance area B10 impact (ha)	Disturbance area HZ impact (ha)	Total impact (ha)
45	160_SVTM	160 - Nitre Goosefoot shrubland wetland on clays of the inland floodplains	Benchmark	1.37	0.00	0.00	0.00	1.37
26	160_Moderate-good		Moderate-good	15.32	0.00	0.00	0.00	15.32
27	163_Moderate-good	163 - Dillon Bush (Nitre Bush) shrubland of the semi-arid and arid zones	Moderate-good	51.98	0.00	0.00	0.00	51.98
41	163_SVTM		Benchmark	11.26	0.00	0.00	0.00	11.26
28	164_Moderate-good	164 - Cotton Bush open shrubland of the semi-arid (warm) zone	Moderate-good	253.05	0.00	0.00	0.00	253.05
43	164_SVTM		Benchmark	95.65	0.00	0.00	0.00	95.65
29	170_Derived	170 - Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones	Derived	1.42	0.00	0.00	0.00	1.42
30	170_Thinned		Thinned	2.09	2.08	0.02	0.00	4.17
42	216_Moderate-good	216 - Black Roly Poly low open shrubland of the Riverina Bioregion and Murray Darling Depression Bioregion	Moderate-good	9.80	0.00	0.00	0.00	9.80
Totals				**981.84**	**120.23**	**16.86**	**0.00**	**1102.08**

Table 9.4 Summary of residual direct impacts for the Inland Slopes IBRA subregion

BAM-C Veg Zone Number	BAM-C – Vegetation zone name	PCT ID number and name	Condition/other defining feature	Disturbance area A impact (ha)	Disturbance area B4 impact (ha)	Disturbance area B10 impact (ha)	Disturbance area HZ impact (ha)	Total impact (ha)
1	76_Thinned	76 - Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	Thinned	0.30	0.00	0.00	0.00	0.30
2	266_Mod-good	266 - White Box grassy woodland in the upper slopes subregion of the NSW South Western Slopes Bioregion	Mod-good	0.08	0.04	0.00	0.04	0.16
3	266_Thinned		Thinned	0.02	0.00	0.00	0.00	0.02
4	277_Dervied_ LCV	277 - Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	Derived - Low Conservation Value	40.86	0.00	0.00	0.00	40.86
9	277_Mod-good		Mod-good	0.19	0.00	0.00	0.00	0.19
5	277_Thinned		Thinned	1.82	0.79	0.00	0.40	3.01
6	319_Dervied_ LCV	319 - Tumbledown Red Gum - White Cypress Pine hill woodland in the southern part of the NSW South Western Slopes Bioregion	Derived - Low Conservation Value	11.66	0.00	0.00	0.00	11.66
7	319_Thinned		Thinned	0.75	0.04	0.00	0.04	0.83

BAM-C Veg Zone Number	BAM-C – Vegetation zone name	PCT ID number and name	Condition/other defining feature	Disturbance area A impact (ha)	Disturbance area B4 impact (ha)	Disturbance area B10 impact (ha)	Disturbance area HZ impact (ha)	Total impact (ha)
8	343_Dervied_ LCV	343 - Mugga Ironbark - Red Box - Red Stringybark - Western Grey Box grass/shrub woodland on metamorphic substrates in the Tarcutta - Gundagai region, NSW South Western Slopes Bioregion	Derived - Low Conservation Value	3.79	0.00	0.00	0.00	3.79
10	343_Mod-good		Mod-good	0.00	0.00	0.00	0.01	0.01
Totals				**59.47**	**0.87**	**0.00**	**0.49**	**60.83**

9.1.2 Change in vegetation integrity score

The BAM has been established under the guiding principle of avoid and minimise impacts to biodiversity values. For impacts that cannot be totally avoided, impacts must be minimised to enable better outcomes for biodiversity values.

During operation, the transmission line easement would be managed through the removal of vegetation with specific growth height levels in accordance with vegetation clearing requirements (i.e. down to a growth height of four metres) leaving the midstorey and ground layers intact.

In assessing direct impacts on native vegetation, future vegetation integrity scores were calculated in the BAM-C for each disturbance area subset and associated vegetation zone as follows:

- for disturbance area A (Management Zone A in the BAM-C), the future vegetation integrity score was calculated as zero (assuming total loss of all biodiversity values)
- for disturbance area B4, B10 (partial clearing of the transmission line easement) and HZ future vegetation integrity scores have been calculated through assuming total loss of tree related values and calculating changes to mean average scores in attributes associated with composition condition, structure condition, and function condition. Each disturbance area has been categorised as different Management Zones B4, B10 and HZ in the BAM-C.

For the calculations of impact, this assessment outlines that there would be no impact to vegetation zones that do not exceed four metres in natural growth height within Disturbance area B4, B10 and HZ i.e. no impact to these areas as there is no tree/shrub layer or no vegetation removal is required.

This partial clearing of the transmission line easement forms part of the measures taken to minimise impacts to biodiversity values. Maintaining a shrub layer would help avoid total loss of species richness, encourage native species and limit colonisation opportunities of introduced species (see Clarke and White, 2008). To facilitate these partial vegetation clearing scenarios, the BAM allows for circumstances where partial clearing of vegetation is proposed, and remaining vegetation would be maintained (i.e. not degraded further over time). The future value of the relevant VI attributes can be determined as greater than zero in these circumstances.

Table 9.6 to Table 9.8 details the changes to vegetation integrity for each IBRA subregion within the subject land.

9.1.2.1 Evidence-based approach to assessing partial impacts

Transmission line clearings develop into novel habitats over time (see Eldridge, Eyitayo et al., 2017) and species and functional composition have been shown to be different between sites with control and thinned canopy treatments with proportionally more individuals of grasses and forbs in thinned plots (see Tsai et al., 2018). Where structural elements such as the canopy tree layer is removed from existing transmission line easements across NSW, shrubby mid storey layer, or derived shrub land vegetation structure may develop.

Canopy opening disturbance has immediate and substantive effects on understory microclimate and therefore the establishment and growth of understory plants (Tsai et al., 2018). Where shrub and ground stratum cover increases it has been documented that composition or species richness may decrease through species being out competed by more dominant species. Studies show a general shift to early successional shade intolerant species and those species that reproduce through clonal growth (see Luken, et al., 1992; Eldridge, Eyitayo et al. 2017; Walker & Koen, 1995).

Transgrid have undertaken an evidence-based approach to assessing partial impacts associated with the project. The evidence incorporates detailed field survey across historically managed transmission easements and verification of post construction easement corridor for EnergyConnect (NSW – Western section) (WSP 2025) and Central-West Orana Renewable Energy Zone (CWO REZ) transmission infrastructure Project (WSP 2023) (refer to Appendix N of this BDAR).

Appendix N provides evidence to support and the justify the quantum of partial loss applied to disturbance area B and HZ based on field data collected from existing transmission line easements in the locality.

Specifically, these assessments provide (through collection of paired BAM plots) changes in VI and individual attribute scores across the dominant formations identified with a partial impact.

The key trends observed throughout the post construction areas of Disturbance Areas B, were:

- while significantly reduced, some canopy composition and structure values are retained within the easement
- the composition and structure for key attributes of grass and forbs was consistently observed to increase in value across a range of PCTs and formations
- exotic composition and structure increased following construction but not to the detriment of native understorey values

The observed trends from field survey are generally supported by the broader scientific literature in areas of disturbance following removal or reduction in canopy and shrub layers.

Table 9.5 below outlines how the future means for disturbance area B4, B10 and HZ were calculated based on the evidence base collected from partial impacts within transmission lines.

Table 9.5 Future vegetation integrity score adjustment based on vegetation formation

BAM-C attribute	Vegetation layer	Vegetation formation				
		Grassy woodland	Semi-arid woodland (Shrubby)	Semi-arid woodland (Grassy)	Forested wetland	Dry-sclerophyll Forest (Shrubby)
Composition	Tree	Complete removal	30% reduction	50 % reduction	Complete removal	Complete removal
	Shrub	10 % reduction	10 % reduction	20 % reduction	30 % reduction	30 % reduction
	Grass/grasslike	10 % reduction	No reduction	No reduction	30 %reduction	30 % reduction
	Forb/fern/other	No reduction	No reduction	No reduction	30 %reduction	30 % reduction
Structure	Tree	No reduction	No reduction	No reduction	30 % reduction	30 % reduction
	Shrub	Complete removal	50 % reduction	80 % reduction	Complete removal	Complete removal
	Grass/grasslike	No reduction	5 % reduction	30 %r eduction	30 % reduction	30 % reduction
	Forb/fern/other	No reduction	No reduction	No reduction	30 % reduction	30 % reduction
Function	Tree	Complete removal	Complete removal	Complete removal	Complete removal	Complete removal
	Understory	30 % reduction in leaf litter and fallen timber				

Table 9.6 Impacts to vegetation integrity for the Murray Fans IBRA subregion

BAM-C #	BAM-C – Vegetation zone name	Management zone[1]	Area (ha)	Before development				After development				Change
				Composition	Structure	Function	VI score	Composition	Structure	Function	VI score	Change in VI score
22	2_SVTM	Area A	0.02	100	100	100	100	0	0	0	0	-100
		Area B4	0.10	100	100	100	100	79.4	64.2	30.7	53.9	-46.1
1	7_Moderate-good	Area A	1.46	81.6	61.5	83	74.7	0	0	0	0	-74.7
		Area B4	2.17	81.6	61.5	83	74.7	51.7	21.8	19.5	28	-46.7
		Area HZ	1.04	81.6	61.5	83	74.7	51.7	21.8	19.5	28	-46.7
3	10_Moderate-good	Area A	5.23	25.2	28.2	42.9	31.3	0	0	0	0	-31.3
		Area B4	5.47	25.2	28.2	42.9	31.3	12.5	0.6	10.2	5	-26.2
		Area HZ	2.77	25.2	28.2	42.9	31.3	12.5	0.6	10.2	5	-26.2
4	10_Thinned	Area A	5.31	48.8	17.3	26.1	28	0	0	0	0	-28
		Area B4	4.88	48.8	17.3	26.1	28	24.6	2.3	2.7	5.4	-22.6
		Area HZ	2.47	48.8	17.3	26.1	28	24.6	2.3	2.7	5.4	-22.6
23	10_SVTM	Area A	0.37	100	100	100	100	0	0	0	0	-100
		Area B4	0.62	100	100	100	100	79.4	64.2	30.7	53.9	-46.1
		Area HZ	0.40	100	100	100	100	79.4	64.2	30.7	53.9	-46.1
2	10_Derived	Area A	3.52	40.6	3.6	4.4	8.7	0	0	0	0	-8.7
33	10_Derived_LCV	Area A	5.20	55.8	13	0	9	0	0	0	0	-9

BAM-C #	BAM-C – Vegetation zone name	Management zone[1]	Area (ha)	Before development				After development				Change
				Composition	Structure	Function	VI score	Composition	Structure	Function	VI score	Change in VI score
5	11_Moderate-good	Area A	0.13	95.1	13.2	60	42.3	0	0	0	0	-42.3
		Area B4	0.26	95.1	13.2	60	42.3	82.6	2.6	20.9	16.6	-25.7
		Area HZ	0.10	95.1	13.2	60	42.3	82.6	2.6	20.9	16.6	-25.7
7	13_Moderate-good	Area A	28.82	78	49.6	45.8	56.2	0	0	0	0	-56.2
		Area B4	30.83	78	49.6	45.8	56.2	68.7	11.6	9.4	19.6	-36.6
8	13_Thinned	Area A	13.31	69.5	48.6	42.8	52.5	0	0	0	0	-52.5
		Area B4	8.65	69.5	48.6	42.8	52.5	58.4	16	11.7	22.2	-30.2
24	13_SVTM	Area A	8.09	100	100	100	100	0	0	0	0	-100
		Area B4	6.26	100	100	100	100	94.4	63	30.7	56.7	-43.3
34	13_Planted_NatVeg	Area A	0.06	56	77.1	80.1	70.2	0	0	0	0	-70.2
		Area B4	0.14	56	77.1	80.1	70.2	48	64.9	10.1	31.6	-38.6
31	13_Derived	Area A	15.11	59.9	11.1	0	8.7	0	0	0	0	-8.7
6	13_Derived_LCV	Area A	49.33	43.4	45.9	0	12.6	0	0	0	0	-12.6
10	15_Moderate-good	Area A	6.49	81.4	78.2	59.5	72.3	0	0	0	0	-72.3
		Area B4	5.95	81.4	78.2	59.5	72.3	75	48.7	24	44.4	-28
11	15_Thinned	Area A	1.40	68.1	33.3	23.4	37.5	0	0	0	0	-37.5
		Area B4	1.24	68.1	33.3	23.4	37.5	63.1	17.8	0.3	10.4	-27.2
25	15_SVTM	Area A	0.68	100	100	100	100	0	0	0	0	-100
		Area B4	0.90	100	100	100	100	94.4	63	30.7	56.7	-43.3

BAM-C #	BAM-C – Vegetation zone name	Management zone[1]	Area (ha)	Before development				After development				Change
				Composition	Structure	Function	VI score	Composition	Structure	Function	VI score	Change in VI score
32	15_Derived	Area A	5.23	41	42	0	12	0	0	0	0	-12
9	15_Derived_LCV	Area A	6.38	31	9.6	0	6.7	0	0	0	0	-6.7
12	17_Moderate-good	Area A	0.14	65	64.6	0	64.8	0	0	0	0	-64.8
26	19_SVTM	Area A	0.54	100	100	100	100	0	0	0	0	-100
		Area B4	1.05	100	100	100	100	98.7	97.2	30.7	66.5	-33.5
13	28_Derived	Area A	0.20	16.9	13.3	0	6.1	0	0	0	0	-6.1
14	28_Derived_TS	Area A	0.19	78.6	40	16.7	37.5	0	0	0	0	-37.5
		Area B4	0.48	78.6	40	16.7	37.5	77.7	39.5	11.3	32.7	-4.8
27	44_SVTM	Area A	10.17	100	100	0	100	0	0	0	0	-100
35	86_Moderate-good	Area A	0.05	100	100	100	100	0	0	0	0	-100
15	160_Moderate-good	Area A	0.14	26.4	80.8	0	46.2	0	0	0	0	-46.2
28	160_SVTM	Area A	0.04	100	100	0	100	0	0	0	0	-100
17	163_Moderate-good	Area A	14.08	69.2	100	0	83.2	0	0	0	0	-83.2
29	163_SVTM	Area A	1.02	100	100	0	100	0	0	0	0	-100
16	163_Derived_LCV	Area A	0.68	55.3	71.1	0	62.7	0	0	0	0	-62.7
19	164_Moderate-good	Area A	3.46	85.5	89.7	0	87.6	0	0	0	0	-87.6
30	164_SVTM	Area A	0.09	100	100	0	100	0	0	0	0	-100

BAM-C #	BAM-C – Vegetation zone name	Management zone[1]	Area (ha)	Before development				After development				Change
				Composition	Structure	Function	VI score	Composition	Structure	Function	VI score	Change in VI score
18	164_Derived_LCV	Area A	5.48	44.9	76.6	0	58.7	0	0	0	0	-58.7
20	216_Moderate-good	Area A	0.66	65.5	86.4	0	75.3	0	0	0	0	-75.3
21	237_Moderate-good	Area A	0.21	69.6	43.3	87.2	64	0	0	0	0	-64
		Area B4	0.48	69.6	43.3	87.2	64	58.4	24.9	34.3	36.8	-27.2
		Area HZ	0.15	69.6	43.3	87.2	64	58.4	24.9	34.3	36.8	-27.2

(1) Management zones where; Area A = Disturbance Area A. Area B4 = Disturbance area B4 & Area HZ = Disturbance area HZ

Table 9.7 Impacts to vegetation integrity for the Murrumbidgee IBRA subregion

BAM-C #	BAM-C – Vegetation zone name	Management zone[1]	Area (ha)	Before development				After development				Change
				Composition	Structure	Function	VI score	Composition	Structure	Function	VI score	Change in VI score
31	13_SVTM	Area B4	0.01	100	100	100	100	94.4	63	30.7	56.7	-43.3
1	13_Moderate-good	Area A	1.42	78.5	71.8	32.8	57	0	0	0	0	-57
		Area B4	2.23	78.5	71.8	32.8	57	67.5	43.4	1.4	16.1	-40.9
32	15_SVTM	Area A	0.33	100	100	100	100	0	0	0	0	-100
3	15_Moderate-good	Area A	29.84	84.3	93.8	44.5	70.6	0	0	0	0	-70.6
		Area B4	32.61	84.3	93.8	44.5	70.6	77.8	64.6	23.3	48.9	-21.7
2	15_Derived	Area A	7.95	42.3	56.3	10.5	29.2	0	0	0	0	-29.2
46	15_Thinned	Area A	0.54	100	100	100	100	0	0	0	0	-100
		Area B4	0.18	100	100	100	100	94.4	63	30.7	56.7	-43.3
4	17_Moderate-good	Area A	12.49	69.2	84.1	0	76.8	0	0	0	0	-76.8
33	17_SVTM	Area A	2.38	100	100	100	100	0	0	0	0	-100
5	20_Derived	Area A	0.99	100	100	0	21.5	0	0	0	0	-21.5
47	20_Derived_LCV	Area A	0.77	16	8.6	0	5.2	0	0	0	0	-5.2
6	20_Thinned	Area A	0.03	95.1	23.3	19.3	34.9	0	0	0	0	-34.9
		Area B4	0.13	95.1	23.3	19.3	34.9	94.2	23.3	0.1	13	-22
7	23_Derived	Area A	2.71	92.9	93.1	0	20.5	0	0	0	0	-20.5
8	23_Derived_LCV	Area A	3.54	61.5	73.9	0	16.6	0	0	0	0	-16.6

BAM-C #	BAM-C – Vegetation zone name	Management zone[1]	Area (ha)	Before development				After development				Change
				Composition	Structure	Function	VI score	Composition	Structure	Function	VI score	Change in VI score
9	23_Moderate-good	Area A	1.83	100	99.9	38	72.4	0	0	0	0	-72.4
		Area B4	1.58	100	99.9	38	72.4	99.1	99.9	16.5	54.7	-17.7
49	23_Thinned	Area A	0.13	100	100	100	100	0	0	0	0	-100
		Area B4	0.07	100	100	100	100	98.7	97.1	30.7	66.5	-33.5
10	24_Moderate-good	Area A	7.02	79.7	65.1	0	72	0	0	0	0	-72
11	26_Derived	Area A	138.90	71.8	46.8	0.8	15	0	0	0	0	-15
12	26_Derived_LCV	Area A	1.29	43.5	33.9	0	11.4	0	0	0	0	-11.4
13	26_Moderate-good	Area A	49.73	97.2	87.7	53	76.7	0	0	0	0	-76.7
		Area B4	41.59	97.2	87.7	53	76.7	92.5	85.8	21.9	55.8	-20.9
14	26_Thinned	Area A	48.62	75.3	81.9	22.3	51.6	0	0	0	0	-51.6
		Area B4	35.47	75.3	81.9	22.3	51.6	66.5	77	2.6	23.8	-27.8
34	26_SVTM	Area A	1.33	100	100	100	100	0	0	0	0	-100
48	28_Moderate-good	Area A	1.36	100	100	100	100	0	0	0	0	-100
		Area B4	1.58	100	100	100	100	98.7	97.2	30.7	66.5	-33.5
15	28_Derived	Area A	19.63	93.5	98.4	0	21	0	0	0	0	-21
16	28_Derived_TS	Area A	0.45	64.5	71.8	19.7	45	0	0	0	0	-45
		Area B4	0.19	64.5	71.8	19.7	45	62.7	71.8	7.7	32.6	-12.4
17	28_Derived_LCV	Area A	5.03	61.9	93.3	0	17.9	0	0	0	0	-17.9

BAM-C #	BAM-C – Vegetation zone name	Management zone[1]	Area (ha)	Before development				After development				Change
				Composition	Structure	Function	VI score	Composition	Structure	Function	VI score	Change in VI score
18	28_Thinned	Area A	3.53	74.8	82.1	2.2	23.9	0	0	0	0	-23.9
		Area B4	2.12	74.8	82.1	2.2	23.9	71.3	82	1	18	-5.9
35	28_SVTM	Area A	6.04	100	100	100	100	0	0	0	0	-100
36	44_SVTM	Area A	8.79	100	100	0	100	0	0	0	0	-100
19	44_Moderate-good	Area A	14.77	96	96.6	0	96.3	0	0	0	0	-96.3
37	45_SVTM	Area A	5.96	100	100	100	100	0	0	0	0	-100
20	45_Moderate-good	Area A	3.58	75.3	95.5	0	84.3	0	0	0	0	-84.3
44	46_SVTM	Area A	19.07	100	100	0	100	0	0	0	0	-100
21	46_Moderate-good	Area A	39.35	96.6	89	0	92.7	0	0	0	0	-92.7
22	47_Moderate-good	Area A	0.17	82.2	93.1	0	87.5	0	0	0	0	-87.5
24	58_Thinned	Area A	0.38	39.7	99.6	25.1	46.3	0	0	0	0	-46.3
		Area B4	0.32	39.7	99.6	25.1	46.3	34.3	99.6	12.1	34.6	-11.7
23	58_Moderate-good	Area A	0.19	65.6	77.8	57.2	66.3	0	0	0	0	-66.3
		Area B4	0.07	65.6	77.8	57.2	66.3	64.8	77.8	5.1	29.5	-36.9
38	70_SVTM	Area A	0.16	100	100	100	100	0	0	0	0	-100
25	157_Moderate-good	Area A	91.91	73.6	98.9	0	85.3	0	0	0	0	-85.3
39	157_SVTM	Area A	7.55	100	100	0	100	0	0	0	0	-100
40	159_SVTM	Area A	0.05	100	100	0	100	0	0	0	0	-100

BAM-C #	BAM-C – Vegetation zone name	Management zone[1]	Area (ha)	Before development				After development				Change
				Composition	Structure	Function	VI score	Composition	Structure	Function	VI score	Change in VI score
45	160_SVTM	Area A	1.37	100	100	0	100	0	0	0	0	-100
26	160_Moderate-good	Area A	15.32	92.5	85	0	88.7	0	0	0	0	-88.7
27	163_Moderate-good	Area A	51.98	95.9	99.6	0	97.7	0	0	0	0	-97.7
41	163_SVTM	Area A	11.26	100	100	0	100	0	0	0	0	-100
28	164_Moderate-good	Area A	253.05	76.2	99.2	0	86.9	0	0	0	0	-86.9
43	164_SVTM	Area A	95.65	100	100	0	100	0	0	0	0	-100
29	170_Derived	Area A	1.42	25.1	74.7	0	12.3	0	0	0	0	-12.3
30	170_Thinned	Area A	2.09	39.4	84	30.7	46.6	0	0	0	0	-46.6
		Area B4	2.08	39.4	84	30.7	46.6	33.9	83.3	16.3	35.8	-10.8
42	216_Moderate-good	Area A	9.80	100	100	0	100	0	0	0	0	-100

(1) Management zones where; Area A = Disturbance Area A. Area B4 = Disturbance area B4 & Area HZ = Disturbance area HZ

Table 9.8 Impacts to vegetation integrity for the Inland Slopes IBRA subregion

BAM-C #	BAM-C – Vegetation zone name	Management zone[1]	Area (ha)	Before development				After development				Change
				Composition	Structure	Function	VI score	Composition	Structure	Function	VI score	Change in VI score
1	76_Thinned	Area A	0.30	30.8	35.4	45.6	36.8	0	0	0	0	-36.8
2	266_Moderate-good	Area A	0.08	55.9	75.6	94.2	73.6	0	0	0	0	-73.6
		Area B4	0.04	55.9	75.6	94.2	73.6	45.7	54.1	26.6	40.4	-33.2
		Area HZ	0.04	55.9	75.6	94.2	73.6	45.7	54.1	26.6	40.4	-33.2
3	266_Thinned	Area A	0.02	55.9	63.5	5.2	26.4	0	0	0	0	-26.4
9	277_Moderate-good	Area A	0.19	100	100	100	100	0	0	0	0	-100
5	277_Thinned	Area A	1.82	52.7	88.4	54.6	63.4	0	0	0	0	-63.4
		Area B4	0.79	52.7	88.4	54.6	63.4	45.2	63.5	4.4	23.3	-40.1
		Area HZ	0.40	52.7	88.4	54.6	63.4	45.2	63.5	4.4	23.3	-40.1
4	277_Derived_LCV	Area A	40.86	42.4	64.5	0	14	0	0	0	0	-14
7	319_Thinned	Area A	0.75	23.5	28.2	44.9	31	0	0	0	0	-31
		Area B4	0.04	23.5	28.2	44.9	31	22.3	22.4	14.1	19.2	-11.8
		Area HZ	0.04	23.5	28.2	44.9	31	22.3	22.4	14.1	19.2	-11.8
6	319_Derived_LCV	Area A	11.66	36.9	18.7	0	8.8	0	0	0	0	-8.8
10	343_Moderate-good	Area HZ	0.01	100	100	100	100	73.1	28.6	30.7	40	-60
8	343_Derived_LCV	Area A	3.79	22.6	27.3	0	8.5	0	0	0	0	-8.5

(1) Management zones where; Area A = Disturbance Area A. Area B4 = Disturbance area B4 & Area HZ = Disturbance area HZ

9.1.3 Residual direct impacts to BC Act listed TECs

The residual direct impact to BC Act listed TECs is outlined in Table 9.9. The direct impact across these six TECs is expected to impact 276.292 hectares within the subject land, with 190.13 hectares within Disturbance area A.

Table 9.9 Residual direct impact to BC Act listed TECs within the subject land

TEC Name	Profile ID (from TBDC)	BC Act status[1]	IBRA subregion	Associated PCT and vegetation zones with the subject land	Disturbance area A (ha)	Disturbance area B4 (ha)	Disturbance area B10 (ha)[2]	Disturbance area HZ (ha)	Impact within subject land (ha)
Acacia melvillei Shrubland in the Riverina and Murray-Darling Depression bioregions	20094	E	Murrumbidgee	23_Mod-good (3.41 ha) 23_Thinned (0.20 ha) 23_Derived (2.71 ha) 23_Derived_LCV (3.54 ha)	8.21	1.65	0.18	0.00	9.86
Allocasuarina luehmannii Woodland in the Riverina and Murray-Darling Depression Bioregions	20082	E (SAII)	Murrumbidgee	20_Thinned (0.16 ha) 20_Derived (0.99 ha) 20_Derived_LCV (0.77 ha)	1.79	0.13	0.07	0.00	1.92

TEC Name	Profile ID (from TBDC)	BC Act status[1]	IBRA subregion	Associated PCT and vegetation zones with the subject land	Disturbance area A (ha)	Disturbance area B4 (ha)	Disturbance area B10 (ha)[2]	Disturbance area HZ (ha)	Impact within subject land (ha)
Inland Grey Box Woodlands in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions	20072	E	Inland Slopes	76_Thinned (0.30 ha)	0.30	0.00	0.00	0.00	0.30
			Murray Fans	237_Mod-good (0.84 ha)	0.21	0.48	0.00	0.15	0.84
Myall Woodlands in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions	10973	E	Murrumbidgee	26_Mod-good (91.32 ha) 26_Thinned (84.09 ha) 26_SVTM (1.33 ha)	99.68	77.06	15.66	0.00	176.74
Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregions	20083	E	Murray Fans	19_SVTM (1.59 ha) 28_Derived (0.20 ha) 28_Derived tall shrubland (0.67 ha)	0.93	1.53	0.00	0.00	2.46
			Murrumbidgee	28_Mod-good (2.94 ha) 28_Thinned (5.65 ha) 28_Derived tall shrubland (0.64 ha) 28_Derived (19.63 ha) 28_Derived_LCV (5.03 ha) 28_SVTM (6.04 ha)	36.04	3.89	0.92	0.00	39.93

TEC Name	Profile ID (from TBDC)	BC Act status[1]	IBRA subregion	Associated PCT and vegetation zones with the subject land	Disturbance area A (ha)	Disturbance area B4 (ha)	Disturbance area B10 (ha)[2]	Disturbance area HZ (ha)	Impact within subject land (ha)
White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions	10837	CE (SAII)	Inland Slopes	266_Mod-good (0.16 ha) 266_Thinned (0.02 ha) 277_Mod-good (0.19 ha) 277_Thinned (3.01 ha) 277_Derived_LCV (40.86)	42.97	0.83	0.00	0.44	44.24
Totals					**190.13**	**85.57**	**16.83**	**0.59**	**276.29**

(1) E = Endangered, CE = Critically Endangered, SAII = Serious and irreversible impacts

(2) For the purposes of this assessment, areas of impact to vegetation with a growth height potential of ten metres or above have been amalgamated into disturbance area B4, while vegetation with a growth height potential of ten metres or less have been identified in disturbance area B10 and would be retained.

9.1.4 Residual direct impacts to EPBC Act listed TECs

The residual direct impact to EPBC Act listed TECs is outlined in Table 9.10. The direct impacts across these six TECs is expected to be 209.46 hectares within the subject land, with 157.03 hectares within Disturbance area A.

Table 9.10 Summary of impact to EPBC Act listed TECs within the subject land

TEC name	EPBC Act status[1]	IBRA subregion	Associated PCT and vegetation zones within the subject land	Disturbance area A (ha)	Disturbance area B4 (ha)	Disturbance area B10 (ha)[2]	Disturbance area HZ (ha)	Impact within subject land (ha)
Buloke woodlands of the Riverina and Murray Darling Depression bioregions	E	Murrumbidgee	20_Thinned (0.16 ha) 20_Derived (2.11 ha) 20_Derived_LCV (1.23 ha)	1.79	1.71	0.00	0.00	3.50
Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	E	Murray Fans	237_Mod-good (0.84 ha)	0.21	0.48	0.00	0.15	0.84
Natural Grasslands of the Murray Valley Plains	CE	Murrumbidgee	44_Mod-good (14.77 ha) 44_SVTM (18.96 ha) 45_Mod-good (3.58 ha) 45_SVTM (5.96 ha) 46_Mod-good (39.35 ha) 46_SVTM (19.07 ha)	101.69	0.00	0.00	0.00	101.69

TEC name	EPBC Act status[1]	IBRA subregion	Associated PCT and vegetation zones within the subject land	Disturbance area A (ha)	Disturbance area B4 (ha)	Disturbance area B10 (ha)[2]	Disturbance area HZ (ha)	Impact within subject land (ha)
Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains	CE	Murrumbidgee	47_Mod-good (0.17)	0.17	0.00	0.00	0.00	0.17
Weeping Myall Woodlands	E	Murrumbidgee	26_Mod-good (91.32 ha) 26_SVTM (1.33 ha)	51.06	41.59	0.00	0.00	92.65
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	CE	Inland Slopes	266_Mod-good (0.16 ha) 266_Thinned (0.02 ha) 277_Mod-good (0.19 ha) 277_Thinned (3.01 ha)	2.11	0.83	0.00	0.44	3.36
Totals				**157.03**	**44.61**	**0.00**	**0.59**	**202.23**

(1) E = Endangered, CE = Critically Endangered under the EPBC Act

(2) For the purposes of this assessment, areas of impact to vegetation with a growth height potential of ten metres or above have been amalgamated into disturbance area B4, while vegetation with a growth height potential of ten metres or less have been identified in disturbance area B10 and would be retained.

9.1.5 Residual direct impact to threatened species

A summary of the residual direct impact to BC Act listed threatened flora and fauna species is outlined in Table 9.11 and Table 9.12 respectively. The expected direct impact to threatened flora species and their habitat is 1,208.63 hectares within the subject land. While the expected direct impact to threatened fauna species habitat is 1,071.56 hectares. This total impact is composed of two components; confirmed and assumed loss of habitat. Confirmed loss refers to areas where the species has been recorded as present within the subject land during field verification survey. Alternatively, assumed loss is an approach to estimating species impact in areas that have not been subject to field verification, often due to land access restrictions or seasonal survey timing constraints. It conservatively assumes the maximum likelihood of impact to each species based on the extent of associated habitat present within the un-surveyed area. This is likely to be significantly reduced following field verification survey. The residual direct impact to BC Act listed threatened species by IBRA subregion is provided in Table 9.13 to Table 9.15.

Table 9.11 Summary of residual direct impacts to threatened flora species credit species within the subject land

Scientific name	Common name	BC Act status[1]	EPBC Act status[2]	IBRA subregion			Confirmed loss of habitat (ha) or individuals	Assumed loss of habitat (ha) or individuals	Total impact habitat (ha) or individuals
				Inland Slopes	Murray Fans	Murrumbidgee			
Ammobium craspedioides[3]	Yass Daisy	V	V	✓	-	-	0.00	2.08	4
Amphibromus fluitans	River Swamp Wallaby-grass	V	V	-	✓	-	0.00	0.43	0.43
Austrostipa metatoris	-	V	V	-	✓	-	0.00	1.24	1.24
Austrostipa wakoolica	-	E	E	-	-	✓	0.00	29.11	29.11
Brachyscome muelleroides	Mueller Daisy	V	V	-	-	✓	0.00	1.04	1.04
Brachyscome papillosa	Mossgiel Daisy	V	V	-	-	✓	12.67	128.59	141.26
Caladenia arenaria	Sand-hill Spider Orchid	E	E	✓	-	-	0.00	0.30	0.30
Calotis moorei	Burr-daisy	E	E	-	-	✓	0.00	12.14	12.14
Convolvulus tedmoorei	Bindweed	E	-	-	-	✓	0.00	28.92	28.92
Cullen parvum	Small Scurf-pea	E	-	✓	-	✓	0.00	25.49	25.49

Scientific name	Common name	BC Act status[1]	EPBC Act status[2]	IBRA subregion			Confirmed loss of habitat (ha) or individuals	Assumed loss of habitat (ha) or individuals	Total impact habitat (ha) or individuals
				Inland Slopes	Murray Fans	Murrumbidgee			
Diuris tricolor	Pine Donkey Orchid	V	-	✓	-	-	0.00	0.30	0.30
Eleocharis obicis	Spike Rush	V	V	-	✓	✓	13.21	144.10	157.31
Eucalyptus leucoxylon subsp. *pruinosa*[3]	Yellow Gum	V	-	-	✓	-	0.00	30.30	5
Grevillea wilkinsonii	Tumut Grevillea	CE	CE	✓	-	-	0.00	0.10	0.10
Lepidium monoplocoides	Winged Peppercress	E	E	-	✓	✓	0.05	80.49	80.54
Leptorhynchos orientalis	Lanky Buttons	E	-	-	-	✓	0.00	43.70	43.70
Maireana cheelii	Chariot Wheels	V	V	-	✓	✓	4.24	152.60	156.84
Pilularia novae-hollandiae	Austral Pillwort	E	-	-	✓	✓	10.62	103.48	114.10
Prasophyllum petilum	Tarengo Leek Orchid	E	E	✓	-	-	0.00	1.98	1.98
Prasophyllum sp. Moama	-	CE	-	-	✓	-	0.00	9.88	9.88
Pterostylis despectans	Lowly Greenhood	CE	E	-	✓	-	0.00	9.88	9.88
Sclerolaena napiformis	Turnip Copperburr	E	E	-	-	✓	0.00	43.39	43.39
Solanum karsense	Menindee Nightshade	V	V	-	-	✓	0.00	0.24	0.24
Swainsona murrayana	Slender Darling-pea	V	V	-	-	✓	168.51	171.95	340.46

Scientific name	Common name	BC Act status[1]	EPBC Act status[2]	IBRA subregion			Confirmed loss of habitat (ha) or individuals	Assumed loss of habitat (ha) or individuals	Total impact habitat (ha) or individuals
				Inland Slopes	Murray Fans	Murrumbidgee			
Swainsona plagiotropis	Red Darling-pea	V	V	-	-	✓	0.00	45.67	45.67
Swainsona recta	Small Purple-pea	E	E	✓	-	-	0.00	2.08	2.08
Swainsona sericea	Silky Swainson-pea	V	-	✓	-	✓	0.00	47.39	47.39
Total									**1302.96**

(1) V = Vulnerable, E = Endangered, EP = Endangered Population, CE = Critically Endangered under the BC Act

(2) M = Migratory, V = Vulnerable, E = Endangered, CE = Critically Endangered under the EPBC Act

(3) Species are a 'count' species under the BAM where the assumed loss of habitat (ha) is a representation of areas not subject to targeted flora surveys where suitable habitat for the species may occur. A representative one individual has been entered for each vegetation zone subject to impact where suitable habitat has been identified.

Table 9.12 Summary of residual direct impacts to threatened fauna species credit species within the subject land

Scientific name	Common name	BC Act status[1]	EPBC Act status[2]	IBRA subregion			Confirmed loss of habitat (ha) or individuals	Assumed loss of habitat (ha) or individuals	Total impact habitat (ha) or individuals
				Inland Slopes	Murray Fans	Murrumbidgee			
Aprasia parapulchella	Pink-tailed Worm-lizard	V	V	✓	-	-	0.00	0.62	0.62
Ardeotis australis	Australian Bustard	E	-	-	✓	✓	0.00	116.10	116.10
Burhinus grallarius	Bush Stone-curlew	E	-	✓	✓	✓	7.61	253.46	261.07
Callocephalon fimbriatum	Gang-gang Cockatoo	E	E	✓	-	-	0.00	0.06	0.06
Haliaeetus leucogaster	White-bellied Sea-Eagle	V	-	✓	✓	✓	0.00	29.76	29.76
Hamirostra melanosternon	Black-breasted Buzzard	V	-	-	✓	-	0.00	2.38	2.38
Hemiaspis damelii	Grey Snake	E	E	-	✓	✓	0.00	190.31	190.31
Hieraaetus morphnoides	Little Eagle	V	-	✓	✓	✓	0.00	42.80	42.80
Litoria raniformis	Southern Bell Frog	E	V	-	✓	✓	10.25	0.00	10.25
Lophochroa leadbeateri	Pink Cockatoo	V	E	-	✓	✓	0.00	50.26	50.26
Lophoictinia isura	Square-tailed Kite	V	-	-	✓	✓	0.00	39.84	39.84
Myotis macropus	Southern Myotis	V	-	-	✓	✓	0.00	20.73	20.73
Ninox connivens	Barking Owl	V	-	✓	✓	✓	0.00	80.15	80.15
Pedionomus torquatus	Plains-wanderer	E	CE	-	-	✓	1.19	0.00	1.19
Petaurus norfolcensis – Endangered population	Squirrel Glider – Endangered population in the Wagga Wagga LGA	E	-	✓	-	-	0.00	0.92	0.92
Phascolarctos cinereus	Koala	E	E	✓	✓	-	0.00	149.77	149.77

Scientific name	Common name	BC Act status[1]	EPBC Act status[2]	IBRA subregion			Confirmed loss of habitat (ha) or individuals	Assumed loss of habitat (ha) or individuals	Total impact habitat (ha) or individuals
				Inland Slopes	Murray Fans	Murrumbidgee			
Polytelis swainsonii	Superb Parrot	V	V	✓	-	-	0.00	29.81	29.81
Tyto novaehollandiae	Masked Owl	V	-	✓	✓	✓	0.00	52.98	52.98
Total									**1,080.26**

(1) V = Vulnerable, E = Endangered, EP = Endangered Population, CE = Critically Endangered under the BC Act

(2) M = Migratory, V = Vulnerable, E = Endangered, CE = Critically Endangered under the EPBC Act

Table 9.13 Residual direct impacts to species credit species within the Murray Fans IBRA subregion

Scientific name	Common name	BC Act status[1]	EPBC Act status[2]	Disturbance area applicable to the species (full or partial impact) (ha)				Confirmed loss of habitat (ha) or individuals	Assumed loss of habitat (ha) or individuals	Total impact habitat (ha) or individuals
				Disturbance area A	Disturbance area B4	Disturbance area B10	Disturbance area HZ			
Amphibromus fluitans	River Swamp Wallaby-grass	V	V	0.43	0.00	0.00	0.00	0.00	0.43	0.43
Austrostipa metatoris	-	V	V	1.24	0.00	0.00	0.00	0.00	1.24	1.24
Austrostipa wakoolica	-	E	E	0.38	0.00	0.00	0.00	0.00	0.38	0.38
Eleocharis obicis	Spike Rush	V	V	29.27	0.00	0.00	0.00	0.93	28.34	29.27
Eucalyptus leucoxylon subsp. pruinosa[3]	Yellow Gum	V	-	15.38	14.85	0.00	0.00	0.00	30.23	4
Lepidium monoplocoides	Winged Peppercress	E	E	28.37	0.00	0.00	0.00	0.00	28.37	28.37
Maireana cheelii	Chariot Wheels	V	V	10.02	0.00	0.00	0.00	0.14	9.88	10.02
Pilularia novae-hollandiae	Austral Pillwort	E	-	41.58	0.00	0.00	0.00	0.00	41.58	41.58
Prasophyllum sp. Moama	-	CE	-	9.88	0.00	0.00	0.00	0.00	9.88	9.88
Pterostylis despectans	Lowly Greenhood	CE	E	9.88	0.00	0.00	0.00	0.00	9.88	9.88
Burhinus grallarius	Bush Stone-curlew	E	-	30.55	24.91	0.00	3.97	0.00	59.43	59.43

Scientific name	Common name	BC Act status[1]	EPBC Act status[2]	Disturbance area applicable to the species (full or partial impact) (ha)				Confirmed loss of habitat (ha) or individuals	Assumed loss of habitat (ha) or individuals	Total impact habitat (ha) or individuals
				Disturbance area A	Disturbance area B4	Disturbance area B10	Disturbance area HZ			
Haliaeetus leucogaster	White-bellied Sea-Eagle	V	-	15.83	11.82	0.00	2.10	0.00	29.75	29.75
Ardeotis australis	Black Breasted Buzzard	E	-	1.07	0.80	0.00	0.51	0.00	2.38	2.38
Hemiaspis damelii	Grey Snake	E	E	61.97	0.00	0.00	0.00	0.00	61.97	61.97
Hieraaetus morphnoides	Little Eagle	V	-	20.91	18.30	0.00	2.67	0.00	41.88	41.88
Litoria raniformis	Southern Bell Frog	E	V	8.57	0.00	0.00	0.00	0.00	0.00	8.57
Lophochroa leadbeateri	Pink Cockatoo	V	E	21.52	19.16	0.00	2.97	0.00	43.66	43.66
Lophoictinia isura	Square-tailed Kite	V	-	19.77	16.82	0.00	2.34	0.00	38.92	38.92
Myotis macropus	Southern Myotis	V	-	8.85	7.79	0.00	4.09	0.00	20.73	20.73
Ninox connivens	Barking Owl	V	-	27.01	22.13	0.00	2.69	0.00	51.83	51.83
Phascolarctos cinereus	Koala	E	E	71.04	67.28	0.00	6.94	0.00	145.25	145.25
Polytelis swainsonii	Superb Parrot	V	V	12.24	10.38	0	2.57	0	25.20	25.20
Tyto novaehollandiae	Masked Owl	V	-	23.89	19.07	0.00	2.66	0.00	45.62	45.62

(1) V = Vulnerable, E = Endangered, EP = Endangered Population, CE = Critically Endangered under the BC Act

(2) M = Migratory, V = Vulnerable, E = Endangered, CE = Critically Endangered under the EPBC Act

(3) Species are a 'count' species under the BAM where the assumed loss of habitat (ha) is a representation of areas not subject to targeted flora surveys where suitable habitat for the species may occur. A representative one individual has been entered for each vegetation zone subject to impact where suitable habitat has been identified.

Table 9.14 Residual direct impacts to species credit species within the Murrumbidgee IBRA subregion

Scientific name	Common name	BC Act status[1]	EPBC Act status[2]	Disturbance area applicable to the species (full or partial impact) (ha)				Confirmed loss of habitat (ha) or individuals	Assumed loss of habitat (ha) or individuals	Total impact habitat (ha) or individuals
				Disturbance area A	Disturbance area B4	Disturbance area B10	Disturbance area HZ			
Austrostipa wakoolica	-	E	E	19.23	0.00	0.00	0.00	0.00	28.42	28.42
Brachyscome muelleroides	Mueller Daisy	V	V	1.03	0.00	0.00	0.00	0.00	1.03	1.03
Brachyscome papillosa	Mossgiel Daisy	V	V	141.26	0.00	0.00	0.00	12.67	128.59	141.26
Calotis moorei	Burr-daisy	E	E	12.14	0.00	0.00	0.00	0.00	12.14	12.14
Convolvulus tedmoorei	Bindweed	E	-	28.92	0.00	0.00	0.00	0.00	28.92	28.92
Cullen parvum	Small Scurf-pea	E	-	23.51	0.00	0.00	0.00	0.00	23.51	23.51
Eleocharis obicis	Spike Rush	V	V	128.04	0.00	0.00	0.00	12.28	115.76	128.04
Eucalyptus leucoxylon subsp. *pruinosa*[3]	Yellow Gum	V	-	0.07	0	0	0.00	0.07	1	0.07
Lepidium monoplocoides	Winged Peppercress	E	E	43.04	0.00	0.00	0.00	0.05	52.12	52.17
Leptorhynchos orientalis	Lanky Buttons	E	-	34.57	0.00	0.00	0.00	0.00	43.70	43.70
Maireana cheelii	Chariot Wheels	V	V	133.61	0.00	0.00	0.00	4.10	142.72	146.82

Scientific name	Common name	BC Act status[1]	EPBC Act status[2]	Disturbance area applicable to the species (full or partial impact) (ha)				Confirmed loss of habitat (ha) or individuals	Assumed loss of habitat (ha) or individuals	Total impact habitat (ha) or individuals
				Disturbance area A	Disturbance area B4	Disturbance area B10	Disturbance area HZ			
Pilularia novae-hollandiae	Austral Pillwort	E	-	72.52	0.00	0.00	0.00	10.62	61.90	72.52
Sclerolaena napiformis	Turnip Copperburr	E	E	43.39	0.00	0.00	0.00	0.00	43.39	43.39
Solanum karsense	Menindee Nightshade	V	V	0.24	0.00	0.00	0.00	0.00	0.24	0.24
Swainsona murrayana	Slender Darling-pea	V	V	340.46	0.00	0.00	0.00	168.52	171.94	340.46
Swainsona plagiotropis	Red Darling-pea	V	V	45.67	0.00	0.00	0.00	0.00	45.67	45.67
Swainsona sericea	Silky Swainson-pea	V	-	45.31	0.00	0.00	0.00	0.00	45.31	45.31
Burhinus grallarius	Bush Stone-curlew	E	-	107.69	82.96	0.00	0.00	0.00	190.65	190.65
Hemiaspis damelii	Grey Snake	E	E	128.33	0.00	0.00	0.00	0.00	128.33	128.33
Hieraaetus morphnoides	Little Eagle	V	-	0.92	0.00	0.00	0.00	0.00	0.92	0.92
Litoria raniformis	Southern Bell Frog	E	V	1.68	0.00	0.00	0.00	1.68	0.00	1.68
Lophochroa leadbeateri	Pink Cockatoo	V	E	6.60	0.00	0.00	0.00	0.00	6.60	6.60

Scientific name	Common name	BC Act status[1]	EPBC Act status[2]	Disturbance area applicable to the species (full or partial impact) (ha)				Confirmed loss of habitat (ha) or individuals	Assumed loss of habitat (ha) or individuals	Total impact habitat (ha) or individuals
				Disturbance area A	Disturbance area B4	Disturbance area B10	Disturbance area HZ			
Lophoictinia isura	Square-tailed Kite	V	-	0.92	0.00	0.00	0.00	0.00	0.92	0.92
Ninox connivens	Barking Owl	V	-	14.21	14.12	0.00	0.00	0.00	28.32	28.32
Pedionomus torquatus	Plains-wanderer	E	CE	1.20	0.00	0.00	0.00	1.19	0.00	1.19
Polytelis swainsonii	Superb Parrot	V	V	0.92	0	0	0	0	0.92	0.92
Tyto novaehollandiae	Masked Owl	V	-	3.53	3.84	0.00	0.00	0.00	7.37	7.37

(1) V = Vulnerable, E = Endangered, EP = Endangered Population, CE = Critically Endangered under the BC Act

(2) M = Migratory, V = Vulnerable, E = Endangered, CE = Critically Endangered under the EPBC Act

Table 9.15 Residual direct impacts to species credit species within the Inland Slopes IBRA subregion

Scientific name	Common name	BC Act status[1]	EPBC Act status[2]	Disturbance area applicable to the species (full or partial impact) (ha)				Confirmed loss of habitat (ha) or individuals	Assumed loss of habitat (ha) or individuals	Total impact habitat (ha) or individuals
				Disturbance area A	Disturbance area B4	Disturbance area B10	Disturbance area HZ			
Ammobium craspedioides[3]	Yass Daisy	V	V	2.08	0.00	0.00	0.00	0.00	4	4
Caladenia arenaria	Sand-hill Spider Orchid	E	E	0.30	0.00	0.00	0.00	0.00	0.30	0.30
Cullen parvum	Small Scurf-pea	E	-	2.01	0.00	0.00	0.00	0.00	1.98	1.98
Diuris tricolor	Pine Donkey Orchid	V	-	0.30	0.00	0.00	0.00	0.00	0.30	0.30
Grevillea wilkinsonii	Tumut Grevillea	CE	CE	0.10	0.00	0.00	0.00	0.00	0.10	0.10
Prasophyllum petilum	Tarengo Leek Orchid	E	E	1.98	0.00	0.00	0.00	0.00	1.98	1.98
Swainsona recta	Small Purple-pea	E	E	2.08	0.00	0.00	0.00	0.00	2.08	2.08
Swainsona sericea	Silky Swainson-pea	V	-	2.08	0.00	0.00	0.00	0.00	2.08	2.08
Aprasia parapulchella	Pink-tailed Worm-lizard	V	V	1.82	0.00	0.00	0.00	0.00	0.62	0.62
Burhinus grallarius	Bush Stone-curlew	E	-	2.33	0.83	0.00	0.45	0.00	3.61	3.61
Callocephalon fimbriatum	Gang-gang Cockatoo	E	E	0.06	0.00	0.00	0.00	0.00	0.06	0.06

Scientific name	Common name	BC Act status[1]	EPBC Act status[2]	Disturbance area applicable to the species (full or partial impact) (ha)				Confirmed loss of habitat (ha) or individuals	Assumed loss of habitat (ha) or individuals	Total impact habitat (ha) or individuals
				Disturbance area A	Disturbance area B4	Disturbance area B10	Disturbance area HZ			
Petaurus norfolcensis – endangered population	Squirrel Glider Endangered population of the Wagga Wagga LGA	E	-	0.73	0.06	0.00	0.13	0.92	0.00	0.92
Phascolarctos cinereus	Koala	E	E	3.17	0.87	0.00	0.49	0.00	4.52	4.53
Polytelis swainsonii	Superb Parrot	V	V	2.43	0.83	0.00	0.44	0.00	3.70	3.70

(1) V = Vulnerable, E = Endangered, EP = Endangered Population, CE = Critically Endangered under the BC Act

(2) M = Migratory, V = Vulnerable, E = Endangered, CE = Critically Endangered under the EPBC Act

(3) Species are a 'count' species under the BAM where the assumed loss of habitat (ha) is a representation of areas not subject to targeted flora surveys where suitable habitat for the species may occur. A representative one individual has been entered for each vegetation zone subject to impact where suitable habitat has been identified.

9.1.6 Residual direct impacts to scattered trees

A total of 16 scattered trees were recorded within the subject land with 14 trees occurring within the Murray Fans IBRA subregion, one tree occurring within the Murrumbidgee IBRA subregion and one tree occurring in the Inland Slopes IBRA subregion. The residual direct impacts to scattered trees for each IBRA subregion is presented in Table 9.16 to Table 9.18.

Table 9.16 Summary of residual direct impacts to scattered trees in the Murray Fans IBRA subregion

Class	Species	DBH category	Contain hollows	Number of trees
13 - Black Box - Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)				
3	*Eucalyptus largiflorens*	Yes (estimated)	>50 cm DBH	5
3	*Eucalyptus largiflorens*	No (visual assessment)	>50 cm DBH	4
3	*Alectryon oleifolius*	Yes (visual assessment)	>50 cm DBH	2
3	*Alectryon oleifolius*	No (visual assessment)	>50 cm DBH	3
Total				**14**

Table 9.17 Summary of residual direct impacts to scattered trees in the Murrumbidgee IBRA subregion

Class	Species	DBH category	Contain hollows	Number of trees
58 - Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion				
3	*Casuarina pauper*	No (visual assessment)	>50 cm DBH	1

Table 9.18 Summary of residual direct impacts to scattered trees in the Inland Slopes IBRA subregion

Class	Species	DBH category	Contain hollows	Number of trees
343 - Mugga Ironbark - Red Box - Red Stringybark - Western Grey Box grass/shrub woodland on metamorphic substrates in the Tarcutta - Gundagai region, NSW South Western Slopes Bioregion				
3	*Eucalyptus sideroxylon*	No (visual assessment)	>50 cm DBH	1

9.2 Indirect impacts

Indirect impacts, as defined in the BAM (Section 8.2) impacts occur when the project affects native vegetation and threatened species habitat beyond the development footprint or within retained areas. This includes impacts from activities related to the construction or operation of the project.

Indirect impacts associated with the project include:

- inadvertent impacts on adjacent habitat or vegetation
- reduced viability of adjacent habitat due to edge effects
- reduced viability of adjacent habitat due to noise, dust or light spill
- transport of weeds, pests and pathogens from the site to adjacent vegetation
- increased risk of starvation, exposure and loss of shade or shelter
- loss of breeding habitats
- trampling of threatened flora species
- increased risk of fire
- increased risk of collision with lines and EMF impacts with new infrastructure.

Table 9.19 documents the residual indirect impacts (likely to occur on native vegetation, threatened entities and their habitat beyond the subject site).

As outlined in section 9.1, partial clearing of the transmission line easement forms part of the measures taken to minimise impacts to biodiversity values. A hard edge with abrupt transition between totally cleared easement and forest or woodland would not be created. Instead, there would be more gradual transition from cleared easement to lower shrubland into forest or woodland. The partial vegetation clearing scenarios allow for a direct calculation of indirect partial impacts adjacent to areas of complete vegetation and habitat removal. This directly incorporates any potential edge effects into the calculation as follows:

- **Disturbance area A** is the area of most impact likely to generate indirect impacts to adjacent retained vegetation.
- **Disturbance area B4** (partial clearing of the transmission line easement) located directly adjacent to Disturbance area A would be subject to the most indirect impact. Indirect impacts are incorporated into the direct impact calculation for this disturbance area.
- **Disturbance area HZ** hazard tree zone is an area adjacent to Disturbance area B (where required) and the direct impact calculation for this area incorporates the indirect impacts that may occur adjacent to Disturbance area B.

The mapping of Disturbance area B and HZ act as management zones adjacent to the area of total impact (Disturbance area A) and the impacts calculated from these areas incorporate the indirect impacts in terms of partial loss in vegetation integrity score. Importantly, while this is a linear infrastructure project it would not have the same level of predicted indirect impacts as other linear infrastructure projects such as major roads and the extent of indirect impacts adjacent to the subject land would be considerably less. The project would not result in any ‘sterilisation’ of remaining vegetation.

Table 9.19 Summary of residual indirect impacts

Indirect impact	Impacted entities (PCT/threatened entity and their habitats and where relevant, EPBC Act listing)	Extent (ha or zone reference)	Frequency	Duration (long-term/ short-term/ medium-term)	Project phase/ timing of impact (e.g. construction, operation, rehabilitation)	Likelihood and consequences	Evidence-based justification for predictions of impacts (including any limitations to data, assumptions and predictions)
Inadvertent impacts on adjacent habitat or vegetation	All PCTs Threatened species Threatened ecological communities Aquatic habitat	All PCTs Aquatic habitats associated with creeks and rivers.	Frequent during the length of the construction phase where it is near the feature.	Short-term	Construction	**Low.** Inadvertent impacts on adjacent vegetation can include a range of indirect impacts including soil disturbance, erosion, sedimentation, enriched run-off and water quality. Construction of the project has the potential to result in sedimentation and erosion and mobilisation of contaminants within the disturbance area and into adjoining native vegetation and aquatic habitats, through soil disturbance and construction activities. Sediment laden runoff and spills affect water quality and adversely affect aquatic life particularly during construction near rivers, creek lines and Key Fish Habitats. These impacts have the potential to reduce the viability of habitat for aquatic and semi aquatic species (including frogs) temporarily.	The project has been carefully designed to minimise impact to these sensitive environmental receivers through targeting narrow width crossing points of waterways and floodplain areas (and their associated riparian habitats e.g. around the Edward, Wakool and Murray River). The mobilisation of sediments would be contained within the indicative disturbance area as sediment control measures would be implemented as part of mitigation measures.

Indirect impact	Impacted entities (PCT/threatened entity and their habitats and where relevant, EPBC Act listing)	Extent (ha or zone reference)	Frequency	Duration (long-term/ short-term/ medium-term)	Project phase/ timing of impact (e.g. construction, operation, rehabilitation)	Likelihood and consequences	Evidence-based justification for predictions of impacts (including any limitations to data, assumptions and predictions)
Reduced viability of adjacent habitat due to edge effects	Native vegetation	All PCTs	Ongoing. Impacts are likely to be higher during construction. The level of impacts is likely to decrease over time with the increase resilience of managed vegetation and habitats.	Long-term	Construction/ operational	**Negligible.** Indirect impacts on adjacent native vegetation and habitats are considered unlikely due to the observed quality of woodland and forest habitats adjacent to existing transmission line easements in the subject land and biodiversity survey area. Vegetation integrity scores are considered unlikely to decline in adjacent retained vegetation.	The new environmental conditions along habitat edges can promote the growth of different vegetation types (including weeds), promote invasion by pest animals specialising in edge habitats, or change the behaviour of resident animals (Moenting & Morris, 2006). The species composition, structure and ecological processes of a patch of habitat at the line of contact with another patch of habitat may be changed (see Murcia, 1995). The intensity of edge effects (abiotic, biological and indirect biological effects) is generally measured by distance from the edge. The distance of edge effect influence can vary, with the extent of edge effects having been recorded greater than 1 kilometre from an edge (Forman *et al*. 2000) and stopping as little as 50 m from an edge (Bali, 2005).

Indirect impact	Impacted entities (PCT/threatened entity and their habitats and where relevant, EPBC Act listing)	Extent (ha or zone reference)	Frequency	Duration (long-term/ short-term/ medium-term)	Project phase/ timing of impact (e.g. construction, operation, rehabilitation)	Likelihood and consequences	Evidence-based justification for predictions of impacts (including any limitations to data, assumptions and predictions)
							The new edges created by the easement as it crosses through vegetation would cause changes in microclimates (a gradient of temperature, light intensity, and moisture would be formed running perpendicular to the edge) (see Murcia, 1995). The increase in light at the edge may result in increased plant growth (Murcia, 1995) which may favour certain species. Increased wind speed at edges can result in detrimental impacts to taller tree growth forms due to impacts from wind throw (Murcia, 1995) as the trees on the new edge would be poorly adapted to increased wind speeds as they have grown in the confines of the interior of the vegetation patch buffered from direct wind gusts.

Indirect impact	Impacted entities (PCT/threatened entity and their habitats and where relevant, EPBC Act listing)	Extent (ha or zone reference)	Frequency	Duration (long-term/ short-term/ medium-term)	Project phase/ timing of impact (e.g. construction, operation, rehabilitation)	Likelihood and consequences	Evidence-based justification for predictions of impacts (including any limitations to data, assumptions and predictions)
							There would be changed dynamics of species interactions at the newly created edge and cascading effects may occur (Murcia, 1995). Increased leaf growth can be expected which may result in attraction of more herbivorous insects that in turn may attract more insectivorous birds, which may attract more nest predators and brood parasites (Murcia, 1995). The newly created edges would create a new habitat type, but the impact may not be negative based on evidence collected from the subject land.

Indirect impact	Impacted entities (PCT/threatened entity and their habitats and where relevant, EPBC Act listing)	Extent (ha or zone reference)	Frequency	Duration (long-term/ short-term/ medium-term)	Project phase/ timing of impact (e.g. construction, operation, rehabilitation)	Likelihood and consequences	Evidence-based justification for predictions of impacts (including any limitations to data, assumptions and predictions)
Reduced viability of adjacent habitat due to noise, dust or light spill	Native vegetation Threatened species Threatened ecological communities	All PCTs	Noise and dust pollution is likely to be more frequent during the construction phase. During the operation phase, the generation of noise and dust is likely to be minimal and restricted to scheduled maintenance times. Light spill is likely to be daily (during night-time hours), however restricted to specific locations.	Short-term	Construction/ operational	**Negligible.** During construction increased levels of noise and dust are likely however these would be short term and mostly associated with vehicle movements, vegetation clearing, access track and transmission infrastructure construction. Operational phase would result in no lights on the transmission line sections and minimal additional lighting at other transmission line infrastructure. A short-term increase in construction noise would be mostly limited to daylight hours and is unlikely to have long-term adverse effects on the viability of adjacent habitats as they would be short-term in nature only. In terms of increased dust, construction impacts associated with permanent vegetation clearing is limited to Disturbance area A.	Anthropogenic noise can alter the behaviour of animals or interfere with their normal functioning (Bowles, 1997). The impacts from noise emissions are likely to be localised to the construction areas and are not considered likely to have a significant, long-term, impact on wildlife populations outside the area of impact. Within the area of impact, some sensitive species (e.g. woodland birds) may avoid the noise and some more tolerant species, including small mammals, would habituate over the longer-term (Byrnes *et al*. 2012). Elevated levels of dust may be deposited onto the foliage of vegetation adjacent to the project during construction. This has the potential to reduce photosynthesis and transpiration and cause abrasion and radioactive heating resulting in reduced growth rates and decreases in overall health of the vegetation. Consequently, changes in the structure and composition of plant communities and consequently the grazing patterns of fauna may occur

Indirect impact	Impacted entities (PCT/threatened entity and their habitats and where relevant, EPBC Act listing)	Extent (ha or zone reference)	Frequency	Duration (long-term/ short-term/ medium-term)	Project phase/ timing of impact (e.g. construction, operation, rehabilitation)	Likelihood and consequences	Evidence-based justification for predictions of impacts (including any limitations to data, assumptions and predictions)
						This clearing area would mostly be buffered by Disturbance area B where partial clearing is limited to vegetation above 4 metres growth height areas. Disturbance area B would have limited dust generation post construction. Increased vehicle movements would have a short-term increase in localised dust levels although given the ongoing agricultural landscape usage, current dust levels are unlikely to substantial increase to an extent that would adversely reduce the viability of adjacent habitats. Beyond the transmission line corridor (such as for construction compounds and substation works) dust impacts are likely to also be limited and short term in nature. The project is unlikely to generate light spill to an extent that would adversely reduce the viability of adjacent habitats as lighting during construction would be minimal.	(Auerbach *et al*. 1997; Walker & Everett 1987). The deposition of dust on foliage is likely to be highly localised, intermittent, and temporary and is therefore not considered likely to be a major impact of the project Ecological light pollution is the descriptive term for light pollution that includes direct glare, chronic or periodic increased illumination, and temporary unexpected fluctuations in lighting, that can have potentially adverse effects on wildlife (Longcore and Rich, 2004). Ecological light pollution may potentially affect nocturnal fauna by interrupting their life cycle. Some species (i.e. light tolerant microchiropteran bats) may benefit from the lighting due to increased food availability (insects attracted to lights) around these areas. Due to the likely short frequency and duration of the lighting, it is unlikely that animals would need to habituate to the light disturbance and only a short-term impact in the area of lighting is likely.

Indirect impact	Impacted entities (PCT/threatened entity and their habitats and where relevant, EPBC Act listing)	Extent (ha or zone reference)	Frequency	Duration (long-term/ short-term/ medium-term)	Project phase/ timing of impact (e.g. construction, operation, rehabilitation)	Likelihood and consequences	Evidence-based justification for predictions of impacts (including any limitations to data, assumptions and predictions)
						Mitigation measures would require lighting designs to be in accordance with the *National Light Pollution Guidelines for Wildlife* (DCCEEW, 2023a). Operational impacts would include minor light spill from permanent lighting installed at Dinawan substation and to vehicle movements for maintenance activities. Permanent lighting installed at Dinawan substation would be operational from dusk until dawn, 7 days a week and be installed in accordance with the requirements of Australian Standard AS 4282-2019 *Control of the obtrusive effects of outdoor lighting* (Standards Australia, 2019). As such, the lighting would be designed and installed in a way that reduces light spill into areas beyond the substation boundary and indirect impacts are considered unlikely to	

Indirect impact	Impacted entities (PCT/threatened entity and their habitats and where relevant, EPBC Act listing)	Extent (ha or zone reference)	Frequency	Duration (long-term/ short-term/ medium-term)	Project phase/ timing of impact (e.g. construction, operation, rehabilitation)	Likelihood and consequences	Evidence-based justification for predictions of impacts (including any limitations to data, assumptions and predictions)
						reduce viability of adjacent habitat due to light spill. Additionally, vehicle movement, would be periodic and of an extent and duration that is unlikely to reduce viability of adjacent habitat due to noise, dust or light spill. Any residual negligible impact such as short-term impact aspects is considered likely to be adequately managed with mitigation measures.	

Indirect impact	Impacted entities (PCT/threatened entity and their habitats and where relevant, EPBC Act listing)	Extent (ha or zone reference)	Frequency	Duration (long-term/ short-term/ medium-term)	Project phase/ timing of impact (e.g. construction, operation, rehabilitation)	Likelihood and consequences	Evidence-based justification for predictions of impacts (including any limitations to data, assumptions and predictions)
Transport of weeds, pests and pathogens from the site to adjacent vegetation	Native vegetation Threatened flora species Threatened ecological communities	All PCTs		Long-term	Construction/ operational	**Negligible.** Whilst this type of indirect impact has the potential to lead to a reduction of native vegetation integrity in surrounding habitats, management measures would be developed during construction to maintain the integrity of native vegetation in adjoining habitats. During operational phase, all maintenance and associated works would be subject to biosecurity protocols.	Weed and pest species pose some of the greatest threats to biodiversity as these species displace native species through predation and competition, and damage vegetation by grazing and trampling (Adair & Groves, 1998; Clarke, G. M., *et al*. 2000; Thorp & Lynch, 2011). Consequently, proliferation of weed and pest species due to the project has the potential to be a key biodiversity impact. Proliferation of weed and pest species is likely to occur during construction and operation, although impacts would be greatest as a result of vegetation clearing during the construction phase. The effects of proliferation of weed and pest species may not be experienced immediately, however, would likely commence a few months after the construction phase commences.

Indirect impact	Impacted entities (PCT/threatened entity and their habitats and where relevant, EPBC Act listing)	Extent (ha or zone reference)	Frequency	Duration (long-term/ short-term/ medium-term)	Project phase/ timing of impact (e.g. construction, operation, rehabilitation)	Likelihood and consequences	Evidence-based justification for predictions of impacts (including any limitations to data, assumptions and predictions)
							Without appropriate management strategies, project activities have the potential to disperse weeds into areas of remnant vegetation where weed species are currently limited or in low density. Project activities also have the potential to import new weed species into the subject land. The most likely causes of weed dispersal and importation associated with the project include earthworks, movement of soil, and attachment of seed (and other propagules) to vehicles and machinery during all phases. Weed dispersal by vehicles along roads and access tracks is a key source of weed invasion (see Birdsall *et al*. 2012). The subject land is currently habitat for a range of pest species including rabbits. Project activities have the potential to disperse pest species out of the project footprint across the surrounding landscape and increase the ability of pest species to utilise habitats due to habitat removal, noise, and human presence during construction and operation.

Indirect impact	Impacted entities (PCT/threatened entity and their habitats and where relevant, EPBC Act listing)	Extent (ha or zone reference)	Frequency	Duration (long-term/ short-term/ medium-term)	Project phase/ timing of impact (e.g. construction, operation, rehabilitation)	Likelihood and consequences	Evidence-based justification for predictions of impacts (including any limitations to data, assumptions and predictions)
							Construction of linear infrastructure through large patches of intact vegetation can result in the establishment of pest species (particularly predators such as foxes and cats) into areas where they are currently absent or in low numbers. However, in the context of the project this impact is predicted to be minimal as all vegetation in the subject land is likely to be impacted by foxes and cats. The magnitude of this impact would be low. During operational phase, all maintenance and associated works would be subject to biosecurity protocols so the potential for a detrimental impact to occur is reduced.

Indirect impact	Impacted entities (PCT/threatened entity and their habitats and where relevant, EPBC Act listing)	Extent (ha or zone reference)	Frequency	Duration (long-term/ short-term/ medium-term)	Project phase/ timing of impact (e.g. construction, operation, rehabilitation)	Likelihood and consequences	Evidence-based justification for predictions of impacts (including any limitations to data, assumptions and predictions)
Increased risk of starvation, exposure and loss of shade or shelter	All fauna species	All PCTs	Impacts of potential starvation, exposure and loss of shade or shelter would occur at one time at the clearing/construction phase of the project. Ongoing vegetation management is likely to occur every 12 months, maintaining the vegetation structure. Vegetation management is unlikely to cause any significant changes to the level of the initial impacts.	Short-term to medium-term	Construction	**Negligible.** A significant portion of subject land has been subject to agricultural development, and only smaller proportions of the subject land are made up of native vegetation. Displacement of resident fauna species during native vegetation clearing is considered relatively low due to the modified vegetation structure resulting from long term agricultural stock grazing. Given the linear nature of the project and mostly highly mobile nature of most potential resident fauna species the increased risk of starvation, exposure and loss of shade or shelter due to the project is considered low.	Vegetation clearance and habitat loss can cause indirect impacts associated with increased risk of starvation, exposure and loss of shade or shelter as fauna may not survive due to shortages in available habitat resources. Even small-scale clearing within largely intact patches of vegetation can cause localised depletion of some species (see Kutt *et al*. 2012). However, in the context of the project and subject land the impacts are likely to be minimal. Entire habitat patches would not be removed and habitat adjacent to the easement would remain intact. It is therefore considered unlikely that the project would result in an increase in risk of starvation, exposure and loss of shade or shelter.

Indirect impact	Impacted entities (PCT/threatened entity and their habitats and where relevant, EPBC Act listing)	Extent (ha or zone reference)	Frequency	Duration (long-term/ short-term/ medium-term)	Project phase/ timing of impact (e.g. construction, operation, rehabilitation)	Likelihood and consequences	Evidence-based justification for predictions of impacts (including any limitations to data, assumptions and predictions)
Loss of breeding habitats	All fauna species	All PCTs	Impacts to breeding habitat (incl. hollow-bearing trees, nests, dreys, burrows & fallen timber) would occur at one time at the clearing/earth works and construction phase of the project. Ongoing vegetation management is likely to occur every 12 months, maintaining the vegetation structure. Vegetation management has the potential to cause further loss breeding habitats such as nests, dreys & burrows.	Long-term	Construction/ operation	**Moderate.** The loss of breeding habitat such as hollow-bearing trees, nests, dreys and burrows and fallen timber has the potential to affect native animals such as: — hollow-dependent bats — hollow-nesting and canopy-nesting birds — arboreal mammals — reptiles and amphibians — terrestrial fauna (including species that utilise burrows and fallen timber). The loss of breeding habitats is unlikely to extend beyond the subject land. Impacts beyond this area would be avoided through mitigation and management measures.	Loss of discrete breeding habitats impacts population persistence. Loss of specific breeding habitats is associated with a decrease in roost-site preference or selectivity, an increase in mobility of individuals, and a decrease in social cohesion (Chaverri and Kunz, 2011). These responses may reduce fitness by potentially increasing energetic expenditure, predator exposure, and a decrease in cooperative interactions (Chaverri and Kunz, 2011). Loss of breeding habitats such as hollow-bearing trees, nests, dreys and burrows and fallen timber would be managed through avoidance as a priority.

Indirect impact	Impacted entities (PCT/threatened entity and their habitats and where relevant, EPBC Act listing)	Extent (ha or zone reference)	Frequency	Duration (long-term/ short-term/ medium-term)	Project phase/ timing of impact (e.g. construction, operation, rehabilitation)	Likelihood and consequences	Evidence-based justification for predictions of impacts (including any limitations to data, assumptions and predictions)
Trampling of threatened flora species	Threatened flora species	All PCTs providing habitat for these species	Likely maintenance activities would include regular inspection and maintenance of all network infrastructure (ground and aerial), including transmission lines and transmission line infrastructure, Vegetation removal required to maintain appropriate electrical safety clearances to the transmission lines (as required depending on vegetation growth rates).	Construction – Short-term Operation – long-term	Construction/ operation	**Low.** Reduction in population extent and available habitat of threatened flora species that occur in the ground stratum could occur due to trampling or unauthorised material, storage, vehicle and plant equipment. All populations and associated habitat for threatened flora species would be available in GIS files for all construction contractors and would be designated no-go areas during construction. Mitigation measures would include protection for these areas and inadvertent impacts such as trampling is considered unlikely. During the operational phase, any maintenance would be subject to existing environmental operational protocols and have a low risk of any inadvertent impacts to any threatened flora species.	Trampling can cause decreases in plant density, plant size and reproductive performance (flowers and fruits production) (see Fenu *et al.,* 2013; Kelly *et al.,* 2003; McDougall and Wright, 2004 for some examples). The vegetation and habitats within the subject land display the damage caused by stock grazing since the 1800s. The continuous intense grazing by large, introduced herbivores that has occurred in the subject land over the last 200+ years has caused significant trampling effects. Any impacts caused by the project are insignificant in the context of current agricultural practices. During the operational phase, any maintenance would be subject to existing environmental operational protocols and have a low risk of any inadvertent impacts to any threatened flora species.

Indirect impact	Impacted entities (PCT/threatened entity and their habitats and where relevant, EPBC Act listing)	Extent (ha or zone reference)	Frequency	Duration (long-term/ short-term/ medium-term)	Project phase/ timing of impact (e.g. construction, operation, rehabilitation)	Likelihood and consequences	Evidence-based justification for predictions of impacts (including any limitations to data, assumptions and predictions)
Increased risk of fire	Native vegetation All flora & fauna species	All PCTs	Ongoing	Long-term	Construction/ operation	**Moderate.** Bushfire risk assessment has been considered as part of the project. The risk of ignition and spreading of a bushfire from project construction activities would be extreme and specific mitigation measures for bushfire have been identified in the EIS. Ignition of bushfires as a result of the project's operation has the potential to occur during maintenance of project infrastructure and from the infrastructure itself. The project would be designed and managed in accordance with the *Electricity Supply Act 1995* and Electricity Supply (Safety and Network Management) Regulation 2014 which requires a network operator to take all reasonable steps to ensure that all aspects of its network are safe. Vegetation maintenance would occur in accordance with standard operational procedures. Impact	Most Australian plant species are adapted to specific fire regimes. Different components of the fire regime may have adverse impacts on plant persistence, including fire frequency, severity, seasonality, type and spatial extent and patchiness (Gallagher *et al.,* 2021). High fire frequency is known to threaten the persistence of plant species reliant on specific fire intervals to facilitate regeneration (Fisher *et al*., 2009; Russell-Smith *et al.,* 2002). Altered fire regimes due to the project may result in impacts to species. In terms of fauna species there are winners and losers with any fire regime and most faunal groups are extremely resilient to fire (highly contrasting fire regimes often having little or no detectable impact on species abundances, at least in the medium term) (Andersen, 2021). The most important effects of fire on fauna are typically indirect through habitat modification and fire intensity is not as important a factor as is widely

Indirect impact	Impacted entities (PCT/threatened entity and their habitats and where relevant, EPBC Act listing)	Extent (ha or zone reference)	Frequency	Duration (long-term/ short-term/ medium-term)	Project phase/ timing of impact (e.g. construction, operation, rehabilitation)	Likelihood and consequences	Evidence-based justification for predictions of impacts (including any limitations to data, assumptions and predictions)
						assessment has considered this maintenance provision and is included in Disturbance area B calculations.	thought; rather, fire frequency is particularly important (Andersen, 2021). Vegetation maintenance would occur in accordance with standard operational procedures. Increased risk of fire is considered likely to be low. Fire would be suppressed, and this may have detrimental impacts to some species.

Indirect impact	Impacted entities (PCT/threatened entity and their habitats and where relevant, EPBC Act listing)	Extent (ha or zone reference)	Frequency	Duration (long-term/ short-term/ medium-term)	Project phase/ timing of impact (e.g. construction, operation, rehabilitation)	Likelihood and consequences	Evidence-based justification for predictions of impacts (including any limitations to data, assumptions and predictions)
Increased risk of collision with lines and EMF impacts with new infrastructure	Larger and higher-flying birds, which generally reside over larger territories, such as birds of prey, ravens and magpies, cockatoos and some parrots, waterbirds and waterfowl	All PCTs	Daily	Long-term	Operation	**Moderate.** Whilst this type of indirect impact has the potential to lead to some level of increase of bird mortality, mitigation measures would be implemented to ensure the likely impacts are minimised. While the southern part of the project starts at the Murray River and heads north through the Wakool and Edward Rivers it has been located within the most disturbed parts of these catchment areas and away from wetlands to the greatest extent possible. The project transmission lines are likely to be below flight paths for a majority of species. Mitigation measures would include line markers (i.e. diverters).	It is widely known and observed that, of all fauna groups, birds most regularly use electrical transmission lines, and their associated infrastructure, such as transmission line structures and poles, for perching and nesting. A detailed analysis of potential transmission line impacts and ameliorative measures for birds is provided in Appendix J. The reasons bird species use tall structures such as electrical transmission infrastructure include: — increased separation from terrestrial threats — as vantage points to allow early detection of airborne and terrestrial threats — for a commanding view over a patch of hunting territory — for the defence and proclamation of breeding territories, and — as safe elevated locations to build nests and raise their young.

Indirect impact	Impacted entities (PCT/threatened entity and their habitats and where relevant, EPBC Act listing)	Extent (ha or zone reference)	Frequency	Duration (long-term/ short-term/ medium-term)	Project phase/ timing of impact (e.g. construction, operation, rehabilitation)	Likelihood and consequences	Evidence-based justification for predictions of impacts (including any limitations to data, assumptions and predictions)
							The use of transmission lines does not extend across all bird species, as the open spaces in which aerial transmission line infrastructure are located is too exposed for many bird species, especially smaller cover preferring bird groups. Therefore, the most common transmission line using groups are birds that use open and aerial habitats. A review of available scientific literature on EMF indicates that it is likely that EMF's may influence the physiology of birds nesting on transmission line structures. However, the levels of those effects to each species under a range of different conditions is not easily quantifiable and there is currently no conclusive evidence to suggest that such effects would have a significant effect on the long-term viability of local bird populations. In their 2005 review paper, Fernie and Reynolds (2005) found that the majority of studies found when birds are subjected to EMFs, changes are observed in; bird

Indirect impact	Impacted entities (PCT/threatened entity and their habitats and where relevant, EPBC Act listing)	Extent (ha or zone reference)	Frequency	Duration (long-term/ short-term/ medium-term)	Project phase/ timing of impact (e.g. construction, operation, rehabilitation)	Likelihood and consequences	Evidence-based justification for predictions of impacts (including any limitations to data, assumptions and predictions)
							behaviour, reproductive success, growth and development, physiology and endocrinology, and oxidative stress, although not always with a consistent effect or direction (Fernie and Reynolds, 2005). Studies have shown positive effects of Electromagnetic Fields (EMFs) on birds including increased fertility in two breeding events studied in American Kestrels (*Falco sparverius*) (Fernie and Reynolds, 2005). Furthermore, a study conducted over nine (9) breeding seasons, Tomas *et al.* (2012) found that within a single population of Great Tits (*Parus major*), breeding occurrences subjected to the effects of EMF exposure showed an increase in clutch size by 7% and an increase in egg volume by 3%. Despite mitigation efforts reducing the impact of transmission line electrocution of raptors, the impacts persist with transmission lines still responsible for a significant cause of death (Kagan, 2017). This is partially because some of these risks are likely inconspicuous or just more

Indirect impact	Impacted entities (PCT/threatened entity and their habitats and where relevant, EPBC Act listing)	Extent (ha or zone reference)	Frequency	Duration (long-term/ short-term/ medium-term)	Project phase/ timing of impact (e.g. construction, operation, rehabilitation)	Likelihood and consequences	Evidence-based justification for predictions of impacts (including any limitations to data, assumptions and predictions)
							pervasive than originally thought in the late 20th century (Lehman, 2001). There is limited data available on estimate impacts within Australia however in 2014 it was estimated transmission line related mortalities were between 12 to 64 million birds with as much as 11.6 million bird electrocution deaths each year (Loss *et al.* 2014). Studies have shown transmission line collision rates varies between species of similar flight trajectories, however overall, in respect to population sizes, are not a major threat to populations (Janss & Ferrer 2000). Bats have shown a wide range of behavioural changes in response to anthropomorphic stressors; however, the effects of transmission lines are still relatively uncertain and diverse (Froidevaux *et. Al.* 2023). Studies have shown a mixed response of microbats to EMF with some actively avoiding high EMFs and others unimpacted (Froidevaux *et. Al.* 2023, Nicholls B. & Racey P.A. 2007). Froidevaux *et al.* (2023) power

Indirect impact	Impacted entities (PCT/threatened entity and their habitats and where relevant, EPBC Act listing)	Extent (ha or zone reference)	Frequency	Duration (long-term/ short-term/ medium-term)	Project phase/ timing of impact (e.g. construction, operation, rehabilitation)	Likelihood and consequences	Evidence-based justification for predictions of impacts (including any limitations to data, assumptions and predictions)
							monitoring showed certain microbat species alter foraging habits around high-voltage transmission line pylons or cables based on humidity levels despite high voltage EMF radiation possibly just in response to changing invertebrate activity impacted by humidity. Globally, the predictiveness and effectiveness of bird transmission line impact and mitigation, is compromised by a general lack of understanding about the regionally specific complexity of bird ecologies and how they interact with different collision drivers (Bernardino *et al.,* 2018). Mitigation for EMF impacts are best implemented by transmission line structures designs that discourage birds from building nest on them. As an important priority for maintenance of transmission lines to ensure that nesting birds do not constitute a risk to power delivery, transmission line structures being considered are currently designed to discourage their use by birds.

9.2.1 Indirect impacts on waterbirds

The project traverses approximately 250 kilometres across southern NSW through a range of habitats likely to be used by nationally threatened wetland bird movements from time to time.

9.2.1.1 Bird movement footprints

Waterbirds using wetland habitats in regions the project traverses, access those habitats in a variety of ways via all three types of movements (long distance, nocturnal and nomadic) and their risk of impact varies depending on which movement type they are undertaking.

Most of the wetlands associated with the subject land are not permanent, but ephemeral or semi-permanent in terms of water retention, so do not attract waterbirds continuously, sometimes not using these sites for long periods of time.

Migratory bird wetland use

An unknown cohort of international migratory waders are considered likely to cross the alignment at least twice annually.

International shorebirds using Australian habitats largely originate from Eastern Siberia or Alaska, via the East Asian Australasian Flyway (EAAF), and the Western Pacific Flyway (WPF). There is overlap between these two flyways in Coastal East Asia, but at least some birds fly directly across the Pacific from Alaska. The broad spectrum of origin and flyway chosen means that most of northern Australian coasts receive birds from the north, particularly those locations where they might have mudflats to refuel.

While many of the international migratory shorebird flock use estuarine habitats, a subset of those species use both freshwater and estuarine wetland habitats to a greater or lesser extent. Nevertheless, records, in central Australian locations, of species that generally prefer estuarine habitats, such as the Bar-tailed Godwit, strongly suggest that an unknown portion of the migratory flock migrate to the southern coasts of South Australia, Victoria and through to Tasmania via central Australia. This suggests that there is a portion of the international migrant flock crossing country that the project traverses at least twice a year. Once when migrating to Australia and then again to return to their breeding range in the northern hemisphere.

Migratory shorebirds have been demonstrated to fly at considerably high altitudes, even when there are no mountain ranges to cross, so it is expected that most international migrants crossing the continent in the vicinity of the project would fly at altitudes that would prevent them from interacting with transmission line infrastructure. Nevertheless, when wetlands are subject to water levels offering foraging opportunities for such species, they would descend from long distance migrating height altitudes to access such habitats. It is during descents to foraging habitat that birds on migration would most likely fly through altitudes of transmission line infrastructure. Such movements are better described as local movements.

9.2.1.2 Dispersing bird wetland use

While technically not migratory movements, many birds make long distance movements in Australia as a consequence of its notoriety of being both a land of drought and flooding rain. The inland of Australia is an inhospitable place for waterbirds while dry conditions prevail, but when rare inland rain events recharge drainage basins and inland lakes, birds move to these areas in considerable numbers. Once again, many birds traverse these distances at high altitudes; pelicans and ibis soaring high on thermals to be able to glide long distances denotes one of the strategies birds use to save energy over such distances.

International migratory birds also regularly make dispersing movements while they are in Australia, as shallow ephemeral wetlands provide wetted edges and substrates, and very shallow water columns that suit their foraging habits.

There is very little known about the range of altitudes birds fly for such movements, but birds generally fly long distances at higher, rather than lower, altitudes, because higher air is cooler for shedding heat generated through flight and predatory birds are less likely to be encountered at higher elevations.

9.2.1.3 Local bird movements

At all wetland habitats, permanent or ephemeral, many waterbirds periodically move from such habitats to other habitats close by or further afield as resources are depleted or wetlands dry out. Birds also make localised movements in and out of wetlands and fly around wetlands in response to danger from territorial birds, flushing from terrestrial or airborne predators, movements to and from roosting locations and accessing and vacating wetlands from long distance movements.

It is while descending and ascending from wetlands, and while making short movements between nearby wetlands, that waterbirds have the greatest risk of striking transmission line infrastructure, particularly when the birds are unfamiliar with local landscape features, such as when they are young or only intermittently visiting some sites.

Movement pathways and risk analysis for waterbirds occurring in the transmission line localities

When local wetlands are dry, international migratory waterbirds are most likely to cross the project l from north to south, and vice versa, but very likely at altitudes well above infrastructure on the ground.

Long distance dispersing birds may cross the project from any direction depending on the juxtaposition of departure and arrival locations and are also likely to make their movements at higher altitudes due to heat dissipation benefits, thermal lift advantages, and predator avoidance benefits by flying well above the ground.

Waterbirds accessing the wetlands for foraging and breeding purposes, unless sedentary for extended periods in wetlands offering cover, as is the case of rails, crakes, native-hens, bitterns and to a lesser extent snipe, are most likely to make local movements between local wetlands. In such instances, birds are more likely to fly at lower altitudes and would generally fly in a direction toward the wetland they're moving toward. Flight responses to predators may result in movements in any direction.

It is likely that some species are at greater risk than others, as studies in North America have found, but little work has been undertaken in inland Australian contexts. Young birds appear to be more prone to transmission line strike than adult individuals.

When analysing the habits of wetland bird groups in relation to their movements, what appears to be clear, is that waterbirds are at greater risk of transmission line strike when unfamiliar with a locality (would apply to any site for young birds) and when flying at lower elevations. Of all the movement types birds make, low elevation flights represent the greatest risk for waterbirds and are most likely to occur during local movements, which are those movements that are close to the wetlands themselves. Therefore, the maximum reduction in risk for waterbirds striking transmission line infrastructure is to be realised by transmission line alignments skirting wetlands, ephemeral or permanent, by significant margins.

Riverine and wetland environments

Five Nationally Important Wetland has been identified by database searches, being:

- Werai Forest
- Black Swamp and Coopers Swamp
- Lake Willian
- Koodrook and Perricoota Forests, and
- Lake Kelly and Stevensons Swamp.

The project would not directly impact any RAMSAR wetlands. However, the project is located within the locality of a series of RAMSAR wetlands including:

- NSW Central Forests:
  - Koondrook Forest Group (NSW) – located around 9km to the east at the closest point to the project
  - Werai Forest Group (NSW) – located around 8km to the south at the closest point to the project

- Kerang Wetlands:
    - Lake Tutchewop/Lake Kelly (Victoria) which are a series of lakes between eight and 10 kilometres to the south of the proposed NSW/Victoria border crossing point for the project.

The project is located downstream from the NSW Central Forests wetlands and is not located within the catchment of the Kerang Wetlands. As such, indirect impacts on these Ramsar wetlands are unlikely.

The network augmentation works near Wagga Wagga are located within an agricultural landscape and are not near any substantial wetlands or key watercourses.

The project's northern end of the main component commences at its eastern extremity near the future Dinawan substation, around the eastern extremity of the Delta Creek drainage area on the eastern side of Kidman Way. From this northern point, it traverses west across Kidman Way then turns northwest to follow an unsealed track in a west south-westerly heading. It runs roughly parallel to the meandering Delta Creek to Carrathool Road skirting the eastern extremity of the Steam Plains section of South West Woodland Nature Reserve. It continues west southwest for around 10 kilometres and turns west northwest to follow unsealed tracks across Wouldurah Road, skirting north of the meandering Delta Creek. Continuing west, it traverses a mosaic of ephemeral depressions and small lakes including Dillons Swamp on the eastern side of the Cobb Highway.

From the Cobb Highway, it turns northwest to cross the Coleambally Outfall Drain then turns west southwest below a cluster of ephemeral depressions then continues west southwest across Maude Road to pass south under The Forest Creek around 5 kilometres south of Lake Lyle. The alignment then crosses Balranald Road and the Edward River before turning south to cross Swan Hill Road and, in turn, the Northern Branch Canal, Yarrein Creek and then the Mallan Branch Canal. The alignment's southern path follows Pike Pike Lane to the east of the highly ephemeral Lake Nangtree and around five kilometres west of Mortons Lake.

The alignment continues south through Black Box communities to cross the Niemur River and to its south Wood Lane, and the forested Cunninyeuk Creek. It then continues south through rural landscapes across the ephemeral Magpie Creek to Cunninyeuk Road, following its southeast orientation before turning southwest to cross the Black Box communities associated with the Murray Valley National Park (including the Wetuppa Forest within the Noorong-Wetuppa area) – associated with the Wakool River. The crossing passes through broken landscapes at a point where clearing for the alignment minimises the loss of native woodland communities.

It then continues southwest to cross Larry's Creek before turning southeast to follow an unsealed rural road, through Black Box Woodland, skirting ephemeral wetland habitats and crossing Larry's Creek again. The alignment then continues southeast along the path of the unsealed rural road through rural lands spanning an ephemeral depression (in a pastoral paddock) and an associated creek-line before Black Box Woodlands associated with Noorong Road and another ephemeral wetland (again occurring in a pastoral paddock).

The alignment then turns to the south southwest through pastoral lands to cross Murrabit Road and the billabongs of Bullockhide Creek. Aerial mapping shows that pastoral lands associated with the alignment through this area are subject to inundation and may provide ephemeral habitats for waterbird species that are prone to respond to flooding events.

The alignment continues in a southerly direction through pastoral landscapes characterised by scant stands of trees before reaching the end of its NSW alignment at the crossing of the Murray River.

While the project traverses through the above landscape, it has purposefully been designed to avoid the most sensitive areas for water birds, such as the wetlands associated with the Werai State Forest and other areas of the Edward-Wakool River Catchment (refer to EIS Appendix C (Options report)). Where crossings of the rivers and creeks occur, the project has been designed to maximise use of the more disturbed riparian locations and to cross generally perpendicularly to minimise disturbance. The vast majority of the project within the southern part of the subject land closer to the Murray River, Edward River and Wakool River systems minimises impacts. This in turn has minimised the likely impacts to waterbirds as the likelihood of interaction and or impacts from the project, once constructed, is low.

9.2.2 Fauna strike risk assessment

While a number of threatened fauna species are likely to occur in the localities through which the project traverses, only a portion of those species are capable of flying at heights (up to 70 m) which might put them at risk of transmission line strike.

Flying and gliding mammals have the potential to make aerial movements at elevations where transmission lines are located, although many of those species are either not present locally, they do not fly at elevations where transmission lines are positioned (many microchiropteran bats and gliders) and they are unlikely to accidentally strike transmission lines, because they navigate by radar clicks and not sight (i.e. larger microchiropteran bats).

The general fauna group most likely to have potential for transmission line strike are the birds, but only small subsets of birds are likely to fly at elevations that would place them at risk of transmission line strike.

Birds which are strongly tied to terrestrial habitats, like understorey strata or other strata below the top of canopy height (particularly in open, shrubby or mallee woodland habitats) would rarely if ever fly to the height of transmission lines and when they do, it is to perch and there is no risk of transmission line strike, since flights are made at relatively slow speeds and transmission lines represent part of the habitat within their known territories.

Generally, it is those groups of birds which are likely to fly at heights where transmission lines are located, and are not familiar with local habitat attributes, which have the most potential to encounter transmission line infrastructure. Such birds can include, birds of prey, quail, and other birds, many of which move in response to changing distributions of resources usually associated with water. Such species groups include waterfowl (ducks and swans), waterbirds (storks, cranes, egrets, herons, bitterns, ibis, spoonbills, water-hens, rails and crakes) and, both resident and migratory waders (stilts, avocets, lapwings, plovers, sandpipers and, snipe). Nevertheless, while there is always likely to be a subset of resident birds of prey, many of those species which are at risk, particularly waterbirds are unlikely to occur in habitats associated with the majority of the subject land, because those habitats remain dry for long periods of time. Many species within the waterbird groups are unlikely to fly at elevations of transmission lines, unless making local movements, and a much smaller subset of those overall species are listed as Species Credit species or Ecosystem Credit. Furthermore, much of the habitats through which the project traverses is devoid of the shallow aquatic habitats that are most likely to attract such species.

A fauna risk assessment is provided in Appendix J, and the following threatened species in Table 9.20 have been identified as moderate to high risk of collision with transmission line infrastructure (high risk species denoted by High-risk notation)**.**

Table 9.20 Threatened species with moderate to high risk of collision with transmission line infrastructure

Common name	Scientific name	SAII	MNES	Risk rating
Ecosystem credit species				
Magpie Goose	*Anseranas semipalmata*	No	No	Moderate
Dusky Woodswallow	*Artamus cyanopterus cyanopterus*	No	No	Moderate
Australasian Bittern	*Botaurus poiciloptilus*	No	Yes	High
Curlew Sandpiper	*Calidris ferruginea*	Yes	Yes	Moderate
Brolga	*Grus rubicunda*	No	No	High
White-bellied Sea-Eagle	*Haliaeetus leucogaster*	No	No	High
Little Eagle	*Hieraaetus morphnoides*	No	No	High
Pink Cockatoo	*Lophochroa leadbeateri*	No	Yes	Moderate
Square-tailed Kite	*Lophoictinia isura*	No	No	High

Common name	Scientific name	SAII	MNES	Risk rating
Blue-winged Parrot	*Neophema chrysostoma*	No	Yes	Moderate
Blue-billed Duck	*Oxyura australis*	No	No	Moderate
Superb Parrot	*Polytelis swainsonii*	No	Yes	Moderate
Australian Painted Snipe	*Rostratula australis*	No	Yes	Moderate
Freckled Duck	*Stictonetta naevosa*	No	No	Moderate
Species credit species				
White-bellied Sea-Eagle	*Haliaeetus leucogaster*	No	No	High
Little Eagle	*Hieraaetus morphnoides*	No	No	High
Pink Cockatoo	*Lophochroa leadbeateri*	No	Yes	Moderate
Square-tailed Kite	*Lophoictinia isura*	No	No	High
Superb Parrot	*Polytelis swainsonii*	No	Yes	Moderate

All of these species are wide-ranging in the vicinity of the NSW/Victorian border to the future Dinawan substation component of the project.

9.2.3 Indirect impacts on bird strike and EMF criteria assessment

The project is likely to have an indirect operational impact to avifauna resulting from interactions and collision with electrical power infrastructure, however there is no specific assessment criteria under the BAM for this type of indirect impact. Therefore, for the purpose of this assessment, the vehicle strike prescribed impact assessment criteria were considered the most appropriate for assessment of bird strike and EMF associated with electrical power infrastructure.

The vehicle strike criteria and assessment of each species are provided below, with relevant assessment undertaken for the potential indirect impacts. A worked example of the assessment process is firstly provided, followed by the individual species assessments (see Appendix J). This is provided so that the process for assessment can be clearly followed, given that bird strike and EMF impacts do not neatly fit into the BAM process.

9.2.3.1 Assessed species selection

Given uncertainty around these indirect operational impacts, in association with discussions with CPHR, additional biodiversity offsets (over and above the biodiversity offsets required by the BAM for direct impacts) have been calculated for the following high-risk species in Table 9.21 as determined by the risk assessment in Appendix J. Note that if a species is a species credit and ecosystem credit it is included as a species credit only.

Table 9.21 Threatened species identified as having high risk of collision with transmission line infrastructure

Common name	Scientific name	SAII	MNES	Risk rating
Ecosystem credit species				
Australasian Bittern	*Botaurus poiciloptilus*	No	Yes	High
Brolga	*Grus rubicunda*	No	No	High
Species credit species				
White-bellied Sea-Eagle	*Haliaeetus leucogaster*	No	No	High
Little Eagle	*Hieraaetus morphnoides*	No	No	High
Square-tailed Kite	*Lophoictinia isura*	No	No	High

These species have been selected:

- as surrogate species to be able to calculate proportional impacts to threatened and non-threatened avifauna
- as they have all been recorded or assumed within the subject land
- as they have a greater likelihood of interaction with the transmission line infrastructure as outlined in this section.

In the BAM calculator, it is not possible to calculate credits for non-threatened or ecosystem credit species, so the use of surrogate species to provide additional impact compensation over and above that required for direct impacts is considered appropriate.

For this assessment, these dual credit species have been treated as species credit species to enable calculation of additional species credits to account for these impacts. That is, they have been treated as breeding species (despite breeding actually not being observed). This is considered to be a conservative approach.

Indirect impacts from bird strike and EMF whilst unlikely, have been considered for the future Dinawan substation component of the project where it does not currently have electrical infrastructure. Habitats within the parts of the project that follow existing similar electrical infrastructure are assumed to be already being affected by indirect impacts associated with bird strike and EMF.

Within the areas assessed for indirect impacts from bird strike and EMF, impact calculations have assumed 10 per cent of habitat for these species to be impacted. This conservative assumption is considered to be proportional to the likely extent of impacts to the airspace, when compared to full clearing of directly impacted areas (Disturbance Area A) in which the tree canopy layer that these species would use would be impacted. Limiting the assessed impacts to 10 per cent of the available habitat is considered to be appropriate representative given the impacts of bird strike or EMF are considered to be at a much lower level than actual habitat removal. Impacted habitat was conservatively based on the assigned habitat PCTs in Bionet for each species.

9.2.4 *Summary of indirect impacts*

A summary outlining the extent of potential indirect impacts for the representative species credit species is presented in tables Table 9.22.

Table 9.22 Summary of indirect impacts on threatened fauna species for the Murray Fans IBRA subregion

Scientific name	Common name	BC Act status[1]	EPBC Act status[2]	Disturbance area applicable to the species (full or partial impact) (ha)			Confirmed loss of habitat (ha)	Assumed loss of habitat (ha)	Total impact habitat (ha)	Indirect impact (10% of direct impact) (ha)
				Disturbance area A	Disturbance area B	Disturbance area HZ				
Haliaeetus leucogaster	White-bellied Sea-Eagle	V	-	15.83	11.82	2.10	0.00	29.75	29.75	2.98
Hieraaetus morphnoides	Little Eagle	V	-	20.90	18.30	2.67	0.00	41.88	41.88	4.19
Lophoictinia isura	Square-tailed Kite	V	-	19.77	16.82	2.34	0.00	38.92	38.92	3.89

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

(2) V = Vulnerable, E = Endangered, CE = Critically Endangered under the EPBC Act

Table 9.23 Summary of indirect impacts on threatened fauna species for the Murrumbidgee IBRA subregion

Scientific name	Common name	BC Act status[1]	EPBC Act status[2]	Disturbance area applicable to the species (full or partial impact) (ha)			Confirmed loss of habitat (ha)	Assumed loss of habitat (ha)	Total impact habitat (ha)	Indirect impact (10% of direct impact) (ha)
				Disturbance area A	Disturbance area B	Disturbance area HZ				
Hieraaetus morphnoides	Little Eagle	V	-	0.92	0.00	0.00	0.00	0.92	0.92	0.09
Lophoictinia isura	Square-tailed Kite	V	-	0.92	0.00	0.00	0.00	0.92	0.92	0.09

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

(2) V = Vulnerable, E = Endangered, CE = Critically Endangered under the EPBC Act

9.3 Prescribed impacts

An assessment of prescribed biodiversity impacts has been prepared in accordance with section 8.2 of the BAM and is presented in Table 9.24 below.

Residual prescribed impacts that cannot be avoided or mitigated, would be addressed through retiring additional biodiversity credits. This would be determined in consultation with CPHR.

Table 9.24 Assessment of prescribed biodiversity impacts

Prescribed biodiversity impacts	Nature (i.e. relevance to the Project)	Extent	Duration	Consequence
(a) impacts of development on the habitat of threatened species or ecological communities associated with karst, caves, crevices, cliffs and other geological features of significance, or rocks.	No areas of species geological features of significance occur, although a typical rocky hilltop environment exists in the area mapped as rocky woodland fauna habitat stratification unit, near Wagga Wagga. This provides a different type of terrestrial habitat to other parts of the subject land.	Impacts would be negligible; the rocky environment would be minimally impacted, and these habitats would remain post-construction.	The minor impacts to the rocky environments would be permanent.	The consequence of the impacts would be minor and non-significant.
(b) impacts of development on the habitat of threatened species or ecological communities associated with: (i) human made structures, or (ii) non-native vegetation	No human made structures would be impacted. Areas of cropped and exotic-dominated vegetation would be impacted; however, this are of comparatively minimal value for the native species and communities along the alignment.	Impacts would be negligible; the extensive cropped and exotic vegetation habitats would remain post-construction.	The minor impacts to the extensive cropped and exotic vegetation habitats would be permanent.	The consequence of the impacts would be minor and non-significant.

Prescribed biodiversity impacts	Nature (i.e. relevance to the Project)	Extent	Duration	Consequence
(c) impacts of development on habitat connectivity	The project has the potential to impact on connectivity for habitat of threatened species that facilitates movement across species' ranges. The nature of the potential impacts to connectivity primarily relate to impacts to aerial species such as birds or bats through interaction with the proposed transmission line structures or associated transmission lines. Generally, terrestrial connectivity would not be substantially affected.	The project would result in a highly permeable structure for biodiversity and connectivity is expected to remain largely unaffected for all species. Transgrid would also establish 20-metre-wide connectivity corridors near transmission line structures locations that occur in woodland vegetation at strategic locations that would be developed as part of a connectivity strategy. However, an unknown (though likely low) level of interaction such as bird strike (and fatality) may occur. Mitigating factors include: — the additional gaps for connectivity likely to be created by the project are limited to infrequently used access tracks approximately 10 m in width, which native flora and fauna can generally still disperse across — native vegetation up to 4 and 10 m growth height along the easement would be retained, providing cover for native species and connectivity	The impacts to connectivity area expected to be permanent, though minor. They are likely to reduce over time as biodiversity acclimatises to the presence of the transmission line infrastructure and transmission lines.	The consequence of the impacts would be generally minor overall and non-significant as a result of the pro-active design process that reduced impacts to habitat connectivity. Further detailed discussion of project impacts on habitat connectivity is presented in section 9.3.4 and Appendix K.

Prescribed biodiversity impacts	Nature (i.e. relevance to the Project)	Extent	Duration	Consequence
(d) impacts of development on water bodies, water quality and hydrological processes that sustain threatened species and threatened ecological communities	The project has the potential to impact on water quality, water bodies and hydrological processes that sustain threatened biodiversity.	The extent of impact related to this issue is expected to be minor. Essentially the works would mostly be limited to above-ground infrastructure construction (including access tracks) and transmission line installation, with appropriate erosion and sedimentation control measures to be implemented. No direct impacts are expected to occur to these aquatic values of reliant threatened species.	The highest potential for these impacts is during construction, although erosion and sedimentation control measures would be implemented. Once operational, such impacts are considered to be negligible on an ongoing basis.	The consequence of the predicted low-level of impact to water-values is minor and expected to be able to be appropriately managed with erosion and sediment controls implemented during construction.
(e) impacts of wind turbine strikes on protected animals	Not applicable.	Not applicable.	Not applicable.	Not applicable.
(f) the impacts of vehicle strikes on threatened species of animals or on animals that are part of a threatened ecological community	The project has the potential to impact on animals through vehicular strike.	The extent of vehicular strike is expected to be minor in context.	The most vehicular movements would be generated during construction. Once construction is completed, vehicular movements are not expected to significantly increase compared to the existing situation.	The consequence of the predicted level of impact is expected to overall be minor. Particular focus would be required during the construction phase to manage vehicle and animal interaction.

9.3.1 Karst, caves, crevices, cliffs, rocks and other geological features of significance

Karst, caves, crevices, cliffs, rocks, and other geological features of significance are absent from a majority of the subject land.

No areas of species geological features of significance occur, although a typical rocky hilltop environment exists in the area mapped as rocky woodland fauna habitat stratification unit, near Wagga Wagga. This provides a different type of terrestrial habitat to other parts of the subject land. Impacts would be negligible; the rocky environment would be minimally impacted, and these habitats would remain post-construction. Based on the above, additional mitigation measures or additional credits for prescribed impacts are not considered to be warranted.

9.3.2 Human-made structures

No substantial human-made structures (such as old farm buildings, mine infrastructure etc) are present in the subject land.

Based on the above, additional mitigation measures or additional credits for prescribed impacts are not considered to be warranted.

9.3.3 Non-native vegetation

The introduction of non-native vegetation to novel habitats can have significant ecological impacts across the entire recipient ecosystem (Leege & Murphy, 2011). As such, the impacts of this project on non-native vegetation, and the subsequent effect on native species or communities, must be considered.

Non-native vegetation is present in the subject land in the form of agricultural land and improved pastures dominated by exotic species. These areas would experience minor but permanent impacts as a result of the project.

Importantly, these areas are of minimal value for native species and communities along the alignment, and as the impact on non-native vegetation is expected to be minor and non-substantive, the risk to native species or communities is also likely to be negligible.

Based on the above, additional mitigation measures or additional credits for prescribed impacts are not considered to be warranted.

9.3.4 Habitat connectivity

The nature and extent of the proposed project calls for considerations of potential fragmentation to landscape-scale habitat connectivity for threatened entities. These considerations are outlined in Table 9.25 alongside appropriate mitigation measures.

Table 9.25 Impacts of the project on habitat connectivity

Connectivity feature species	Nature (i.e. relevance to the project)	Extent	Duration	Consequence	Mitigation
Aerial Connectivity					
Avifauna such as: — Barking Owl — Masked Owl — Superb Parrot — Regent Parrot — Gang-gang Cockatoo — South-eastern Glossy Black-Cockatoo — Pink Cockatoo — Little Eagle — Square-tailed Kite — Brolga	The project has the potential to impact on connectivity for habitat of the species that facilitates movement across species' ranges. Possible movement corridors exist for the species between key breeding sites and habitats within the Murray River system and its tributaries.	The project would result in a highly permeable structure generally not considered to impede fauna movement across the landscape, especially in locations adjoining or in close proximity to existing transmission line infrastructure where fauna species are accustomed navigating around existing transmission line infrastructure. However, a likely very low level of interaction such as bird strike (and fatality) may occur, due to the lower general flight elevations of the species compared to proposed infrastructure.	The impacts to connectivity area expected to be permanent, though minor. They are likely to reduce over time as biodiversity acclimatises to the presence of the transmission line infrastructure.	The consequence of the impacts would be minor and non-significant as a result of a pro-active design process where aerial connectivity has been assessed and minimised throughout the planning design process and through the colocation with existing infrastructure	Mitigation measures include the installation of bird diverters (refer to section 9.4.2).

Connectivity feature species	Nature (i.e. relevance to the project)	Extent	Duration	Consequence	Mitigation
Waterbirds – broadly includes a range of species across a number of species groups, including Anatidae (Waterfowl), Charadriiformes (Migratory Waders and related groups), Pelecaniformes (large Waterbirds), and Rallidae (Rails and water hens)	Waterbird groups are here dealt with together as their potential connectivity (mobility) impacts are largely in common. The project has the potential to be a connectivity barrier for waterbirds across potential flyways. Three waterbird movement types may occur in relation to transmission lines. Migratory movements, dispersive movements and local movements. Impacts are considered most likely to occur during local movements when waterbird groups are attracted to retained surface water habitats in proximity to the transmission lines during periods of higher rainfall.	The project would result in a highly permeable structure generally not considered to impede fauna movement across the landscape. Extent of impacts is likely to be intermittently tied to movement pathways. Risk likely to be intermittent with largely long periods between periods when risk exists, with an unknown (though likely low) level of interaction such as bird strike (and fatality) may occur.	The impacts to connectivity are expected to be permanent, though limited to intermittent periods tied to habitat availability. Within some habitat use contexts they are likely to reduce over time as biodiversity acclimatises to the presence of the transmission line infrastructure and transmission lines.	The consequence of the impacts would be intermittent and relatively minor and non-significant as a result of the pro-active design process where aerial habitats have been assessed and minimised throughout the planning design process.	Mitigating measures include the installation of bird diverters (refer to section 9.4.2).

Connectivity feature species	Nature (i.e. relevance to the project)	Extent	Duration	Consequence	Mitigation
Southern Myotis	The project has the potential to impact on connectivity for habitat of the species that facilitates movement across species' ranges. In particular likely movement corridors exist for the species between key breeding sites and habitats along the Murray River system, its tributaries and adjoining riparian / aquatic habitats.	The project would result in a highly permeable structure generally not considered to impede fauna movement across the landscape. However, an unknown (though likely very low) level of interaction such as line strike (and fatality) may occur, due to the lower general flight elevations of the species compared to proposed infrastructure.	The impacts to connectivity area expected to be permanent, though minor. They are likely to reduce over time as biodiversity acclimatises to the presence of the transmission line infrastructure and transmission lines.	The consequence of the impacts would be minor and non-significant as a result of the pro-active design process where habitat for this species were considered during the planning design phase.	Not applicable.
Terrestrial Connectivity					
Squirrel Glider	The project has the potential to impact on connectivity for habitat of the species that facilitates movement across species' ranges. In particular potential movement corridors exist for the species. The project would result in a new influence on movement through the establishment of a gap in canopy cover of up to 70 m within greenfield sections and up to 140 m where co-located with adjoining transmission infrastructure.	The project would result in new or increased fragmentation of canopy at locations along the alignment. The majority of the project is in greenfield locations (i.e. not co-located with other transmission lines) and in these sections the removal of canopy would potentially fragment the species habitat, without appropriate mitigation measures.	The impacts to habitat connectivity are expected to be permanent, though minor. They are likely to reduce over time as biodiversity acclimatises to the presence of the transmission line infrastructure and transmission lines.	The consequence of the impacts would be moderate if unmitigated.	Species would typically require habitat stepping-stones to facilitate dispersal through: — maintained vegetated understorey within B4 and B10 zones — maintained vegetated corridors <10 metres in height, and/or — installation of under-transmission glider poles in appropriate locations

Connectivity feature species	Nature (i.e. relevance to the project)	Extent	Duration	Consequence	Mitigation
Plains-wanderer	The project as the potential to impact on connectivity for habitat of the species that facilitates movement across species' ranges.	The project would result in new or increased fragmentation of habitat to a very minor degree in locations mapped as this species habitat along the alignment.	The impacts to connectivity area expected to be permanent, though very minor. They are likely to reduce over time as biodiversity acclimatises to the presence of the transmission line infrastructure and transmission lines.	The consequence of the impacts would be moderate if unmitigated	Project has been amended to avoid almost all of this species mapped habitat and during construction, the mapped habitat would be purposefully avoided to exclude direct impacts to the greatest extent possible.
Southern Bell Frog	The project has the potential to impact on connectivity for habitat of the species that facilitates movement across species' ranges.	The project would result in new or increased fragmentation of to a very minor degree in locations mapped as this species habitat along the alignment. Individuals were mostly associated with water bodies and associated vegetation around rivers, farm dams, billabongs and irrigation channels and these are primarily likely to remain unaffected by the project.	The impacts to connectivity area expected to be permanent, though very minor. They are likely to reduce over time as biodiversity acclimatises to the presence of the transmission line infrastructure and transmission lines.	The consequence of the impacts would be moderate if unmitigated	Project has been amended to avoid this species habitat wherever possible. Mitigation would include supervision during clearing activities within the identified habitats and locations.

Connectivity feature species	Nature (i.e. relevance to the project)	Extent	Duration	Consequence	Mitigation
Woodland birds have here been grouped together into two movement guilds: 1.) small species for which large gaps in woodland habitats inhibits their potential to move from patch to patch, including: — Brown Treecreeper (*Climacteris picumnus victoriae*) — Varied Sittella (*Daphoenositta chrysoptera*) — Black-chinned Honeyeater (*Melithreptus gularis gularis*) Diamond Firetail (*Stagonopleura guttata*), and 2.) those species for which gaps in woodland vegetation represent no significant barrier. This guild includes all other woodland birds that have a moderate to high likelihood of occurrence in the subject land. Bush Stone-curlew, which has been identified within the subject land, falls into guild 2.	The project has no potential to impact habitat of species in guild 2 but may have some initial impacts on habitat for species in guild 1.	The project would result in a highly permeable structure generally not considered to impede fauna movement across the landscape, especially in locations adjoining or in close proximity to existing transmission line infrastructure where fauna species are accustomed navigating around existing transmission line infrastructure. The maximum cleared to ground level gap would be 20 m in width, while that is increased to 60 m for vegetation >4 m in height. All cleared transmission line easements (60 m wide) observed during field surveys had understorey regrowth, which facilitate stepping-stone movements and allowed continued connectivity for guild 1 woodland birds. Bush Stone-curlew is considered to easily traverse relatively small breaks (<200 m) in native vegetation.	The impacts to connectivity area expected to be permanent to guild 1, although the minimum gap of 20 m is likely to be minor. Species like the Bush Stone-curlew are unlikely to be impacted considering the maintenance of understorey vegetation.	The consequence of the impacts would be minor and non-significant as a result of the pro-active design process incorporating maintained understorey vegetation within B4 and B10 zones and vegetated corridors.	Mitigation measures would include: — maintained vegetated understorey within B4 and B10 zones, and — maintained vegetated corridors <10 metres in height.

Connectivity feature species	Nature (i.e. relevance to the project)	Extent	Duration	Consequence	Mitigation
Reptiles including: — Pink-tailed Worm-lizard — Striped Legless Lizard — Grey Snake	The project has the potential to partially impact on connectivity for habitat of the species that facilitates movement across species' ranges. In particular known movement corridors exist for the species throughout existing foraging habitats. The maximum cleared to ground level gap would be 20 m in width. However, these areas would be adjoined by maintained understorey vegetation <4 m in height for the remainder of the corridor.	The project would result in a highly permeable structure generally in locations adjoining existing Transmission line infrastructure.	The impacts to connectivity area expected to be permanent, though minor.	The consequence of the impacts would be minor and non-significant as a result of the pro-active design process incorporating maintained understory vegetation within B4 and B10 zones and vegetated corridors. Connectivity for reptiles would not be significantly diminished due to the retention of understorey strata.	Mitigation measures would include: — maintained vegetated understorey within B4 and B10 zones, and — maintained vegetated corridors <10 m in height.

Connectivity feature species	Nature (i.e. relevance to the project)	Extent	Duration	Consequence	Mitigation
Koala	The project has the potential to partially impact on connectivity for habitat of the species that facilitates movement across species' ranges. In particular known movement corridors exist for the species throughout existing foraging habitats along key riparian corridors and habitat contain feed species. The maximum cleared to ground level gap would be 20 m in width. However, these areas would be adjoined by maintained understorey vegetation <4 m in height for the remainder of the corridor.	The project would result in a highly permeable structure generally in locations adjoining existing Transmission line infrastructure.	The impacts to connectivity area expected to be permanent, though minor.	The consequence of the impacts would be minor and non-significant as a result of the pro-active design process incorporating maintained understorey vegetation within B4 and B10 zones and vegetated corridors.	Mitigation measures would include: — maintained vegetated understorey within B4 and B10 zones, and — maintained vegetated corridors <10 m in height.

9.3.4.1 Overview

Section 9.2 documents the residual predicted impacts of on 1) aerial species, and 2) terrestrial species.

Detailed discussion on regional terrestrial habitat connectivity including mitigation options is provided in Appendix K.

The project has the potential to further fragment habitat within the development footprint through the creation or use of transmission line easements and related infrastructure, thus affecting the connectivity between habitats in the wider landscape. Habitat connectivity is essential for the mitigation of habitat loss and fragmentation resulting from changes to a landscape, with connected habitats providing a means for species dispersal, improved genetic diversity, and movement between populations that might otherwise become isolated by these changes (Doerr *et al*., 2010). Maintenance of access tracks and infrastructure associated with transmission line easements is required regularly, creating a significant abrupt difference of habitat condition types. This ultimately leads to dispersal and movement inhibition for many species (Strevens *et al*. 2008).

However, Clarke *et al*. (2006) demonstrated the degree of clearing has distinct impacts on biodiversity values in relation to small mammals of NSW. They found that areas with significant clearing and minimal remaining vegetation were utilised mostly by introduced mice. However, moderate vegetation presence had the possibility of improving biodiversity, with an increase in the occurrence of species rarer in established forests, particularly where retained vegetation better suited the habitat needs of those species.

Clarke *et al*. (2006) outlines that the removal of the canopy cover would result in habitat creation for some species, while reducing it for others, supporting the intention by the project to ensure the retention of native vegetation up to four and 10 metres growth height along the easement, effectively facilitating species movement between suitable areas of habitat.

Gregory *et al*. (2021) found that the presence of transmission lines can create perching locations for birds of prey in open areas, leading to a reduction in the populations of localised raptor prey, but demonstrating that species would acclimatise to the presence of transmission line infrastructure and transmission lines. This has been demonstrated by some threatened raptors, namely the Black Falcon (*Falco subniger*).

9.3.4.2 Squirrel Glider

For areas of other projects where glider species are potentially impacted, the use of wooden poles to facilitate movement has proven effective. A study by Ball and Goldingay (2008) recorded a maximum glide distance of 25 metres, suggesting that the proposed 20-metre-wide connectivity corridors associated with the project should be functional for gliding species if trees of suitable height are present. Where suitable vegetation is not present, wooden poles can be utilised to replace trees (Ball and Goldingay, 2008).

An important consideration is that only a small part of the project intersects with any likely Squirrel Glider habitat, as identified by species expert report, within the network augmentation works.

Appendix K provides an assessment of the regional habitat connectivity and provides detailed information on glider poles and potential mitigation measures.

Mitigation measures outlined in this BDAR that apply to the Squirrel Glider include the preparation of a Connectivity Strategy. However, in order to address any uncertainties around the impacts to connectivity for this species in the landscape, due to impacts to the tree canopy layer, additional prescribed impact credits are proposed.

Guiding the approach for prescribed impacts on connectivity for the Squirrel Glider are the following principles:

- areas of impact are calculated for the relevant subregions that have been adopted in this report for each of the selected species and
- prescribed impacts to Squirrel Glider due to habitat connectivity impacts encompass areas at which Squirrel Glider habitat has been mapped.

Within the areas assessed for prescribed impacts for Squirrel Glider habitat connectivity, impact calculations have assumed an additional 10 per cent of impacted habitat within Disturbance Area A, Disturbance Area B and Disturbance Area HZ for this species to be impacted. This cautious assumption is considered to be proportional to the likely extent of impacts to the tree canopy connection. This is in addition to the credits generated for Squirrel Glider for the full clearing of directly impacted areas (Disturbance Area A) in which the tree canopy layer that this species would use would be impacted and also in addition to the Disturbance Area B and Disturbance Area HZ zones.

Limiting the assessed impacts to 10 per cent of the available habitat in these locations is considered to be appropriately representative given the impacts to connectivity for Squirrel Glider are considered to be at a much lower level than actual habitat removal, given the mitigation measures such as glider poles and rope ladders are also to be used in association with understorey retention. Impacted habitat was cautiously based on the assigned habitat PCT's in Bionet for each species.

The proposed additional credit obligation for impacts to Squirrel Glider habitat connectivity are provided in Table 9.26 below. Impacts are to be provided for areas habitat identified by species expert report (Appendix I).

Table 9.26 Prescribed connectivity impacts to species credit species within the Inland Slopes IBRA subregion

Scientific name	Common name	BC Act status[1]	EPBC Act status[2]	Disturbance area applicable to the species (full or partial impact) (ha)	Confirmed loss of habitat (ha)	Assumed loss of habitat (ha)	Total impact habitat (ha)	Prescribed impact (10 % of direct impact) (ha)
Petaurus norfolcensis – endangered population	Squirrel Glider in the Wagga Wagga LGA	E	-	0.92	0.00	0.92	0.92	0.09

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

(2) V = Vulnerable, E = Endangered, CE = Critically Endangered under the EPBC Act

9.3.5 Waterbodies, water quality and hydrological processes

The project footprint is expected to cross around 22 named and 83 unnamed watercourses, which are located within Central Murray and Murrumbidgee catchments. Impacts to these waterways could be caused by both the construction of transmission line structures and access tracks.

No transmission line structures would be constructed within 50 metres from the edge of the higher order watercourses (being stream order four and above), which would satisfy the vegetated riparian zone (VRZ) requirement. Around 14 transmission line structures would be located within 50 metres of a lower order watercourses, and six are located within 50 metres of an irrigation channel. While the construction impact for an additional 48 transmission line structures (including break and winch sites) for the NSW/Victorian border to the future Dinawan substation component would be located within 50 metres from the edge of watercourses. Of these, five are within the applicable VRZ of a watercourse that has been mapped as Key Fish Habitat and/or mapped in the distribution of a threatened aquatic species (being two unnamed watercourses (Strahler order 0 and 3), Merran Creek (Strahler order 2), Magpie Creek (Strahler order 2) and Cunninyeuk Creek (Strahler order 3).

The access tracks proposed include new tracks or upgrades to existing tracks, which require new or upgraded watercourse crossings. While the selection of the proposed access tracks has sought to avoid crossing watercourses where possible, it is anticipated that a number of watercourse crossings would be required. Structural assessments of existing crossings would be completed during detailed design, which may identify the need for existing crossings to be upgraded. Four new access tracks are expected to be constructed at watercourses that have mapped Key Fish Habitats, with an additional 16 watercourse crossings may require works to upgrade the existing crossing. Named watercourses subject to crossings are outlined in Appendix M.

Direct impacts to watercourses could result in a change in flow paths and direct disturbance to banks and channels, resulting in direct impacts to fish and fish habitat. Removal of riparian vegetation would increase the susceptibility to bed and bank erosion, resulting in sedimentation and the release of deleterious substances into aquatic habitats and contributing to the degradation of aquatic habitats. General construction activity in, on or within the vicinity of watercourse may also present water quality impacts (if not properly managed). Following construction, disturbed areas within riparian areas would be stabilised and rehabilitated following the completion of construction activities, as required.

Construction of the transmission line within the vicinity of larger order watercourses is unlikely to result in long-term harmful alteration, disruption and destruction to fish and fish habitat given that direct, instream impacts would not occur. Indirect impacts to fish or fish habitat that may occur, if not properly managed, include:

- introduction of invasive species and diseases
- change in quantity and quality of food supply
- riparian vegetation die-off
- reduction in water quality.

Construction of transmission lines within the riparian area and within the instream area would directly impact lower order watercourses. For watercourses that have the potential support aquatic fauna or contain Key Fish Habitat, the direct and indirect impacts are likely to result in long-term harmful alteration, disruption and destruction to fish and fish habitat. Direct and indirect impacts to fish and fish habitat include:

- introduction of invasive species and diseases
- removal of riparian vegetation, change in habitat structure and cover, and/or direct removal of fish or Key Fish Habitat
- change in quantity and quality of food supply
- reduction in water quality
- direct impact to fish, eggs or ova
- blockage of fish passage
- potential mortality of fish/eggs/ova due to direct impacts by vehicles or plant and equipment
- change in water flows within a watercourse.

Given the relatively high number of watercourse crossings and potential for impacts to waterbodies and water quality. Additional mitigation measures have included in section 9.3.2 and Appendix M. In addition to these mitigation measures all construction activities for transmission line structures and access tracks would be undertaken in accordance with:

- *Policy and guidelines for fish habitat conservation and management* (Update 2013) (DPI, 2013)
- *Why do fish need to cross the road? Fish Passage Requirements for Waterway Crossings* (Fairfull and Witheridge, 2003)
- *Controlled activities – Guidelines for watercourse crossings on waterfront land* (DPE, 2022b)
- *Controlled activities – Guidelines for riparian corridors on waterfront land* (DPE, 2022c)
- *Managing Urban Stormwater: Soils and Construction – Volume 1, 4th Edition* (Landcom, 2004)
- *Guidelines for the planning, construction and maintenance of tracks* (Department of Land and Water Conservation, 1994)
- *Managing Urban Stormwater: Soils and Construction – Volume 2C Unsealed Roads* (DECC, 2008a).

A residual risk assessment of impacts to aquatic habitats is provided in Appendix M. It has been determined that there is a medium risk of impacts to aquatic habitats due to the removal of riparian vegetation, potential riparian vegetation die-off, change in habitat structure and cover, and a reduction in water quality within water courses. All other potential impacts are considered to be adequately managed through mitigation measures. Given this, no additional credits for prescribed impacts are to be considered warranted.

9.3.5.1 Key fish habitats

Mapped key fish habitat and the indicative distribution of threatened species are independent of each other.
A watercourse can be mapped as not containing key fish habitat but can be mapped as having an indicative distribution of threatened species. This discrepancy may occur as the watercourse does not contain all the habitat features to be deemed to be key fish habitat, or the watercourse has not been fully assessed.

The key fish habitat and associated sensitivity classification scheme is summarised in Table 1 of the *Policy and guidelines for fish habitat conservation and management* (DPI, 2013). Under this scheme any known or expected protected or threatened species habitat or area of declared 'critical habitat' under the FM Act (NSW) is defined as "TYPE 1 – Highly sensitive key fish habitat".

According to the Fisheries NSW Spatial Data Portal, the subject land contains mapped distribution for:

- Flathead Galaxias – EPBC Act (Cth): Critically Endangered, FM Act (NSW): Critically Endangered
- Silver Perch – EPBC Act (Cth): Endangered, FM Act (NSW): Vulnerable
- Murray Hardyhead – EPBC Act (Cth): Endangered, FM Act (NSW): Critically Endangered
- Murray Spiney Crayfish – FM Act (NSW): Vulnerable.

Key Fish Habitat and mapped distribution of threatened aquatic species occur throughout various named watercourse and unnamed watercourses within the project footprint for the NSW/Victorian to the future Dinawan substation component which are outlined in section 5.6.

Avoiding and minimising impacts on aquatic habitats is a priority of detailed design and any residual indirect impacts would be subject to mitigation measures. Structures may be placed within minor flow paths (1st and 2nd order streams), however, where possible, would be placed 50 metres away from watercourses with a stream order from 3 to 6 (*Technical paper 9 – Hydrology, flooding and water quality impact assessment* (WSP2025b)). For watercourses with a stream order of 7 or higher, transmission line structures would not be located within the banks.

The only likely impact to occur in an area of key fish habitat would be the removal or trimming of tree canopy on the creek banks to facilitate the construction and operation of the transmission lines spanning each riparian area. All trunk bases and understorey would be retained in-situ adjoining the creek banks. All potential indirect impacts associated with erosion and sedimentation impacts would be managed and monitored to ensure that these do not impact the riparian areas. Further, the use of additional temporary infrastructure, such as 'hurdles' on a case-by-case basis during stringing across watercourses would alleviate impacts to such Key Fish Habitats (refer to Chapter 3 (Project description) of the EIS).

All watercourse crossings would be designed in accordance with *Why Do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings* (Fairfull and Witheridge, 2003) and *Policy & Guidelines for Fish Habitat Conservation & Management* (2013 update) (Department of Primary Industries, 2013). Where the project involves works within 40 metres of the high bank of any river, lake or wetlands (collectively waterfront land), such as waterway crossings, the work would be designed and implemented in accordance with the DPI Guidelines for Controlled Activities on Waterfront Land. Mitigation measures and controls are outlined in detail in Appendix M and section 9.4.2.

Temporary impact associated with vehicle waterway crossings during the construction phase would be limited where possible to existing property tracks and crossing points.

Appendix M outlines the watercourse crossing locations of Key Fish Habitat and these include:

- Berambong Creek (Strahler 10)
- Bullockhide Creek (Strahler 10)
- Carroonboon Creek (Strahler 1, 2 and 3)
- Coleambally Outfall Drain (Strahler 9)
- Cunninyeuk Creek (Strahler 3)
- Deadman Creek (Strahler 10)
- Delta Creek (Strahler 1 and 2)
- Edward River (Strahler 10)
- Jaffrey Creek (Strahler 10)
- Larry's Creek (Strahler 10)
- Magpie Creek (Strahler 2)
- Mallan Branch Canal (Strahler 0 - canal)
- Merran Creek (Strahler 10)
- Moore Creek (Strahler 1)
- Murray River (Strahler 10)
- Niemur River (Strahler 10)
- Northern Branch Canal (Strahler 0 - canal)
- Southern No 26 Channel (Strahler 0 - canal)
- Southern No 26 (A) Channel (Strahler 0 - canal)
- Wakool River (Strahler 10)
- Yarrein Creek (Strahler 10)
- Wyam Creek (Strahler 10).

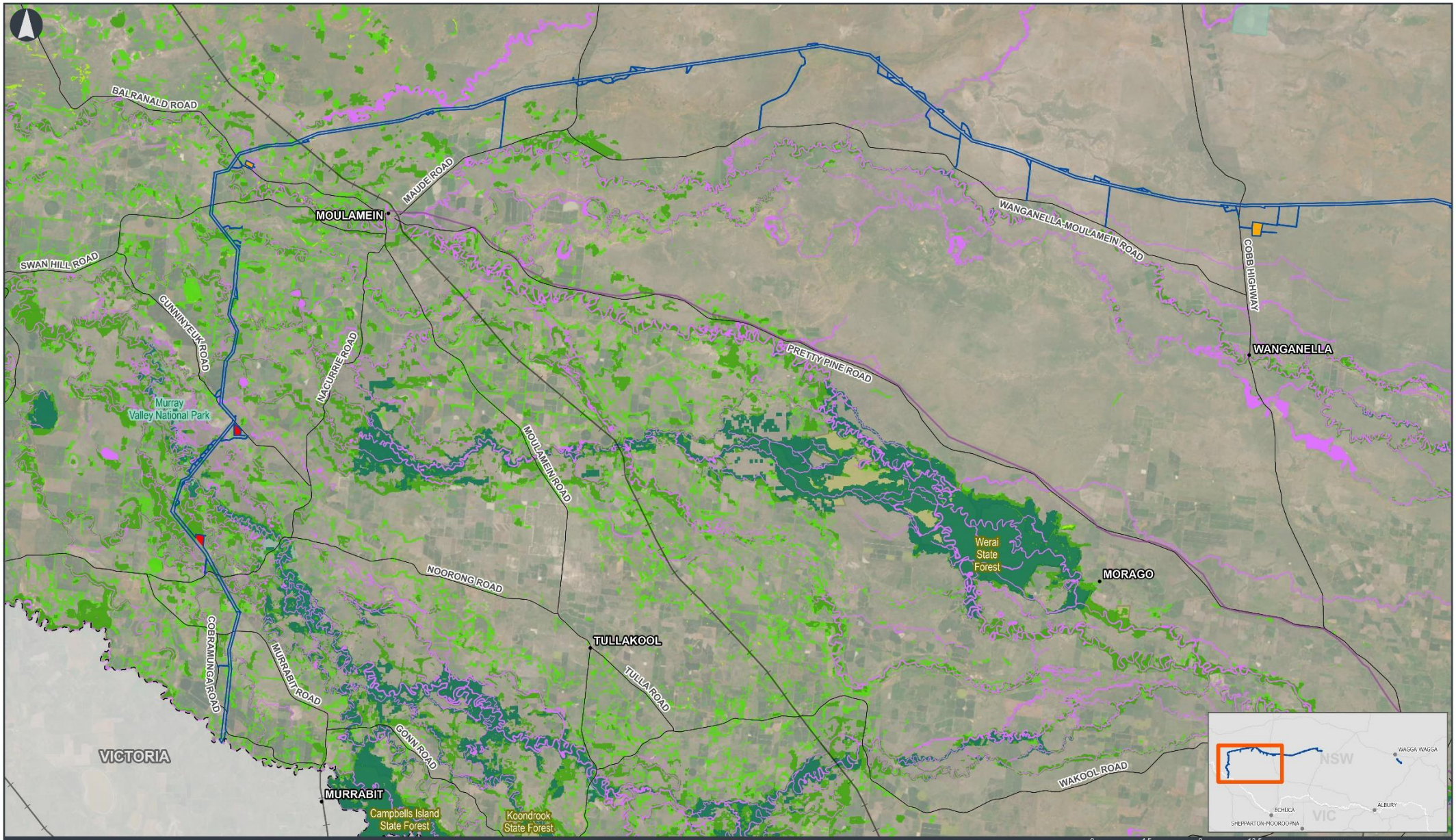
Overall, the impacts of the project are expected to be moderate during the construction phase and are not anticipated to result in significant long-term impacts to the threatened species that may inhabit the project footprint, nor to the Lower Murray River Catchment EEC within the project footprint. However, supplementary surveys are recommended prior to construction to determine site-specific mitigation measures to further minimise and/or mitigate potential impacts.

9.3.5.2 Groundwater dependent ecosystems

Impacts to groundwater associated with the project are identified in *Technical paper 10 – Groundwater impact* assessment and include potential changes in groundwater levels and quality as a result of construction activities, which include (but are not limited to) excavations, piling and contamination as a result of spills. These potential impacts on groundwater and subsequent high priority GDEs from water sharing plans and the HEVAE database is considered low and restricted to direct impact areas. In terms of impacts, concrete pilings may intercept the local water table where the water table is close to surface. During construction concrete would be poured into the excavated pile, and water removed from the pile as it is displaced by the concrete. There is no permanent take of water, and therefore, there is no permanent change to groundwater levels and associated sensitive receivers, during the project construction or operation.

None of the structures or construction activities within the subject land would result in any permanent groundwater take that would alter the groundwater flow outside of the direct impact areas. Given this, native vegetation assessment under BAM is considered adequate to address the direct impacts on terrestrial GDE native vegetation and the project is considered unlikely to result in any indirect additional impact on GDEs.

Based on the above, additional mitigation measures or additional credits for prescribed impacts are not considered to be warranted.



VNI West – EIS

Figure 9.1a
Groundwater dependent ecosystems and key fish habitat

Legend

- NSW/Victorian border
- Existing transmission line
- Main road
- Rail line
- National park
- State forest
- Project footprint
- Combine temporary worker accommodation facility
- Construction compound
- Substation

Groundwater Dependent Ecosystems

- Very high priority GDE
- High priority GDE
- Moderate priority GDE
- Low priority GDE
- Very low priority GDE
- Key Fish Habitat

Data sources: NSW EPI, DELWP, WSP, EnergyConnect



VNI West – EIS

Figure 9.1b
Groundwater dependent ecosystems and key fish habitat

Legend

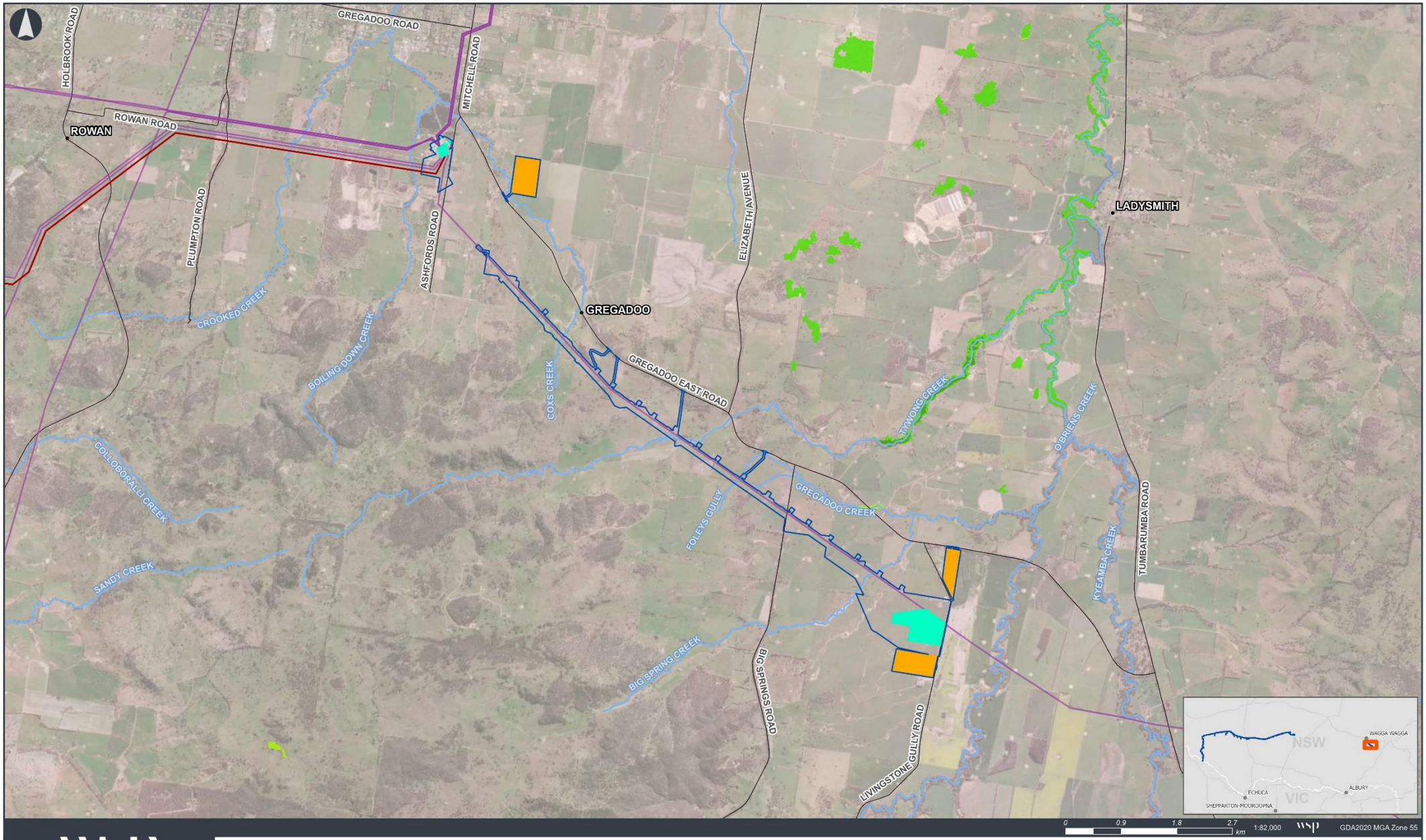
- EnergyConnect (NSW - Eastern section) (under construction)
- Existing transmission line
- Main road
- Rail line
- National park
- State forest
- Project footprint
- Combine temporary worker accommodation facility
- Construction compound
- Substation

Groundwater Dependent Ecosystems

- Very high priority GDE
- High priority GDE
- Moderate priority GDE
- Low priority GDE
- Very low priority GDE
- Key Fish Habitat

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Data sources: NSW EPI, DELWP, WSP, EnergyConnect



VNI West – EIS

Figure 9.1c
Groundwater dependent ecosystems and key fish habitat

Legend

- EnergyConnect (NSW - Eastern section) (under construction)
- Existing transmission line
- Main road
- Named waterway
- Project footprint
- Combine temporary worker accommodation facility
- Construction compound
- Substation

Groundwater Dependent Ecosystems

- Very high priority GDE
- High priority GDE
- Moderate priority GDE
- Low priority GDE
- Very low priority GDE

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Data sources: NSW EPI, DELWP, WSP, EnergyConnect

9.3.6 Vehicle strike

Table 9.27 documents the residual predicted impacts of vehicle strike on: 1) threatened fauna species, and 2) protected fauna species that are part of a TEC. Evidence-based justification for predicted impacts is provided.

Increased traffic as a result of the project has the potential to result in vehicle strike to threatened species and protected fauna species that are part of a TEC occurring in the subject land. Vehicle collision is a direct impact that reduces local population numbers and is a common occurrence in Australia (Coffin 2007; Rowden et al. 2008).

Australia lacks national data on roadkill (Englefield, *et al*., 2020) and as such the impact on animal population are largely unquantified. However, there are some NSW based studies that provide an evidence base. Taylor and Goldingay (2004) showed that roadkill rates of vertebrate species on three major roads in north-eastern NSW equated to 0.3 road-kills kilometre–1 week–1 or one road-kill every 3.8 kilometres week–1. The likelihood of vehicle collisions with kangaroos has been shown to increase exponentially with traffic volume rather than linearly (Klöcker et al., 2006). Kangaroos initially perceive vehicles as a threat and flee at low traffic volumes, but as traffic increases, they become habituated and reduce their flight distance from the road edge (Klöcker *et al*., 2006). Higher traffic volumes may make kangaroos more alert, jumpy, and flighty, resulting in scattered and undirected flights (Klöcker *et al*., 2006) which may result in increased likelihood of vehicle collision. Other evidence suggests that the majority of vehicle strike are caused by very few vehicles as most roadkill deaths occur at night and the majority of traffic volume occurs during the day (Ramp, *et al*., 2005). Although high traffic volume is commonly associated with high fatality rates of fauna on roads, roads that are travelled infrequently but at high speed often incur high fatality rates as species do not appear to become habituated to vehicle presence (Ramp, *et al*., 2005). It is likely that increased vehicle movements, specifically at night, would increase the risk of vehicle strike. An older study by Vestjens (1973) showed that the roadkill on a road between Canberra, ACT and Lake Cowal, NSW was composed of birds (65.9 per cent), mammals (29.1 per cent), reptiles (4.9 per cent) and amphibia (0.1 per cent). This provides evidence upon which to base assumptions of likely vehicle strike impacts to various fauna groups.

Overall, vehicle strike would not appear to be a significant concern for the project. Areas in the region are near existing infrastructure and highly disturbed areas. During operations for the project, vehicle speeds would be very low due to the topography and nature of the roads, combined with speed limits. Therefore, vehicle strike in these areas of higher biodiversity value would be unlikely to be a significant issue. Due to the low likelihood of vehicle strike, and mitigation measures that would be undertaken (i.e. implementation of road signs and speed limits), the residual impacts are likely to be minor.

Table 9.27 Residual prescribed impacts – vehicle strikes

Threatened fauna or protected fauna that are part of a TEC that are at risk of vehicle strike (identified in Chapter 5)	SAII entity	Likelihood	Estimated vehicle strike rates	Consequences
Threatened species				
Squirrel Glider	No	Low	Squirrel Gliders have potential for vehicle strike when gliding across road corridors. Consequently, risk of vehicle strike is low, but could occur on rare occasion.	Due to the low likelihood of vehicle strike, and mitigation measures that would be undertaken (i.e., detailed design of access tracks to avoid areas of key habitat, implementation of road signs and speed limits), the residual impact for Squirrel Glider is likely to be minor.
Eastern Pygmy-possum (*Cercartetus nanus*)	No	Low	Threatened terrestrial and sedentary species, and species with broad home ranges have higher potential for vehicle strike when crossing roads and tracks, and vehicle movement may be slightly increased during construction and operation of the project. However, due to the minor traffic increase, the overall risk of vehicle strike for these species is low.	Due to the low likelihood of vehicle strike and mitigation measures that would be undertaken (i.e. implementation of road signs and speed limits), the residual impact for these threatened species is minor.
Plains-wanderer (*Pedionomus torquatus*)	Yes			
Southern Bell Frog (*Litoria raniformis*)	No			
Striped Legless Lizard (*Delma impar*)	No			
Bush Stone-curlew (*Burhinus grallarius*)	No			
Brush-tailed Phascogale (*Phascogale tapoatafa*)	No			
Koala (*Phascolarctos cinereus*)	No			

Threatened fauna or protected fauna that are part of a TEC that are at risk of vehicle strike (identified in Chapter 5)	SAII entity	Likelihood	Estimated vehicle strike rates	Consequences
Protected fauna species that are part of TECs that are most at risk from vehicle strike based on observations of roadkill made in the locality and database records				
Mammals including Eastern Grey Kangaroo, Red-necked Wallaby, Common Wallaroo, Swamp Wallaby, Common Wombat, Short-beaked Echidna, Common Brushtail Possum, Common Ringtail Possum, Sugar Glider.	No	High	Roadkill rates for mammals has been shown to be second only to birds (see Vestjens, 1973). Taylor and Goldingay (2004) showed that roadkill rates of vertebrate species on three major roads in north-eastern NSW equated to 0.3 road-kills km^{-1} $week^{-1}$ or one road-kill every 3.8 km $week^{-1}$. Due to the minor rate of predicted traffic increase, the overall risk of increased vehicle strike for these species is low.	Due to the low likelihood of vehicle strike, and mitigation measures that would be undertaken (i.e., detailed design of roads/access tracks to avoid areas of key habitat, implementation of road signs and speed limits), the residual impacts are likely to be minor.
Reptiles including Common Bearded Dragon, Jacky Lizard, Nobbi Dragon, Red-bellied Black Snake, Eastern Brown Snake, Eastern Bluetongue, Shingleback Lizard (Boggi), Lace Monitor, Snake-necked Turtle.	No	High	Roadkill rates for reptiles has been shown to be lower than for other fauna groups such as mammals and birds (see Vestjens, 1973). Due to the minor rate of predicted traffic increase, the overall risk of increased vehicle strike for these species is low.	Due to the low likelihood of vehicle strike, and mitigation measures that would be undertaken (i.e., detailed design of roads/access tracks to avoid areas of key habitat, implementation of road signs and speed limits), the residual impacts are likely to be minor.
Amphibians including Ornate Burrowing Frog, Common Froglet, Eastern Sign-bearing Froglet, Brown Toadlet, Striped Marsh Frog, Spotted Grass Frog, Eastern Banjo Frog, Peron's Tree Frog, Broad-palmed Frog, Green Tree Frog, Tyler's Tree Frog, Eastern Dwarf Tree Frog.	No	High	Roadkill rates for amphibians has been shown to be lower than for other fauna groups (see Vestjens, 1973). Due to the minor rate of predicted traffic increase, the overall risk of increased vehicle strike for these species is low.	Due to the low likelihood of vehicle strike, and mitigation measures that would be undertaken (i.e., detailed design of roads/access tracks to avoid areas of key habitat, implementation of road signs and speed limits), the residual impacts are likely to be minor.

Threatened fauna or protected fauna that are part of a TEC that are at risk of vehicle strike (identified in Chapter 5)	SAII entity	Likelihood	Estimated vehicle strike rates	Consequences
Birds including Wedge-tailed Eagle, Whistling Kite, Australian Wood Duck, Pacific Black Duck, Masked Lapwing, Australian Magpie, Pied Currawong, White-winged Chough, Apostlebird, Australian Raven, Red-browed Finch, Double-barred Finch, Zebra Finch, Superb Fairy-wren, Variegated Fairy-wren, Noisy Miner, Australian Pipit, Wouldie Wagtail, Grey Fantail, Sulphur-crested Cockatoo, Little Corella, Galah, Cockatiel, Yellow-tailed Black-cockatoo, Australian King-parrot, Red-winged Parrot, Musk Lorikeet, Budgerigar, Bluebonnet, Eastern Rosella, Crimson Rosella, Red-rumped Parrot, Scaly-breasted Lorikeet, Rainbow Lorikeet, Southern Boobook, Barn Owl, Emu.	No	High	Roadkill rates for birds has been shown to be higher than for other fauna groups (see Vestjens, 1973). Taylor and Goldingay (2004) showed that roadkill rates of vertebrate species on three major roads in north-eastern NSW equated to 0.3 road-kills km^{-1} $week^{-1}$ or one road-kill every 3.8 km $week^{-1}$. Due to the minor rate of predicted traffic increase, the overall risk of increased vehicle strike for these species is low.	Due to the low likelihood of vehicle strike, and mitigation measures that would be undertaken (i.e., detailed design of roads/access tracks to avoid areas of key habitat, implementation of road signs and speed limits), the residual impacts are likely to be minor.

9.3.7 *Protected lands*

Two National Parks and Wildlife Service Reserves are located near the project footprint, however, would not be directly impacted. The protected areas, including Murray Valley National Park (including the Wetuppa Forest within the Noorong-Wetuppa area) at Wetuppa (50 metres from project footprint) and the Southwest Woodlands Nature Reserve (adjacent). While this national park and nature reserve would not be directly impacted by the project, there is potential for indirect impacts to occur during construction. The main construction activity to be carried out adjacent to national parks and nature reserves would be associated with construction of the transmission line structures and clearing within the transmission line easement.

Potential indirect impacts on NPWS estate (adjacent to the project footprint) have been considered in accordance with Developments adjacent to National Parks and Wildlife Service lands: Guidelines for consent and planning authorities (DPIE, 2020d) and are outlined in Table 10.10 of the EIS (See Chapter 10 of the EIS).

There would be no removal of vegetation within this National Park and as such no direct impacts are anticipated, however prescribed indirect impacts are likely to occur resulting from removal of vegetation within close proximity to land parcels within this National Park. Such impacts could include increased fire risk, sudden change in species composition and introduction of new species which could interact with the existing community within the National Park, increased risk of pest and disease introduction and reduced connectivity between National Park parcels.

The project also sits immediately adjacent to the South West Woodlands Nature Reserve. The project would not remove vegetation from within the Nature Reserve but would remove vegetation along approximately one kilometre of the edge of one parcel of land contained within the Nature Reserve. This vegetation removal would not affect connectivity between parcels of the Nature Reserve as it is situated on the edge of a cluster of parcels, and as such impacts are likely to be limited to indirect effects as listed above (excluding internal connectivity), with the addition of reduced connectivity with the wider landscape to the east of the parcel.

9.4 Mitigating residual impacts – management measures and implementation

9.4.1 *Approach to management and mitigation*

The environmental management approach has been developed to be consistent with the regulatory requirements, in accordance with Section 3.2 of the BAM Stage 2 Manual, for management of biodiversity impacts, during the construction and operational phases of the project. Further details on the environmental management approach for the project are provided in Chapter 25 (Environmental management) of the EIS.

Mitigation measures would be implemented during construction to manage the potential impacts of the project on biodiversity values. These mitigation measures would be outlined in a Biodiversity management subplan (BMP) (including a Supplementary Hollow and Nest Strategy and Connectivity Strategy) that would form part of the CEMP.

Upfront assessment of the project's impacts and commitments to mitigation and offsets have been incorporated into the project assessment. This approach includes a conservative assessment and upfront mitigation measures in accordance with Section 8.4 of the BAM.

9.4.1.1 Bird strike

In regard to the potential for bird strike, the options for mitigation strategies are limited once the transmission line structures are in place. Given the stationary nature of the transmission lines and their inability to be turned off, the principal mitigation is through the provision of bird diverters to deter collision. The project would include mitigation measures within one kilometre of the major riparian and wetland zones (refer to section 9.4.2 and Figure 15.3) to address uncertain biodiversity impacts relating to line strike combined with the commitment to provide direct offsets for these indirect impacts on affected species credit species.

9.4.1.2 The proposed disturbance area B4 and B10

Irrespective of the potential project related changes within the B4 and B10 disturbance areas the dynamics of understorey cover and diversity within the arid environment is also significantly influenced by a range of other variables, notably; fire, water availability/drought, grazing, soil crust (Walker and Koen, 1995). These variables are likely to have disproportionately greater impacts on any future site values scores of the understorey outside of the control of Transgrid's management.

Conservative assessment of partial impacts in this BDAR is supported by evidence based resulting in maximum upfront liability. In addition, the BMP would include measures and monitoring such as weed maintenance, ground disturbance particularly partially impacted areas to maintain and manage vegetation and ecological conditions in line with the assessed outcomes in BDAR.

9.4.1.3 Electromagnetic Fields (EMF) for nesting birds in transmission line structures

A review of available scientific literature on EMF indicates that it is likely that EMF's may influence the physiology of birds nesting on transmission line structures. However, the levels of those effects to each species under a range of different conditions is not easily quantifiable and there is currently no conclusive evidence to suggest that such effects would have a significant effect on the long-term viability of local bird populations. *Technical paper 13 – Electric and magnetic fields (EMF) study* (Beca, 2025) also states that:

"There is a body of research examining the effects of EMF on the reproductive biology and physiology of birds in the wild and under aviary conditions. Most studies indicate that EMF exposure of birds generally changes, but not always consistently in effect or in direction, their behaviour, reproductive success, growth and development, physiology and endocrinology, and oxidative stress under EMF conditions".

In conclusion, the data results derived from a range of studies, it is considered likely that EMFs may influence the physiology of birds nesting on transmission line structures. However, the levels of those effects to each species under all different conditions is not easily quantifiable and there is currently no conclusive evidence that such effects would be significant on the long-term viability of local bird populations (Tomas et al., 2012, Fernie and Bird, 2001).

In essence the studies indicate that there are no known substantial impacts to biodiversity (particularly nesting birds) as a result of EMF.

The key measures proposed are:

- upfront commitment to provide direct offsets for indirect impacts on potentially affected species credits that includes consideration of both EMF and bird strike impacts in areas that do not currently already have transmission lines.

9.4.1.4 Habitat connectivity

Habitat connectivity mitigation measures includes installing artificial connectivity measures such as glider poles, rope crossings, habitat bridges) to retain connectivity habitat for the Squirrel Glider. The details for the artificial connectivity measures for the Squirrel Glider would be determined in the Connectivity Strategy as part of the development of the BMP prior to the detailed design phase of the project.

The core objectives of the strategy would be to outline the final location of the proposed mitigation measures identified within the BDAR.

Transgrid would establish a series of 20-metre-wide connectivity corridors near transmission line structures locations that occur in woodland vegetation. These connectivity corridors would involve native vegetation retention up to the 10 metre (330 kV line) or 20 metre (500 kV line). The inclusion of these corridors would also assist in further reducing clearing volumes during design refinement stage. Connectivity corridors would occur as a minimum at:

- key riparian crossings
- areas of the alignment joining proposed state forests or conservation reserve estate
- areas of existing dense woodland.

Exact locations and mapping of connectivity areas would be based on the Connectivity Strategy developed prior to detailed design.

The primary design mitigation measures to be directed towards bird impacts are:

- minimising interaction of birds with the transmission lines which might otherwise result in injury or fatality; and
- minimising nesting on the transmission line structures, which might otherwise result in low-level EMF impacts to birds.

9.4.2 Mitigation measures

9.4.2.1 Detailed design phase

Impacts to matters of biodiversity conservation significance would be avoided to the greatest extent practicable during finalisation of the design and construction methodology for the project. Micro siting of the transmission line infrastructure and associated construction working areas and other areas of disturbance would occur to avoid impacts wherever practicable. Site features with the highest biodiversity conservation, in particular threatened species recorded and their habitat, would be given the highest priority with the creation of Special Biodiversity Protection Zones to further minimise impacts on entities at risk of SAII as outlined below and in Table 9.28. Where native vegetation disturbance activities are required in areas that have not been previously subject to biodiversity survey, additional survey would be carried out prior to works occurring in any such areas and to inform detailed design. Additionally, this would potentially allow for a potential credit reduction through field validation of conditions which have been assessed conservatively at this stage with assumed presence. These surveys would be carried out by a suitably qualified ecologist.

Opportunities to locate facilities associated with construction compounds and combined temporary worker accommodation facilities in areas of limited biodiversity value (e.g. cleared land or areas of native vegetation where an offset is not required) would be prioritised during detailed design:

- existing tracks would be used, where possible, to avoid the construction of new tracks. Where this is not possible, the design would seek to minimise impacts to native vegetation and threatened species habitat
- transmission line structures would be located and constructed to minimise impact to vegetated riparian zones wherever practicable.

A Connectivity Strategy would be developed during the detailed design phase. The core objectives of the strategy would be to outline the final location of the proposed mitigation measures identified within the BDAR.

Transgrid would establish a series of 20-metre-wide connectivity corridors near transmission line structures locations that occur in woodland vegetation. These connectivity corridors would involve native vegetation retention up to the 10 metre (330 kV line) or 20 metre (500 kV line). The inclusion of these corridors would also assist in further reducing clearing volumes during design refinement stage. Connectivity corridors would occur as a minimum at:

- key riparian crossings
- areas of the alignment joining proposed state forests or conservation reserve estate
- areas of existing dense woodland.

Exact locations and mapping of connectivity areas would be based on the Connectivity Strategy developed following detailed design.

Any biodiversity credit liabilities related to retained vegetation such as the connectivity corridors would be considered in final BAM calculations.

The primary design mitigation measures to be directed towards bird impacts are:

- minimising interaction of birds with the transmission lines which might otherwise result in injury or fatality; and
- minimising nesting on the transmission line structures, which might otherwise result in low-level EMF impacts to birds.

The industry-recognised method for electrical transmission to mitigate bird strike and EMF impacts includes the use of bird diverters as part of the design refinement phase. The positioning and exact diverter model is yet to be finalised, however at a minimum, bird diverters would be used within one kilometre of wetland/riverine habitats or recorded raptor nests to reduce collision risk for aerial fauna and allow safer passage within these areas.

9.4.2.2 Pre-construction phase

In addition to the development and implementation of the CEMP, specific mitigation measures have been identified for inclusion in a BMP. Both plans aim to be developed in the pre-construction phase of the project. The proposed measures have been identified to manage both construction and operational impacts and some measures have been identified to manage impacts in a site-specific location. The location/s applicable to each mitigation measure are identified in the table where relevant.

For construction, the BMP would set out measures to minimise and manage impacts on biodiversity. It would include (as a minimum):

- measures to minimise impacts to biodiversity, including measures to reduce disturbance to sensitive flora and fauna
- procedures for clearing of vegetation, including pre-clearing inspections and unexpected finds procedure/protocol.
- procedures for the demarcation and protection of retained vegetation, including vegetation adjacent to construction areas
- weed management
- habitat supplementation measures such as compensatory habitat strategy for hollow dependant fauna in broader easement area if practicable
- rehabilitation strategies including progressive rehabilitation, and measures for the management and maintenance of rehabilitated areas (including duration)
- procedures for unexpected EECs or threatened flora and fauna during construction, including stop work procedures
- monitoring requirements and compliance management
- approach to relocation of nests found within construction area (i.e. nests found in hazardous areas would be translocated to nearby safe areas, direct handling of eggs and chicks would be avoided). This could include potentially new poles/nest platforms
- approach to avoid building in raptor nesting periods.

Other specific pre-construction measures are also listed. These include preparation of:

- Supplementary Hollow and Nest Strategy to offset loss of tree hollow fauna habitat
- Connectivity Strategy.

These strategies may be prepared pre-clearing, updated and implemented on a staged basis across the project, aligned with the proposed construction and clearing schedule.

9.4.2.3 Construction phase

The construction phase would be guided by implementation of the CEMP and related BMP.

The BMP would identify the Special Biodiversity Protection Zones (see Figure 15.9) of high biodiversity value including areas where SAII entities have been confirmed present and assumed and threatened communities at risk of significant impact under the EPBC Act. Special Biodiversity Protection Zones aim to minimise impacts to high biodiversity values, as far as practicable, through:

- clearing being restricted to identified transmission line structure worksite locations and short new perpendicular access tracks where existing tracks cannot be utilised
- alternative line installation techniques which do not require clearing of disturbance area A for vegetation types that do not exceed a maximum growth height of four metres
- additional inductions for all contractors prior to working within a Special Biodiversity Protection Zone, and
- the monitoring of clearing activities by a suitably qualified ecologist.

The locations of Special Biodiversity Protection Zones would be demarcated prior to the commencement of clearing (refer to Table 9.28).

9.4.2.4 Operation phase

Operation of the project would be managed through Transgrid's existing EMS, which is accredited to the international standard ISO 14001 requirements. Transgrid's EMS has been designed to meet the commitments of its Environment Policy by identifying and assessing environmental risks and, where reasonable and practicable, implementing controls to avoid or limit these risks.

No operational environmental management plans would be developed for the project. The EMS includes an Environmental Assessment Framework, which contains checklists, procedures, guidance notes and an *Environmental Handbook* (Transgrid, 2021) to assess and manage the potential impacts of maintenance activities.

Details of Transgrid's approach to environmental management during operation and relevant documents are available on Transgrid's website at Environmental Commitment - Minimising Our Impact | Transgrid.

Details of the environmental constraints identified as part of the EIS, that are relevant to the ongoing operation and maintenance of the asset, would be included in the appropriate Transgrid Geographical Information Systems (GIS). Due diligence environmental checks, including review of environmental information generated from GIS where relevant, would be undertaken with required protection measures identified and confirmed before any maintenance works are carried out.

Proposed mitigation measures are detailed below in Table 9.28.

Table 9.28 Summary of proposed mitigation and management measures for residual impacts (direct, indirect and prescribed)

Number	Mitigation measure (specify if none proposed and ensure an adaptive management strategy is developed and addressed in section 9.5)	Method/technique	Timing	Frequency	Likely efficacy (including risk of failure)	MNES (when relevant)
B01	Impacts to matters of biodiversity conservation significance will be avoided to the greatest extent practicable during finalisation of the design and construction methodology for the project.	Micro-siting of the transmission line infrastructure and associated construction areas and other areas of disturbance will occur to avoid impacts wherever practicable. Site features with the highest biodiversity conservation significance, in particular, threatened ecological communities, threatened species recorded and their habitat will be given the highest priority. Spatial data (species polygons for species credit species) and buffered threatened species locations will be provided to the design and construction teams and considered in detailed design. Associated mapping will be included on sensitive area plans and provided to the construction workforce.	Detailed design and construction	To occur prior to finalisation of designs.	Efficacy: Moderate. Risk of failure: Moderate. Design team must consider sensitive areas in final designs.	All MNES impacted by the project

Number	Mitigation measure (specify if none proposed and ensure an adaptive management strategy is developed and addressed in section 9.5)	Method/technique	Timing	Frequency	Likely efficacy (including risk of failure)	MNES (when relevant)
B02	Assess changes to biodiversity impacts due to design refinements, construction methods or field surveys as required.	If refinements to the project design and construction methodology or additional field surveys result in increased impacts to biodiversity which are not included in this BDAR, these will be assessed in accordance with the requirements of the Biodiversity Assessment Method by an accredited assessor. For refinements to the project design and construction methodology considered to be "minor design refinement" (defined as less than <0.5 ha in area and immediately adjoining biodiversity study area), the assessment by an accredited assessor may consider the representative survey and assessment within the BDAR to inform the qualification of impact to biodiversity against the approved impacts and clearing limits within the BDAR. Impacts outside of the biodiversity study area not considered to be 'minor design refinement' will be subject to field survey an assessment in accordance with the requirements of the Biodiversity Assessment Method by an accredited assessor.	Detailed design and Construction	To occur prior to finalisation of designs.	Efficacy: Moderate. Risk of failure: Moderate. Design team must consider sensitive areas in final designs.	All MNES impacted by the project

Number	Mitigation measure (specify if none proposed and ensure an adaptive management strategy is developed and addressed in section 9.5)	Method/technique	Timing	Frequency	Likely efficacy (including risk of failure)	MNES (when relevant)
B03	Impacts will be located in areas of existing disturbance/low biodiversity value during finalisation of the design and construction methodology for the project.	Opportunities to locate facilities associated with construction compounds and combined temporary worker accommodation facilities in areas of limited biodiversity value (e.g. cleared land or areas of native vegetation where offsets are not required) will be prioritised during finalisation of the design and construction methodology.	Detailed design	To occur prior to finalisation of designs.	Efficacy: Moderate. Risk of failure: Moderate. Design team must consider sensitive areas in final designs.	All MNES impacted by the project
B04	Minimise access track construction and biodiversity impacts as a result of access track remediation works	Existing access tracks and clearings will be used, where possible, to limit the construction of new access tracks. Where this is not possible, the design will seek to minimise impacts to native vegetation as a priority.	Detailed design and Construction	As required, prior to set up of each construction area.	Efficacy: Low. Risk of failure: High.	All MNES impacted by the project

Number	Mitigation measure (specify if none proposed and ensure an adaptive management strategy is developed and addressed in section 9.5)	Method/technique	Timing	Frequency	Likely efficacy (including risk of failure)	MNES (when relevant)
B05	Transmission line transmission line structures will be located and constructed to minimise impact to vegetated riparian corridors	Design and construction of transmission line structures will minimise riparian vegetation clearing and disturbance of watercourses within the subject land. This will include micro-siting of temporary construction infrastructure (including break and winch sites, site offices, construction compounds, temporary worker accommodation facilities and access tracks), away from riparian areas, locating waterway crossings at narrow width locations where required and minimising the quantity of cut and fill activities.	Detailed design Construction	Prior to design finalisation and as required, prior to set up of each construction area.	Efficacy: Low. Risk of failure: High.	All MNES impacted by the project

Number	Mitigation measure (specify if none proposed and ensure an adaptive management strategy is developed and addressed in section 9.5)	Method/technique	Timing	Frequency	Likely efficacy (including risk of failure)	MNES (when relevant)
B06	Apply use of bird diversion techniques near sensitive habitats to minimise strike risk	Conductor line-marking techniques will be implemented during design refinement to minimise bird strike. Use of bird diverters, most likely consisting of the "flapper" variety, will be implemented. Positioning and exact diverter model will be finalised during design refinement and developed as part of a Connectivity Strategy and with reference to any preliminary findings of the current Transgrid sponsored Bird Strike study with Charles Sturt University. At minimum these will be used within one kilometre of wetland/riverine habitats or recorded raptor nests to reduce impacts on aerial fauna species from collision and allow safer passage within these areas.	Detailed design and Construction	Must remain installed and be maintained throughout the construction phase and during early phases of operation	Efficacy: High. Risk of failure: Moderate, subject to implementation and ongoing monitoring/adaptive management.	Australasian Bittern Curlew Sandpiper Pink Cockatoo Blue-winged Parrot Superb Parrot

Number	Mitigation measure (specify if none proposed and ensure an adaptive management strategy is developed and addressed in section 9.5)	Method/technique	Timing	Frequency	Likely efficacy (including risk of failure)	MNES (when relevant)
B07	Establish connectivity corridors around key woodland habitats surrounding the transmission line corridor	A series of 20 m wide connectivity corridors will be established near transmission line structures locations that occur in woodland vegetation. These will occur at strategic locations which will be developed as part of a Connectivity Strategy, targeting the following locations (wherever practicable): — key riparian crossings — areas of the alignment joining state forest and or conservation reserve estate — areas of identified Squirrel Glider habitat (Including under transmission line glider poles). These connectivity corridors will involve native vegetation retention up to the 10 metre or 20 metre wide (for 330 kV and 500 kV lines, respectively). Vegetation heights to be retained will be determined in accordance with vegetation clearing requirements at each location. Any biodiversity credit liabilities related to retained vegetation such as the connectivity corridors will be considered in final Biodiversity Assessment Method calculations.	Detailed design	Prior to design finalisation	Efficacy: High. Risk of failure: Low, subject to implementation	Southern Whiteface Brown Treecreeper South-eastern Hooded Robin Koala Pink-tailed Worm-Lizard Grey Snake Painted Honeyeater Diamond Firetail Growling Grass Frog / Southern Bell Frog

Number	Mitigation measure (specify if none proposed and ensure an adaptive management strategy is developed and addressed in section 9.5)	Method/technique	Timing	Frequency	Likely efficacy (including risk of failure)	MNES (when relevant)
B08	Provide effective compensatory habitat strategy for hollow dependent fauna.	A strategy for compensatory habitats will be provided that directly addresses the projects impacts to nesting habitat for threatened fauna displaced during construction. The strategy will include the following requirements: — survey of tree hollows and nests within the proposed clearing extents and evaluation of hollow utilisation and resource availability. — investigation into strategic and optimal placement of hollows for the targeted species within the locality/region — investigating new and emerging monitoring — funding of targeted research that contributes to effective compensatory habitat measures relevant to the project impacts; and — measures to address and manage nests (such as raptor nests) prior to clearing.	Detailed design and Construction	Prior to the commencement of clearing works in each construction area.	Efficacy: Moderate. Risk of failure: Low, subject to the implementation of ongoing management.	Southern Whiteface Gang-Gang Cockatoo Brown Treecreeper (South-eastern) Pink Cockatoo Superb Parrot

Number	Mitigation measure (specify if none proposed and ensure an adaptive management strategy is developed and addressed in section 9.5)	Method/technique	Timing	Frequency	Likely efficacy (including risk of failure)	MNES (when relevant)
B09	Pre-clearing surveys will be completed prior to clearing at each location by a suitability qualified ecologist.	The proposed clearing extents will be marked out on site prior to the pre-clearing surveys. During the surveys, the ecologist will: — survey the proposed clearing extent — identify any fauna that will require relocation prior to clearing — confirm the location and mark out the extents of any biodiversity exclusion zones — confirm that hollow-bearing trees within and adjacent to the clearing extents are prominently marked/tagged; and — confirm compensatory habitats for hollow dependant fauna species are in place (where required) in suitable locations adjacent to areas to be cleared, or suitable locations for installation have been identified — survey and confirm the presence of raptor nests within and adjacent to the clearing extents.	Detailed design at relevant sites	Prior to the commencement of clearing works in each construction area.	Efficacy: High. Risk of failure: Moderate.	All MNES impacted by the project

Number	Mitigation measure (specify if none proposed and ensure an adaptive management strategy is developed and addressed in section 9.5)	Method/technique	Timing	Frequency	Likely efficacy (including risk of failure)	MNES (when relevant)
B10	Accurately map sensitive areas in vicinity of disturbance footprint.	Where required the results of the pre-clearing surveys will be used to update and verify sensitive area maps within the BDAR.	Detailed design	Prior to the commencement of clearing works	Efficacy: Moderate. Risk of failure: Moderate.	All MNES impacted by the project
B11	Map and confirm biodiversity exclusion zones for retained vegetation.	Biodiversity exclusion zones for retained vegetation will be confirmed by a suitably qualified ecologist and identified as 'No disturbance' zones prior to the commencement of clearing or any site activity that could damage the vegetation within the exclusion zone. 'No disturbance' zones will consider: — identified Plains-wanderer habitat — identified threatened flora populations — threatened ecological communities — connectivity corridors, and — known habitat for threatened frogs and reptiles. Biodiversity exclusion zones will be physically marked and demarcated, and included on sensitive area maps, prior to clearing.	Detailed design	Prior to design finalisation	Efficacy: High. Risk of failure: Moderate.	All MNES impacted by the project

Number	Mitigation measure (specify if none proposed and ensure an adaptive management strategy is developed and addressed in section 9.5)	Method/technique	Timing	Frequency	Likely efficacy (including risk of failure)	MNES (when relevant)
B12	Map and confirm biodiversity sensitive areas in the partial clearing zones.	Biodiversity sensitive areas will be demarcated by a qualified ecologist for areas subject to partial clearing zones prior to the commencement of clearing. 'Biodiversity sensitive area' will consider: — identified Plains-wanderer habitat — identified threatened flora populations — threatened ecological communities — connectivity corridors — known habitat for threatened fauna species. Biodiversity sensitive areas will be physically marked and demarcated, and included on sensitive area maps, prior to clearing.	Detailed design	Prior to design finalisation	Efficacy: High. Risk of failure: Moderate	All MNES impacted by the project

Number	Mitigation measure (specify if none proposed and ensure an adaptive management strategy is developed and addressed in section 9.5)	Method/technique	Timing	Frequency	Likely efficacy (including risk of failure)	MNES (when relevant)
B13	Implement workforce inductions training around specific Plains-wanderer protocols for the project	A Plains-wanderer specific protocol will be developed to ensure that all construction workers are aware of the sensitivities around this critically endangered species and to ensure that all specific requirements in relation to protection, avoidance, management and observation of individual Plains-wanderers are considered. This protocol will be implemented during all project activities in Plains-wanderer habitat.	Detailed design	Inductions and training is to be completed once prior to commencing work. Toolbox talks will be undertaken daily or as required.	Efficacy: High. Risk of failure: Low.	Plains-wanderer
B14	Workforce inductions – General ecological matters	All relevant construction workers will be trained on biodiversity management protocols and the requirements for the project, through inductions, toolbox talks and targeted training and provided with sensitive area maps (showing clearing boundaries and exclusion zones) and updates as required. Additional inductions will be required for access to Special Biodiversity Protection Zones.	Construction	Inductions and training are to be completed once prior to commencing work. Toolbox talks will be undertaken daily or as required.	Efficacy: High. Risk of failure: Low.	All MNES impacted by the project

Number	Mitigation measure (specify if none proposed and ensure an adaptive management strategy is developed and addressed in section 9.5)	Method/technique	Timing	Frequency	Likely efficacy (including risk of failure)	MNES (when relevant)
B15	Monitor clearing of native vegetation areas to ensure impacts areas are not greater than anticipated	The predicted clearing area of native vegetation by the project will be monitored against the recorded clearing area. A revised BAM-C calculation on the project's final project disturbance post construction will be completed and any changes to the credit liability identified will be reflected in the biodiversity offset requirements within the biodiversity offset package.	Construction	Monitoring will require ongoing implementation throughout the process of construction/ vegetation clearing.	Efficacy: Moderate. Risk of failure: Moderate. Requires ongoing monitoring	All MNES impacted by the project
B16	Monitor partial impacts to native vegetation to ensure impact are not greater than anticipated in BDAR	The partial clearing outcomes will be verified within 12 months of clearing occurring to confirm future vegetation integrity. If partial clearing impacts are shown to be greater than the BDAR predictions, adaptive management practices will be implemented within easement to achieve predicted vegetation integrity (VI).	Construction	Monitoring will require ongoing implementation throughout the process of construction/ vegetation clearing.	Efficacy: Moderate. Risk of failure: Moderate. Requires ongoing monitoring	All MNES impacted by the project

Number	Mitigation measure (specify if none proposed and ensure an adaptive management strategy is developed and addressed in section 9.5)	Method/technique	Timing	Frequency	Likely efficacy (including risk of failure)	MNES (when relevant)
B17	Minimise residual impacts to riparian areas and aquatic environments	Activities within riparian zones (within the definition of the Controlled activities – Guidelines for riparian corridors on waterfront land (DPE, 2022c)) will be managed to minimise impacts to native riparian understorey vegetation and aquatic environments. Riparian areas subject to disturbance will be progressively stabilised and rehabilitated to minimise impacts to aquatic habitats, water quality from sedimentation and erosion. Where possible vegetation clearing will be limited to the tree stratum only, with trunk bases being retained in-situ.	Construction/ post-construction	Will require ongoing implementation throughout the process of construction/ vegetation clearing. Rehabilitation of disturbed areas to occur post-construction	Efficacy: Moderate. Risk of failure: Moderate. Requires ongoing monitoring	All MNES impacted by the project

Number	Mitigation measure (specify if none proposed and ensure an adaptive management strategy is developed and addressed in section 9.5)	Method/technique	Timing	Frequency	Likely efficacy (including risk of failure)	MNES (when relevant)
B18	Implement threatened ecological communities and species unexpected finds protocol	A species unexpected finds protocol will be implemented if threatened ecological communities, threatened flora and fauna species, not identified as candidate species in the biodiversity assessment, are identified in the disturbance area. Where pre-clearing surveys identify additional areas of threatened ecological communities, threatened flora and fauna species to those assessed within the approved biodiversity assessment, existing mitigation controls, including Biodiversity exclusion zones will be implemented.	Construction	Will require ongoing implementation throughout the life of the project	Efficacy: Moderate. Risk of failure: High.	All MNES impacted by the project

Number	Mitigation measure (specify if none proposed and ensure an adaptive management strategy is developed and addressed in section 9.5)	Method/technique	Timing	Frequency	Likely efficacy (including risk of failure)	MNES (when relevant)
B19	Develop and implement Vegetation Clearing Procedure	A Vegetation Clearing Procedure will be developed and implemented as part of the biodiversity management sub-plan. Methods and techniques could include: — pre-clearing survey methodology and reporting requirements — consideration of density, species and maximum height — two stage clearing protocol — clearing methods for partial clearing areas to maintain target vegetation condition (integrity) — methods for soft felling habitat trees.	Construction	Will require ongoing implementation throughout the life of the project	Efficacy: Moderate. Risk of failure: High.	All MNES impacted by the project

Number	Mitigation measure (specify if none proposed and ensure an adaptive management strategy is developed and addressed in section 9.5)	Method/technique	Timing	Frequency	Likely efficacy (including risk of failure)	MNES (when relevant)
B20	Implement construction methodology approach for special biodiversity protection zone - Natural Grasslands of the Murray Valley Plains.	Special biodiversity protection zone - Natural Grasslands of the Murray Valley Plains. A bespoke construction methodology will be prepared and implemented to minimise impacts as far as practical to the mapped Natural Grasslands of the Murray Valley Plains – Critically Endangered Threatened Ecological Community (as shown on Figure 15.9). This methodology will include at a minimum: — pre-clearing induction of all contractors that work in this area to discuss this special biodiversity protection zone — during clearing, an ecologist shall be on site at all times to monitor activities within this special biodiversity protection zone — access being prioritised using existing access tracks	Construction	Ongoing implementation required throughout the process of construction/ vegetation clearing in identified area.	Efficacy: Moderate. Risk of failure: High.	Natural Grasslands of the Murray Valley Plains

Number	Mitigation measure (specify if none proposed and ensure an adaptive management strategy is developed and addressed in section 9.5)	Method/technique	Timing	Frequency	Likely efficacy (including risk of failure)	MNES (when relevant)
		— clearing being restricted to the identified transmission line structures worksite locations and short new perpendicular access track or alternative track locations that further reduce impacts to the special biodiversity protection zone. Access tracks will provide access between the existing access track along the project alignment and the transmission line structures and worksite locations — alternative line installation techniques which do not require clearing of disturbance area A (centreline) The final clearing methodology will be developed in accordance with the commitment in mitigation measure B1.				

Number	Mitigation measure (specify if none proposed and ensure an adaptive management strategy is developed and addressed in section 9.5)	Method/technique	Timing	Frequency	Likely efficacy (including risk of failure)	MNES (when relevant)
B21	Implement construction methodology approach for special biodiversity protection zone SAII TECs -*White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions* and *Allocasuarina luehmanii Woodland in the Riverina and Murray-Darling Depression Bioregions*	A bespoke construction methodology for transmission line structures will be prepared and implemented to minimise impacts as far as practical to the mapped SAII TECS and EPBC TECs (as shown on Figure 15.9). This methodology will include at a minimum: — pre-clearing induction of all contractors that work in this area to discuss this special biodiversity protection zone — during clearing an ecologist shall be on site at all times to monitor activities within this special biodiversity protection zone — access being prioritised from existing tracks	Construction	Ongoing implementation required throughout the process of construction/vegetation clearing in identified area.	Efficacy: Moderate. Risk of failure: High.	White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland and *Allocasuarina luehmanii Woodland in the Riverina and Murray-Darling Depression Bioregions*

Number	Mitigation measure (specify if none proposed and ensure an adaptive management strategy is developed and addressed in section 9.5)	Method/technique	Timing	Frequency	Likely efficacy (including risk of failure)	MNES (when relevant)
		— clearing being restricted to the identified transmission line structures worksite locations and short new perpendicular access track or alternative track locations that further reduce impacts to the special biodiversity protection zone. Access tracks will provide access between the existing access tracks along the project alignment and the transmission line structures and worksite locations The final clearing methodology will be developed in accordance with the commitment in mitigation measure B1.				
B22	Implement special biodiversity protection zone – Plains-wanderer	A bespoke construction methodology will be employed which will avoid and minimise impact as far as practicable to the species' habitat (as shown on Figure 15.11b). This methodology will include at a minimum: — pre-clearing induction of all contractors that work in this area to discuss this special biodiversity protection zone	Construction	Ongoing implementation required throughout the process of construction/vegetation clearing in identified area.	Efficacy: Moderate. Risk of failure: High.	Plains-wanderer

Number	Mitigation measure (specify if none proposed and ensure an adaptive management strategy is developed and addressed in section 9.5)	Method/technique	Timing	Frequency	Likely efficacy (including risk of failure)	MNES (when relevant)
		— during clearing an ecologist shall be on site at all times to monitor activities within this special biodiversity protection zone — access being prioritised from existing tracks — clearing being restricted to the identified transmission line structures worksite locations and short new perpendicular access track or alternative track locations that further reduce impacts to the special biodiversity protection zone. Access tracks will provide access between the existing access tracks along the project alignment and the transmission line structures and worksite locations — alternative line installation techniques which do not require clearing of disturbance area A (centreline). The final clearing methodology will be developed in accordance with the commitment in mitigation measure B1.				

Number	Mitigation measure (specify if none proposed and ensure an adaptive management strategy is developed and addressed in section 9.5)	Method/technique	Timing	Frequency	Likely efficacy (including risk of failure)	MNES (when relevant)
B23	Transgrid to spatially record features of high biodiversity conservation significance	Features of high biodiversity conservation significance within the operational easement, including biodiversity exclusions zones identified during construction and retained habitat for threatened species, will be recorded in Transgrid's GIS. The GIS information will be reviewed during the planning of all maintenance or other future activities that could cause disturbance.	Operation	Ongoing throughout project operation	Efficacy: High. Risk of failure: Moderate.	All MNES impacted by the project

Number	Mitigation measure (specify if none proposed and ensure an adaptive management strategy is developed and addressed in section 9.5)	Method/technique	Timing	Frequency	Likely efficacy (including risk of failure)	MNES (when relevant)
B24	Develop and implement guidelines and procedures for operation and maintenance of the project	Project specific operational and maintenance biodiversity guidelines and procedures will be developed and implemented that address the following: — vegetation clearing and maintenance commitments in the BDAR and EIS — avoiding disturbance in biodiversity exclusion zones identified during the construction — minimise access and disturbance in areas of high biodiversity conservation significance; and — avoiding maintenance of vegetation that does not need to be maintained during operation. Provide training to relevant Transgrid operational personnel and vegetation maintenance contractors regarding the operational and maintenance biodiversity guidelines and procedures.	Operation	Ongoing throughout project operation	Efficacy: High. Risk of failure: Moderate.	All MNES impacted by the project

Number	Mitigation measure (specify if none proposed and ensure an adaptive management strategy is developed and addressed in section 9.5)	Method/technique	Timing	Frequency	Likely efficacy (including risk of failure)	MNES (when relevant)
Aquatic mitigation measures						
B25	Instream works for access tracks and relevant construction compounds	The following factors will be considered during the detailed design and micro siting process for waterway crossings or the layout of the Cunninyeuk Road, Cunninyeuk construction compound and combined temporary worker accommodation facilities (western option 2) to minimise potential impacts to aquatic environments, wherever practicable: — any existing crossings will be re-used or upgraded in preference to establishing new crossings — disturbance to waterways (bed, banks and associated riparian zones), will be avoided or minimised — the crossing design and construction work sites will minimise disturbance to any native vegetation, including native instream, fringing, and riparian vegetation within the access track alignment.	Detailed design	Ongoing throughout project construction	Efficacy: High. Risk of failure: Moderate.	All MNES impacted by the project

Number	Mitigation measure (specify if none proposed and ensure an adaptive management strategy is developed and addressed in section 9.5)	Method/technique	Timing	Frequency	Likely efficacy (including risk of failure)	MNES (when relevant)
		— watercourse crossings will be constructed perpendicular to the flow of the water and be positioned away from channel bends (where erosive forces are typically greatest). Preferably crossings will be located in straight stream sections with well-defined channel geometries and shallow stream gradients, in stable dry reaches — micro-siting will avoid direct and indirect (erosion or sedimentation) impacts to riverine features such as riffles and rapids and sensitive habitat features (ie snags, coarse woody debris, instream macrophytes) — all works within watercourse will be completed outside spawning periods of fish that inhabit the stream, which is typically spring through autumn				

Number	Mitigation measure (specify if none proposed and ensure an adaptive management strategy is developed and addressed in section 9.5)	Method/technique	Timing	Frequency	Likely efficacy (including risk of failure)	MNES (when relevant)
		— where instream structures are required, considerations to potential flooding and erosive effects will be made in the design and construction of the crossing. Any dewatering required during works, will be carried out with consideration of native fauna and appropriate measures will be implemented to relocate native aquatic fauna as required.				

Number	Mitigation measure (specify if none proposed and ensure an adaptive management strategy is developed and addressed in section 9.5)	Method/technique	Timing	Frequency	Likely efficacy (including risk of failure)	MNES (when relevant)
B26	Impacts to Key Fish Habitat, threatened species and communities	Pre-construction survey will be carried out for any watercourse (including those connected to Dillons Swamp) identified as being Key Fish Habitat and/or indicative distribution for threatened species that would be directly impacted by project infrastructure to determine: — the Type and Class of watercourses in accordance with Policy and guidelines for fish habitat conservation and management (Update 2013) (NSW Department of Primary Industries , 2013) — the presence/absence or likelihood of threated aquatic species occurring — determine any additional mitigation measures e.g. timing of works — recommendations as to micro-siting and design in order to minimise potential impacts to threatened aquatic species.	Detailed design	Ongoing throughout project construction	Efficacy: High. Risk of failure: Moderate.	All MNES impacted by the project

Number	Mitigation measure (specify if none proposed and ensure an adaptive management strategy is developed and addressed in section 9.5)	Method/technique	Timing	Frequency	Likely efficacy (including risk of failure)	MNES (when relevant)
B27	Instream works associated with watercourse crossings	Watercourse crossings will be designed, microsite and constructed in accordance with *Why Do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings* (Fairfull & Witheridge 2003) and will include maintaining existing nominal flow velocity where possible or at less than 0.3 m/sec to avoid damage to aquatic habitats. Any temporary watercourse crossings will be removed and rehabilitated at the completion of their operational use.	Detailed design	Ongoing throughout project construction	Efficacy: High. Risk of failure: Moderate.	All MNES impacted by the project

Number	Mitigation measure (specify if none proposed and ensure an adaptive management strategy is developed and addressed in section 9.5)	Method/technique	Timing	Frequency	Likely efficacy (including risk of failure)	MNES (when relevant)
B28	Offsets for residual impacts to key fish habitat	During the detailed design and micro-siting process, potential impacts to key fish habitat will be minimised wherever practicable and where residual impacts are identified these will be quantified and offset in accordance with *Policy and guidelines for fish habitat conservation and management (Update 2013)* (DPI, 2013). In addition, opportunities for stockpiling and supply of felled trees for Key Fish Habitat rehabilitation or improvement works will be investigated in consultation with NSW DPI.	Detailed design and construction	Ongoing throughout project construction	Efficacy: High. Risk of failure: Moderate.	All MNES impacted by the project
B29	Instream works and bank stabilisation for watercourse crossings	Any sections of stream or watercourse banks that are impacted or modified by the project will be reformed or remediated to resemble the pre-work condition and form wherever possible or alternatively to a stable design form, as appropriate following the completion of construction work. Felled trees from the project will be used as instream habitat in the form of large woody debris where practicable.	Construction	Ongoing throughout project operation	Efficacy: High. Risk of failure: Moderate.	All MNES impacted by the project

Number	Mitigation measure (specify if none proposed and ensure an adaptive management strategy is developed and addressed in section 9.5)	Method/technique	Timing	Frequency	Likely efficacy (including risk of failure)	MNES (when relevant)
B30	Biosecurity risks at watercourse crossings	The following measures will be implemented to manage biosecurity risks associated with any instream work: — all vehicles, vessels and personal protective gear (PPE) will be disinfected prior to entering a watercourse — equipment used during any instream works will be cleaned, drained, and dried before storing or moving it to a different body of water — all sands and sediments used as infill shall be clean and have not been previously used in another watercourse. Any invasive aquatic species encountered during instream works and dewatering activities will be captured and humanely euthanised.	Construction	Ongoing throughout project construction	Efficacy: High. Risk of failure: Moderate.	All MNES impacted by the project

Number	Mitigation measure (specify if none proposed and ensure an adaptive management strategy is developed and addressed in section 9.5)	Method/technique	Timing	Frequency	Likely efficacy (including risk of failure)	MNES (when relevant)
B31	Management of large woody debris	Large woody debris in the vicinity of watercourse crossings will be managed in accordance with *Policy and guidelines for fish habitat conservation and management (Update 2013)* (DPI, 2013). Where impacts cannot be avoided, lopping will be considered as the first priority for the management of large woody debris. Where lopping is not practicable, realignment will be considered as the next possibility, followed by relocation.	Construction	Ongoing throughout project construction	Efficacy: High. Risk of failure: Moderate.	All MNES impacted by the project

9.5 Adaptive management strategy for uncertain impacts (where relevant)

An adaptive management strategy for uncertain impacts is not applicable for this project.

10 Serious and irreversible impacts

This section identifies every potential serious and irreversible impact (SAII) entity that are listed in the Guidance to assist a decision-maker to determine a serious and irreversible impact.

Impact assessment of potential entities of SAII impacts on biodiversity values are outlined under Section 9 of the BAM and addressed below.

Clause 6.7 of the Biodiversity Conservation Regulation 2017 outlines that an impact is to be regarded as serious and irreversible if it is likely to contribute significantly to the risk of a threatened species or ecological community becoming extinct based on the following four principles:

- Principle 1: it would cause a further decline of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to be in a rapid rate of decline
- Principle 2: it would further reduce the population size of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to have a very small population sizer
- Principle 3: it is an impact on the habitat of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to have a very limited geographic distribution
- Principle 4: the impacted species or ecological community is unlikely to respond to measures to improve its habitat and vegetation integrity and therefore its members are not replaceable.

10.1 Overview of serious and irreversible impacts on threatened entities

To assist the determining authority to evaluate the nature of an impact on a potential entity at risk of a serious and irreversible impact, the BDAR must contain details of the assessment of SAII, in accordance with the assessment criteria set out in the BAM.

SAII threatened ecological communities and species that may be affected by the project and considered potentially at risk of a SAII are summarised in Table 10.1.

Each entity is discussed in further details based on the relevant principles considerations section 10.2 (Threatened Ecological Communities) and section 10.3 (threatened flora) and section 10.4 (threatened fauna).

Table 10.1 Entities at risk of an SAII

Common name	Scientific name	Reason for inclusion in assessment	Notes
SAII Threatened ecological communities			
Buloke Woodland in the Riverina and Murray-Darling Depression Bioregions	*Allocasuarina luehmanii* Woodland in the Riverina and Murray-Darling Depression Bioregions	Included in current list of entities at risk of an SAII and is likely to be impacted by the project	Included due to known occurrence of the community.
White Box Yellow Box Blakely's Red Gum Woodland	White Box Yellow Box Blakely's Red Gum Woodland	Included in current list of entities at risk of an SAII and is likely to be impacted by the project	Included due to known occurrence of the community.
SAII Threatened Flora Species			
Mueller Daisy	*Brachyscome muelleroides*	Included in current list of entities at risk of an SAII and is likely to be impacted by the project	This species is included based on the presence of assumed habitat only.
Burr-daisy	*Calotis moorei*	Included in current list of entities at risk of an SAII and is likely to be impacted by the project	This species is included based on the presence of assumed habitat only.
Bindweed	*Convolvulus tedmoorei*	Included in current list of entities at risk of an SAII and is likely to be impacted by the project	This species is included based on the presence of assumed habitat only.
Tumut Grevillea	*Grevillea wilkinsonii*	Included in current list of entities at risk of an SAII and is likely to be impacted by the project	This species is included based on the presence of assumed habitat only.
	Prasophyllum sp. Moama	Included in current list of entities at risk of an SAII and is likely to be impacted by the project	This species is included based on the presence of assumed habitat only.
Lowly Greenhood	*Pterostylis despectans*	Included in current list of entities at risk of an SAII and is likely to be impacted by the project	This species is included based on the presence of assumed habitat only.
SAII Threatened Fauna Species			
Plains-wanderer	*Pedionomous torquatus*	Included in current list of entities at risk of an SAII and is likely to be impacted by the project	Included due to the presence of a mapped important habitat area.

Table 10.2 SAII principles that apply to each SAII entity subject to assessment

TEC / Species	Principle 1	Principle 2	Principle 3	Principle 4
SAII Threatened ecological communities				
Allocasuarina luehmanii Woodland in the Riverina and Murray-Darling Depression Bioregions	✓	✓	-	-
White Box Yellow Box Blakely's Red Gum Woodland	✓	✓	-	-
SAII Threatened flora species				
Brachyscome muelleroides (Mueller Daisy)	-	-	✓	-
Calotis moorei (Burr-daisy)	-	-	✓	-
Convolvulus tedmoorei (Bindweed)	-	✓	-	-
Grevillea wilkinsonii (Tumut Grevillea)	-	-	✓	-
Prasophyllum sp. Moama	-		✓	-
Pterostylis despectans (Lowly Greenhood)	-	✓	✓	-
SAII Threatened fauna species				
Pedionomous torquatus (Plains-wanderer)	✓	-	-	-

10.2 Additional impact assessment provisions for TECs at risk of an SAII

The extent of the TECs at risk of Serious and Irreversible Impacts within the subject land are shown in Figure 15.13.

10.2.1 Allocasuarina luehmanii Woodland in the Riverina and Murray-Darling Depression Bioregions

The total current extent of the Allocasuarina luehmanii Woodland in the Riverina and Murray-Darling Depression Bioregions TEC is estimated to be roughly 1,000 ha, with an estimated pre-European extent of 9,000 ha. This is an 88% reduction in geographic distribution of PCT 20 since European settlement (Table 10.3). As a result, this TEC is listed as a SAII entity because an impact to this TEC may be regarded as serious and irreversible if it is likely to contribute significantly to the risk of a threatened ecological community becoming extinct because:

- it would cause a further decline of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to be in a rapid rate of decline (known as SAII Principle 1)
- it would further reduce the population size of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to have a very small population size (known as SAII Principle 2).

The following SAII principles are not applicable to this TEC:

- it is an impact on the habitat of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to have a very limited geographic distribution (known as SAII Principle 3)
- the impacted species or ecological community is unlikely to respond to measures to improve its habitat and vegetation integrity and therefore its members are not replaceable (known as SAII Principle 4).

The direct impact on this TEC as a result of the proposed project is 1.15 ha, which represents 0.089% of the current geographic extent in NSW. No indirect impacts are expected for this TEC. Further assessment of direct impacts can be found in Table 10.4.

10.2.1.1 Actions to avoid and minimise direct and indirect impacts

Actions to avoid and minimise direct and indirect impacts to this TEC at risk of a SAII is provided in section 9.3.7. This includes aspects of project location and design.

Alternative technologies, routes, locations, and sites have been considered. For example, undergrounding transmission lines would not avoid impacts. As outlined in section 9.3.7, mitigation measures have been prepared for the project that would be implemented as part of the construction and operational environmental management procedures. The specific mitigation measures targeted to *Allocasuarina luehmanii* Woodland in the Riverina and Murray-Darling Depression Bioregions TEC involve:

- the micro-siting process
- pre-clearing surveys
- delineation of ‘no go’ zones and project clearing boundaries
- monitoring to ensure compliance with the approved impact as presented in this BDAR to ensure impact areas are not exceeded.

Combined, these measures would allow for small site-based changes to design in the detailed design phase that may minimise impacts to the *Allocasuarina luehmanii* Woodland in the Riverina and Murray-Darling Depression Bioregions TEC.

Current status (excluding impacts of the project)

Table 10.3 Current status – *Allocasuarina luehmanii* Woodland in the Riverina and Murray-Darling Depression Bioregions

Criteria	Data/information	Data sources	Details of data deficiency, assumptions, reasons for low confidence in information (e.g. TBDC indicates data is unknown or deficient)
Evidence of reduction in geographic distribution (Principle 1) based on the TEC's geographic range in NSW			
Current total geographic extent (ha) of the TEC in NSW	This TEC has been recorded in the southern part of the Riverina bioregion from near Urana and Mulwala in the east to the Barham district and may extend as far west as Euston in the southern part of the Murray-Darling Depression bioregion. The community occurs in small patches within this range and is currently estimated to cover less than 500-1500 ha. It is currently known from Balranald, Berrigan, Conargo, Corowa, Deniliquin, Murray and Wakool LGAs, but may occur elsewhere in the Riverina and Murray-Darling Depression bioregions. The total current extent of the TEC is estimated to be about 1,300 ha, with an estimated pre-European extent of 9,000 ha. The TEC is known to be associated with two PCTs being PCT 20 (Buloke – Moonah – Black Box open woodland on sandy rises of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)) and PCT 22 (Semi-arid shrubby Buloke – Slender Cypress Pine woodland, far south-western NSW).	(Threatened Species Scientific Committee, 2011) (NSW DCCEEW, 2025a)	The estimated reduction in geographic extent of the TEC since 1970 is unknown, although the TBDC has estimated that about 1,000 ha of PCT 20 remains in NSW. The reduction in geographic distribution of PCT 20 from an estimated pre-European extent of about 8000 hectares is 88 %.
Estimated reduction in geographic extent of the TEC since 1970			

Criteria	Data/information	Data sources	Details of data deficiency, assumptions, reasons for low confidence in information (e.g. TBDC indicates data is unknown or deficient)
Extent of reduction in ecological function for the TEC using evidence that describes the degree of environmental degradation or disruption to biotic processes (Principle 2)			
Change in community structure Change in species composition Disruption of ecological processes	Many of the remaining stands of the TEC are degraded by overgrazing, which has resulted in simplification of community structure, changes in species composition, invasion of weeds and soil erosion. Overgrazing by domestic livestock and feral herbivores, including rabbits and goats, has resulted in a scarcity of woody understorey plants and a lack of regeneration of palatable trees and shrubs. Consequently, senescent trees are not replaced with new individuals and there is a prolonged trend of stand degeneration. Overgrazing also reduces structural complexity, plant species diversity and habitat suitability for vertebrate fauna of the community. The sandy-textured soils of the TEC are sensitive to erosion as a result of trampling by hooved animals and burrowing by rabbits. These impacts are exacerbated under drought conditions. Collectively, these processes have resulted in a large reduction in the ecological function of the community.	(Threatened Species Scientific Committee, 2011)	
Invasion and establishment of exotic species	Fragmentation, grazing and small-scale physical disturbance have resulted in weed invasion throughout the distribution of the TEC, which continues to threaten the ecological function of the community. Principal weed species include Paterson's Curse (*Echium plantagineum*), Cape Weed (*Arctotheca calendula*) and African Boxthorn (*Lycium ferocissimum*).	(Threatened Species Scientific Committee, 2011)	

Criteria	Data/information	Data sources	Details of data deficiency, assumptions, reasons for low confidence in information (e.g. TBDC indicates data is unknown or deficient)
Degradation of habitat	Many of the remaining stands of the TEC are degraded by overgrazing, which has resulted in simplification of community structure, changes in species composition, invasion of weeds and soil erosion. Overgrazing also reduces structural complexity, plant species diversity and habitat suitability for vertebrate fauna of the community. The sandy-textured soils of the TEC are sensitive to erosion as a result of trampling by hooved animals and burrowing by rabbits. These impacts are exacerbated under drought conditions.	(Threatened Species Scientific Committee, 2011)	
Fragmentation of habitat	The TEC has undergone a large reduction in its geographic distribution as a consequence of clearing for cropping and pasture improvement. This has largely occurred within the past 170 years, a time span appropriate to the life cycle of the dominant species of the community. In many cases, remnants are confined to roadsides or other small fragments, while some stands of the community have been reduced to a few isolated trees.	(Threatened Species Scientific Committee, 2011)	
Evidence of restricted geographic distribution (Principle 3) based on the TEC's geographic range in NSW			
Extent of occurrence (ha)	The former and current extent of Buloke Woodlands in south-western New South Wales is somewhat uncertain, in large part due to extensive woodland degradation and clearing that has occurred in the region. Remaining patches are often fragmented and less than 200 ha in extent.	Conservation advice (Commonwealth DCCEEW, 2023)	
Area of occupancy (ha)	N/A		

Criteria	Data/information	Data sources	Details of data deficiency, assumptions, reasons for low confidence in information (e.g. TBDC indicates data is unknown or deficient)
Number of threat-defined locations	Approximately 6 ha of the TEC are estimated to occur within Lake Urana and Wiesners Swamp Nature Reserves. The remainder of the community occurs on private land or on public easements. Sluiter *et al.* (1997) identified incremental roadside clearing, travelling livestock (droving) and opportunistic livestock grazing on roadside reserves, land clearing on private and leasehold land, firebreak construction, herbicide application and fertiliser drift as the main threats affecting the TEC. These remnant patches could be considered threat defined locations.	(Threatened Species Scientific Committee, 2011)	
Evidence that the TEC is unlikely to respond to management (Principle 4) – note Principle 4 is not applicable to this TEC			

10.2.1.2 Impact assessment

Table 10.4 Impact assessment – *Allocasuarina luehmanii* Woodland in the Riverina and Murray-Darling Depression Bioregions

Criteria	Data/information	Data sources	Details of data deficiency, assumptions, reasons for low confidence in information (e.g. TBDC indicates data is unknown or deficient)
Impact on the geographic extent of the TEC (Principles 1 and 3)			
Area of TEC to be impacted by the project (ha)	1.15 ha	GIS Analysis	N/A
Area of TEC to be impacted by the project as a per cent of the current geographic extent in NSW (per cent)	The total current extent of the TEC is estimated to be about 1,300 ha. Based on the estimated current geographic extent in NSW, 0.15 % of this extent is expected to be impacted by the project.	N/A	N/A
Direct/indirect impacts likely as a result of the project to contribute to loss of flora/fauna species characteristic of the TEC (BAM Subsection 9.1.1(4.a.ii.))	The direct impact on this TEC is 1.15 ha which represents 0.089 % of the current geographic extent in NSW. No indirect impacts are expected for this TEC. Additionally, the project is not expected to further impact the characteristics of this TEC.	N/A	N/A

Criteria	Data/information	Data sources	Details of data deficiency, assumptions, reasons for low confidence in information (e.g. TBDC indicates data is unknown or deficient)
Impacts likely to contribute to further environmental degradation or disruption of biotic processes (Principle 2)			
Remaining extent of isolated areas of TEC (ha)	An analysis of *Allocasuarina luehmanii* Woodland (excluding derived condition class) with patch size are greater than 10 ha in size has been undertaken for the indicative disturbance footprint and within the locality (10 km buffer to the project). The project would impact one, largely degraded, patch of TEC within the Murrumbidgee IBRA subregion. This is the only patch field verified within the subject land. There are no other mapped areas of this TEC within the locality identified by SVTM. However, this is considered unlikely and vegetation associated with this TEC has likely been identified as other Riverine Sandhill Woodland vegetation class PCTs within the SVTM.	GIS analysis of ground-truthed vegetation within the subject land. NSW BioNet Vegetation Classification (NSW DCCEEW, 2025) NSW State Vegetation Type Map (2024) – current release C2.0.M2.1 (November2024)	An understanding of remaining extent in locality as this area has been calculated based on vegetation within a narrow corridor.
Average distance between remaining remnants – remnant is retained (m)	The average distance between remnants would be largely unchanged. Based off aerial imagery and field verified vegetation mapping, the TEC has been located to occur on a singular sandhill in the central Murrumbidgee. Of this, the direct impacts caused by the project would remove vegetation at the northern edge of the TEC. Where the project bisects the TEC, the greatest clearing distance is 80 m and vegetation is largely recorded in derived condition. Given this and that this is the only location identified within the locality where the TEC is present, there would be no tangible increase to the average distance between remaining remnants.	GIS analysis	Calculation based on vegetation within subject land corridor.
Average distance between remaining remnants – remnant is removed (m)		GIS analysis	Calculation based on vegetation within subject land corridor.

Criteria	Data/information	Data sources	Details of data deficiency, assumptions, reasons for low confidence in information (e.g. TBDC indicates data is unknown or deficient)
Estimated maximum dispersal distance of species associated with the TEC (km)	*Allocasuarina leuhmannii* is the dominant tree species within this TEC. This species is wind pollinated, with its winged-seed able be wind dispersed locally. It can establish from seed in absence of disturbance, possibly due to tolerance of shade and drought (Benson & McDougall, 1995). With this species wind dispersed, its estimated that dispersal between remnant patches won't be significantly impacted.	(Benson and McDougall, 1993a)	N/A
Area to perimeter ratio of remaining remnants (ratio)	The area to perimeter ratio of remaining remnants is unlikely to be significantly altered in the locality. This TEC occurs on a singular sandhill in the central Murrumbidgee where impacts are limited to minor vegetation clearing (1.15 ha) at the northern end of the identified extent.	GIS analysis	Underestimate as analysis restricted to subject land (200 m wide corridor).

10.2.2 White Box Yellow Box Blakely's Red Gum Woodland

As of 2006, the current estimated area for White Box Yellow Box Blakely's Red Gum Woodland TEC was 250,729 ha, the remnants of an estimated significant 90% reduction post-European settlement. However, uncertainty of the true extent of this PCT is high considering the lack of available data to enable condition or structure threshold to be established under the NSW CEEC final determination listing (see Table 10.5). The TEC is listed as a SAII entity because any impact may be regarded as serious and irreversible if it is likely to contribute significantly to the risk of a threatened ecological community becoming extinct because:

- it would cause a further decline of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to be in a rapid rate of decline (known as SAII Principle 1)
- it would further reduce the population size of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to have a very small population size (known as SAII Principle 2).

The following SAII principles are not applicable to this TEC:

- it is an impact on the habitat of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to have a very limited geographic distribution (known as SAII Principle 3)
- the impacted species or ecological community is unlikely to respond to measures to improve its habitat and vegetation integrity and therefore its members are not replaceable (known as SAII Principle 4).

It is estimated that 0.001 % of the current NSW geographic extent of this TEC would be impacted by the project. Further assessment of this impact can be found in Table 10.6.

10.2.2.1 Actions to avoid and minimise direct and indirect impacts

Actions to avoid and minimise direct and indirect impacts to this TEC at risk of an SAII is provided in section 9.3.7. This includes aspects of project location and design.

Alternative technologies, routes, locations, and sites have been considered. For example, undergrounding transmission lines would not avoid impacts. As outlined in section 9.4.2, mitigation measures have been prepared for the project that would be implemented as part of the construction and operational environmental management procedures by Transgrid. The specific mitigation measures targeted to White Box Yellow Box Blakely's Red Gum Woodland TEC involve:

- the micro-siting process
- pre-clearing surveys
- delineation of exclusion zones and project clearing boundaries
- monitoring to ensure compliance with the approved impact as presented in this BDAR to ensure impact areas are not exceeded.

Combined, these measures would allow for small site-based changes to design in the detailed design phase that may minimise impacts to the White Box Yellow Box Blakely's Red Gum Woodland TEC.

Current status (excluding impacts of the project)

Table 10.5 Current status – White Box Yellow Box Blakely's Red Gum Woodland

Criteria	Data/information	Data sources	Details of data deficiency, assumptions, reasons for low confidence in information (e.g. TBDC indicates data is unknown or deficient)
Evidence of reduction in geographic distribution (Principle 1) based on the TEC's geographic range in NSW			
Current total geographic extent (ha) of the TEC in NSW	As of 2006, the current estimated area was 250,729 ha. However, since this TECs threat status was upgraded from endangered to critically endangered in 2020, the final determination listing has removed reference to condition state. This has resulted in all occurrences of the ecological community, independent of condition, to form part of the CEEC listing. In this context all NSW PCTs that are considered likely to form part of the CEEC need to be considered in terms of establishing a best estimate of current extent in NSW. Using a BioNet TEC PCT power query, a total of 114 PCTs have been identified to be associated with the CEEC. Taking a conservative approach, these PCTs were further filtered to 73 and only include those PCTs listed with a classification confidence level of medium, high and very high. The estimated current extent of these PCTs using the NSW State Vegetation Type Map 2022 data set is 1,657,493 ha (includes derived) or 1,370,658 ha (excludes derived).	(Threatened Species Scientific Committee, 2006a) (Threatened Species Scientific Committee, 2020c) (NSW DCCEEW, 2024)	The assumption of the 250,729-ha estimate has been based from the Commonwealth listing advice where specific key diagnostic and condition threshold need to be meet in order to form part of the ecological community listing. This uncertainty has only been heightened through the lack of available data to enable condition or structure threshold to be established under the NSW CEEC final determination listing. Due to this, and the intent of the listing that all occurrences of the ecological community independent of their condition are covered by the determination, current total geographic extent is considered much higher that previously stated

Criteria	Data/information	Data sources	Details of data deficiency, assumptions, reasons for low confidence in information (e.g. TBDC indicates data is unknown or deficient)
Estimated reduction in geographic extent of the TEC since 1970	The TEC has undergone a very large historical reduction in geographic distribution since 1750 and has experienced disruption of biotic processes of relative severity >90 % over more than 90 % of its distribution since 1750.	(Threatened Species Scientific Committee, 2020a)	The estimated reduction in geographic extent of the TEC since 1970 is unknown. There is uncertainty surrounding both the current extent of the TEC and the extent of its pre-1750 distribution.
Extent of reduction in ecological function for the TEC using evidence that describes the degree of environmental degradation or disruption to biotic processes (Principle 2)			
Change in community structure	Reduction in ecological function is evident in areas subject to threats such as grazing, land clearing, salinity and inappropriate fire regimes. The community's national listing advice identifies three states in which the community occurs in response to such threats. These states include: — overstorey exists, but there is no substantial native understorey — native understorey exists, but the trees have been cleared (derived grasslands) — both native understorey and overstorey exist in conjunction. Ecological function across these three states would differ.	(Threatened Species Scientific Committee, 2006b)	High confidence that alterations to the community's structure would affect ecological function.

Criteria	Data/information	Data sources	Details of data deficiency, assumptions, reasons for low confidence in information (e.g. TBDC indicates data is unknown or deficient)
Change in species composition	Threats noted above can alter the species composition within the community. For example, grazing can lead to the prevention of overstorey species regeneration and can to a reduction in native understorey species diversity and cover. The extent of this change is likely to be linked to the type and severity of the threat.	(Threatened Species Scientific Committee, 2006b)	High confidence based on field survey and research.
Disruption of ecological processes	Impacts to the community to date make the possibility of re-establishment of ecological processes, species composition and structure back to its original extent unlikely, even with human intervention.	(Threatened Species Scientific Committee, 2006b)	Estimated based on past research. Further research on ecological processes probably required to confirm.
Invasion and establishment of exotic species	The national listing advice states that there are essentially no fully intact remnants left as most patches have at least some degree of weed invasion. The threats noted above can however lead to the introduction, establishment and spread of new exotic species. Intact areas are more resistant to large-scale weed invasion. Where weed invasion is prolific it can alter abiotic factors such as species composition and structure.	(Threatened Species Scientific Committee, 2006b)	High confidence that most remnants area already altered by some degree of weed invasion.
Degradation of habitat	Land clearing and other land practices have led to the degradation of large areas of this community throughout its extent. It has occurred at both a patch and landscape scale. Degradation can affect the community's structure, species composition, functionality and viability.	(Threatened Species Scientific Committee, 2006b)	High confidence based on field survey, research and modelled vegetation mapping.

Criteria	Data/information	Data sources	Details of data deficiency, assumptions, reasons for low confidence in information (e.g. TBDC indicates data is unknown or deficient)
Fragmentation of habitat	Land clearing and other land practices have led to the fragmentation of this community throughout its extent. Fragmentation can affect the community's structure, species composition, functionality and viability.	(Threatened Species Scientific Committee, 2006b)	High confidence based on field survey, research and modelled vegetation mapping.
Evidence of restricted geographic distribution (Principle 3) based on the TEC's geographic range in NSW			
Extent of occurrence (ha)	702,800 km^2	(Threatened Species Scientific Committee, 2020c)	The best estimates are derived from a compilation of maps from multiple sources. Not all of the areas occupied by White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland are covered by maps of appropriate scale and accuracy. Therefore, the values quoted may underestimate the true values.
Area of occupancy (ha)	The area of (AOO) in NSW has been estimated to be 151,100 km^2 however the extent of Box Gum Woodland within this AOO is estimated to be 1,657,493 ha.	(Threatened Species Scientific Committee, 2020c) (Threatened Species Scientific Committee, 2020c)	
Number of threat-defined locations	Not identified	Not available	Unknown
Evidence that the TEC is unlikely to respond to management (Principle 4) – note Principle 4 is not applicable to this TEC			
Known reproductive characteristics severely limit the ability to increase the existing population on, or occupy new habitat (e.g. species is clonal) on, a biodiversity stewardship site	Known reproductive characteristics of this ecological community do not severely limit the ability to increase the area of extent/occupancy of the community.	(Department of Environment Climate Change and Water, 2011)	High confidence that threatening processes are the main issue rather than reproductive characteristics.

Criteria	Data/information	Data sources	Details of data deficiency, assumptions, reasons for low confidence in information (e.g. TBDC indicates data is unknown or deficient)
Life history traits and/or ecology is known but the ability to control key threatening processes at a biodiversity stewardship site is currently negligible (e.g. frogs severely impacted by chytrid fungus).	The national recovery plan for the community identifies the following threats: — land use and management change such as agriculture and horticultural development, rural residential and urban development, mining, public infrastructure — conflicting management practices such as grazing regimes and pasture management, firewood collection and 'tidying up', changed fire regimes, increased soil nutrients and use of chemicals, mowing and slashing regimes and revegetation management — degrading landscape processes such as weed invasion, climate change, salinity, acid soils, declining tree health and regeneration — other potential threats such as animal pests, disease and collection/removal of native flora. Some of these threats such as stochastic events like wildlife and prolonged drought, climate change and pests cannot be effectively managed on a biodiversity stewardship site.	(Department of Environment Climate Change and Water, 2011)	High confidence in knowledge of key threatening processes and limited control options.

10.2.2.2 Impact assessment

Table 10.6 Impact assessment – White Box Yellow Box Blakely's Red Gum Woodland

Criteria	Data/information	Data sources	Details of data deficiency, assumptions, reasons for low confidence in information (e.g. TBDC indicates data is unknown or deficient)
Impact on the geographic extent of the TEC (Principles 1 and 3)			
Area of TEC to be impacted by the project (ha)	The project would impact 44.24 ha of the TEC. This is made up of the following disturbance types: — 42.97 ha of impact in Disturbance area A (full impact) — 0.83 ha of impact in Disturbance area B4 (partial impact) — 0.44 ha of impact in Disturbance area HZ. In terms of floristic composition and structural changes to Box Gum Woodland, the project would impact 2.09 ha within disturbance area A where all vegetation would be removed to ground level, thereby substantially changing the vegetation structure and composition (to patches with tree canopy. The remaining 42.15 ha of impact within disturbance area A consists of the TEC in Derived_LCV condition, where cleared paddocks form largely exotic grasslands, resulting in almost no change to vegetation structure or composition.	N/A	N/A

Criteria	Data/information	Data sources	Details of data deficiency, assumptions, reasons for low confidence in information (e.g. TBDC indicates data is unknown or deficient)
	Approximately 0.83 ha (disturbance area B4) would only require vegetation trimming to meet vegetation clearance heights and the ground cover would be undisturbed. This would change the species composition to a lesser degree compared to area A, leading to a reduced change in VI score. However, the TEC would still exist in these areas. Approximately a further 0.44 ha of impact within the Hazard Tree Zone (partial impact) is expected. Vegetation to be removed would have root balls retained, and where practicable, impacts would be restricted to pruning. The assumption is that 10 per cent of the HZ zone would have trees which would need to be cleared. However, the TEC would still exist in these areas.		
Area of TEC to be impacted by the project as a per cent of the current geographic extent in NSW (per cent)	It is estimated that 0.001 % of the current NSW geographic extent of this TEC would be impacted.	N/A	N/A

Criteria	Data/information	Data sources	Details of data deficiency, assumptions, reasons for low confidence in information (e.g. TBDC indicates data is unknown or deficient)
Direct/indirect impacts likely as a result of the project to contribute to loss of flora/fauna species characteristic of the TEC (BAM Subsection 9.1.1(4.a.ii.))	The project would include clearing of approximately 3.38 ha of this TEC. The project would impact isolated patches and patches with limited connectivity, subject to grazing and edge effects from agricultural activities. These areas are not considered to be habitat that would be important for the long-term survival of characteristic species of the TEC. Refer to section 9.1 and 9.2 for detailed discussion of impacts. Direct and indirect impact would be managed through mitigation measures outlined in section 9.4.	N/A	N/A
Impacts likely to contribute to further environmental degradation or disruption of biotic processes (Principle 2)			
Remaining extent of isolated areas of TEC (ha)	An analysis of Box Gum Woodland (excluding derived condition class) with patch size area greater than 10 ha in size has been undertaken for the project impact and within the locality (20 km buffer to the project). The project has been identified to not impact any patches of the TEC that exceed 10 ha whilst within the locality there is a total of 33 patches. Therefore, the project would not impact any of the Box Gum Woodland patches greater than 10 ha in the locality.	GIS analysis of ground-truthed vegetation within the subject land. NSW BioNet Vegetation Classification (2025) NSW State Vegetation Type Map (2024) – current release C2.0.M2.1 (November2024)	An understanding of remaining extent in locality as this area has been calculated based on vegetation within narrow subject land corridor.

Criteria	Data/information	Data sources	Details of data deficiency, assumptions, reasons for low confidence in information (e.g. TBDC indicates data is unknown or deficient)
Average distance between remaining remnants – remnant is retained (m) Average distance between remaining remnants – remnant is removed (m)	The average distance between remnants would be largely unchanged. Based off SVTM, no patches of the TEC larger than 10 ha are expected to be impacted by the project. Given this, there are no expected changes likely to occur to the distance between remaining remnants within the locality.	GIS analysis of ground-truthed vegetation within the subject land. NSW BioNet Vegetation Classification (2025) NSW State Vegetation Type Map (2024) – current release C2.0.M2.1 (November2024)	Calculation based on vegetation within subject land corridor.
Estimated maximum dispersal distance of species associated with the TEC (km)	75 m The dominant canopy species in this TEC include *Eucalyptus albens* (PCT 266), *Eucalyptus blakelyi* (PCT 277) and *Eucalyptus melliodora.* The seeds of these species are dispersed locally by wind and gravity with no dormancy. *E. melliodora* is known to also disperse via mud on cars (Benson & McDougall, 1998). The average distance between remaining remnants isn't expected to change. Therefore, it's expected that the current ecologically functional connectivity for this TEC won't be impacted in the locality.	(Department of Environment and Heritage, 2006)	75 m is based on the gap between trees of Box Gum Woodland that are considered to be a single "patch". It is noted however that dispersal distances for species within this community would vary greatly from limited dispersal of small ground dwelling species, or herbs, to migratory bird species.
Area to perimeter ratio of remaining remnants (ratio)	The area to perimeter ratio of remaining remnants is unlikely to be significantly altered in the locality. The TEC patches expected to be impacted are relatively small when compared to the 33 larger (>10 ha) patches in the locality.	GIS analysis	Underestimate as analysis restricted to subject land (200 m wide corridor).

10.3 Additional impact assessment provisions for threatened flora species at risk of an SAII

Figure 15.13 shows the extent of threatened flora species at risk of Serious and Irreversible Impacts within the subject land.

10.3.1 Brachyscome muelleroides (Mueller Daisy)

Brachyscome muelleroides (Mueller Daisy) is listed as a SAII entity because an impact to this threatened species may be regarded as serious and irreversible if it is likely to contribute significantly to the risk of a threatened species becoming extinct because:

- it is an impact on the habitat of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to have a very limited geographic distribution (known as SAII Principle 3)

The following SAII principles are not applicable to this threatened species:

- it would cause a further decline of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to be in a rapid rate of decline (known as SAII Principle 1)
- it would further reduce the population size of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to have a very small population size (known as SAII Principle 2)
- the impacted species or ecological community is unlikely to respond to measures to improve its habitat and vegetation integrity and therefore its members are not replaceable (known as SAII Principle 4).

10.3.1.1 Actions to avoid and minimise direct and indirect impacts

Actions to avoid and minimise direct and indirect impacts to this threatened species at risk of an SAII is provided in Section 9.3.7. This includes aspects of project location and design.

Current status (excluding impacts of the project)

Table 10.7 Current status – *Brachyscome muelleroides* (Mueller Daisy)

Criteria	Data/information	Data sources	Details of data deficiency, assumptions, reasons for low confidence in information (e.g. TBDC indicates data is unknown or deficient)
Evidence of rapid decline (Principle 1)			
Change in population size in NSW in the past 10 years or 3 generations (indicate whether as a direct estimate of the population or if indicated by an index or surrogate)	Little is known of the former distribution and abundance of *Brachyscome muelleroides*. Many records of the species are now several decades old, and there are few recent records, with most known plants occurring on Morundah Station in NSW. However, there are fluctuations in numbers from year to year, and the inconspicuous nature of the species may mean it has been overlooked. Periods of extended drought covering much of its distribution over has also meant few opportunities to survey for flowering plants. It is likely that there has been a historical decline in abundance of *Brachyscome muelleroides*, with much of the area within its distribution being converted to agriculture, causing loss and degradation of habitat. Natural river flows and flooding regimes have been substantially altered through river regulation, with a consequent reduction in flooding and probably fewer opportunities for germination and growth of *Brachyscome muelleroides*.	(Lucas, 2010)	Current sources include data up to 2010, more recent data lacking.

Criteria	Data/information	Data sources	Details of data deficiency, assumptions, reasons for low confidence in information (e.g. TBDC indicates data is unknown or deficient)
Evidence of small population size (Principle 2)			
Current population size in NSW	Little is known about the current location and status of *Brachyscome muelleroides*. The species has been recorded from about 20 locations since 1900, only about 13 locations since 1930 and only eight locations since 1990. The most important site appears to be Morundah Station in NSW, a Commonwealth Department of Defence property leased for grazing, which has almost all currently recorded plants.	(Lucas, 2010)	Current sources include data up to 2010, more recent data lacking.
Decline in species' population size in 3 years or one generation			
Number or percentage of mature individuals in each subpopulation or whether the species is likely to undergo extreme fluctuations	The suspected relationship of *Brachyscome muelleroides* on flooding and/or waterlogged soils is poorly understood. However, it is clear that the species can tolerate wet environments, and that germination and growth seem to be highly dependent upon wetter years. It is not known how long seeds remain viable through extended dry periods. This may also indicate the potential for the species to undergo extreme fluctuations during periods of extended drought.	(Lucas, 2010)	Current sources include data up to 2010, more recent data lacking.
Evidence of limited geographic range (Principle 3)			
Extent of occurrence (ha)	Data deficient	-	Data deficient
Area of occupancy (ha)	Data deficient	-	Data deficient

Criteria	Data/information	Data sources	Details of data deficiency, assumptions, reasons for low confidence in information (e.g. TBDC indicates data is unknown or deficient)
Number of threat-defined locations	Data deficient There are currently no known published threat-defined locations for this species. The most important site appears to be Morundah Station in NSW, a Commonwealth Department of Defence property leased for grazing, which has almost all currently recorded plants (as of 2010). Listed threats for *Brachyscome muelleroides* include: — land management practices — habitat loss — disturbance from recreational users — overgrazing — demographic threats — lack of knowledge — invasive grasses.	(Lucas, 2010) (NSW DCCEEW, 2025b)	Data deficient
Whether the species' population is likely to undergo extreme fluctuations	The species appear to require sufficient autumn rainfall that results in localised soil waterlogging, or periodic flooding, is required to initiate seed germination and plant growth.	(Lucas, 2010)	Current sources include data up to 2010, more recent data lacking.

Criteria	Data/information	Data sources	Details of data deficiency, assumptions, reasons for low confidence in information (e.g. TBDC indicates data is unknown or deficient)
Evidence that the species is unlikely to respond to management (Principle 4)			
Known reproductive characteristics severely limit the ability to increase the existing population on, or occupy new habitat (e.g. species is clonal) on, a biodiversity stewardship site	There are no known inhibiting characteristics for this species	(Lucas, 2010) TBDC (NSW DCCEEW, 2025b)	Current sources include data up to 2010, more recent data lacking.
The species is reliant on abiotic habitats which cannot be restored or replaced (e.g. karst systems) on a biodiversity stewardship site, or	The species has been recorded growing in damp areas on the margins of claypans in moist grassland. It's also recorded from the margins of lagoons in mud or water.	(Lucas, 2010)	Current sources include data up to 2010, more recent data lacking.
Life history traits and/or ecology is known but the ability to control key threatening processes at a biodiversity stewardship site is currently negligible (e.g. frogs severely impacted by chytrid fungus).	Listed key threats for this species are generally controllable via suitable conditions on a stewardship site.	(Lucas, 2010) TBDC (NSW DCCEEW, 2025b)	Current sources include data up to 2010, more recent data lacking.

10.3.1.2 Impact assessment

Table 10.8 Impact assessment – *Brachyscome muelleroides* (Mueller Daisy)

Impact	Data/information	Data sources	Details of data deficiency, assumptions or reasons for low confidence in information (e.g. TBDC indicates data is unknown or deficient)
Number of individuals (mature and immature) present in the subpopulation on the project footprint	Unknown, but likely to be none. *Brachyscome muelleroides* has not been recorded in surveys of the subject land, however presence has been assumed where suitable habitat occurs on land inaccessible for field verification. Unsurveyed habitat impacts total 1.04 ha	GIS analysis TBDC	Survey has not been undertaken to an extent that would allow for the number of individuals (mature and immature) present in the subpopulation on the subject land to be known. Calculation based on vegetation within subject land in unsurveyed areas.
Number of individuals (mature and immature) present as a percentage of total NSW population (per cent)	Unknown, but likely to be none. This species is assumed to occur based on the presence of potential habitat and absence of survey even though the likelihood of a subpopulation being present in the locality is low.	TBDC Recovery plan for the species (Lucas, 2010)	Survey has not been undertaken to an extent that would allow for the number of individuals (mature and immature) present as a percentage of total NSW population (per cent) to be known.
Number of individuals (mature and immature) to be impacted by the project	Unknown, but likely to be none. This species is assumed to occur based on the presence of potential habitat and absence of survey even though the likelihood of a subpopulation being present in the locality is low.	TBDC Recovery plan for the species (Lucas, 2010)	Survey has not been undertaken to an extent that would allow for the number of individuals (mature and immature) to be impacted by the project to be known.

Impact	Data/information	Data sources	Details of data deficiency, assumptions or reasons for low confidence in information (e.g. TBDC indicates data is unknown or deficient)
Individuals (mature and immature) to be impacted by the project as a percentage of total NSW population (per cent)	Unknown, but likely to be none. This species is assumed to occur based on the presence of potential habitat and absence of survey even though the likelihood of a subpopulation being present in the locality is low.	TBDC Recovery plan for the species (Lucas, 2010)	Survey has not been undertaken to an extent that would allow for the number of individuals (mature and immature) to be impacted by the project as a percentage of total NSW population (per cent) to be known.
Area of habitat to be impacted (ha) (for species measured by area only)	Estimated area of assumed habitat for *Brachyscome muelleroides* is approximately 1.04 ha.	Field survey and mapped species polygon based on areas of potential habitat unable to be surveyed.	Calculation based on vegetation within subject land in unsurveyed areas.
Area of the species' geographic range to be impacted by the project (ha)	Species is data deficient, so current geographic range is unknown. Known from the Wagga Wagga, Narranderra, Tocumwal and Walbundrie areas in NSW.	Recovery plan for the species (Lucas, 2010) TBDC (NSW DCCEEW, 2025b)	Based on field survey and assumptions of potential habitat.
Area of the species' geographic range to be impacted as a percentage of the total area or extent of occupancy (per cent)			
Individuals impacted	No individuals will be directly impacted, some habitat will be impacted	Field survey and mapped species polygon.	Importantly, this species is assumed to occur based on the presence of potential habitat even though the likelihood of a subpopulation being present in the locality is low.

Impact	Data/information	Data sources	Details of data deficiency, assumptions or reasons for low confidence in information (e.g. TBDC indicates data is unknown or deficient)
Viability of a fragmented population (see below)	There would be localised fragmentation of habitat due to the linear nature of the project. However, the population is not currently considered to be severely fragmented based on Criterion 2 of the EPBC Act criteria and regulations. There is no evidence to suggest that the population would become unviable.	Recovery plan for the species (Lucas, 2010) TBDC (NSW DCCEEW, 2025b)	Importantly, this species is assumed to occur based on the presence of potential habitat even though the likelihood of a subpopulation being present in the locality is low.
Changes in threats affecting remaining subpopulations and habitat if the proposed impact proceeds		Identified in BDAR section 9.1.	

10.3.2 *Caladenia arenaria (Sand-hill Spider Orchid)*

Caladenia arenaria (Sand-hill Spider Orchid) is listed as a SAII entity because an impact to this threatened species may be regarded as serious and irreversible if it is likely to contribute significantly to the risk of a threatened species becoming extinct because:

- it is an impact on the habitat of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to have a very limited geographic distribution (known as SAII Principle 3)
- it would further reduce the population size of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to have a very small population size (known as SAII Principle 2).

The following SAII principles are not applicable to this threatened species:

- it would cause a further decline of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to be in a rapid rate of decline (known as SAII Principle 1)
- the impacted species or ecological community is unlikely to respond to measures to improve its habitat and vegetation integrity and therefore its members are not replaceable (known as SAII Principle 4).

10.3.2.1 Actions to avoid and minimise direct and indirect impacts

Actions to avoid and minimise direct and indirect impacts to this threatened species at risk of an SAII is provided in section 9.3.7. This includes aspects of project location and design.

Current status (excluding impacts of the project)

Table 10.9 Current status – Caladenia arenaria (Sand-hill Spider Orchid)

Criteria	Data/information	Data sources	Details of data deficiency, assumptions, reasons for low confidence in information (e.g. TBDC indicates data is unknown or deficient)
Evidence of rapid decline (Principle 1)			
Change in population size in NSW in the past 10 years or 3 generations (indicate whether as a direct estimate of the population or if indicated by an index or surrogate)	Little data is available in population trends for this species. There is an estimated 2000 plants, however in previous surveys competed in 1997 suggest only 25 plants remaining, this can be attributed to the annual dieback to a tuber, which brings about significant variation in flowering success.	Final determination for the species (Threatened Species Scientific Committee, 1997b) Conservation advice for the species (Threatened Species Scientific Committee, 2015)	There is currently insufficient understanding of the taxonomy of the species (NSW DCCEEW, 2025b).
Evidence of small population size (Principle 2)			
Current population size in NSW	As of 2015, the species has a total population of around 2000 individuals, all occurring in NSW.	Conservation advice for the species (Threatened Species Scientific Committee, 2015)	Current sources include data up to 2010, with a lack of more recent data.
Decline in species' population size in 3 years or one generation	No published data on species population decline in three years or one generation.	Final determination for the species (Threatened Species Scientific Committee, 1997b)	No current data available on the species population decline in three years.
Number or percentage of mature individuals in each subpopulation or whether the species is likely to undergo extreme fluctuations	The current number of mature individuals is unknown. As the five known locations of the species is already small and isolated, the percentage of mature individuals at each location is likely to be small.	Conservation advice for the species (Threatened Species Scientific Committee, 2015)	There is a lack in current data available on subpopulation sizes and percentage of mature adults.

Criteria	Data/information	Data sources	Details of data deficiency, assumptions, reasons for low confidence in information (e.g. TBDC indicates data is unknown or deficient)
Evidence of limited geographic range (Principle 3)			
Extent of occurrence (ha)	The current extent of occurrence is not published; however, the species is only known from five locations within NSW. Such locations include a roadside north of Narrandera, a private property near Urana; and in Lonesome, Buckingbong and Pine State Forests. These known locations span the Riverina between Urana and Narranderra.	Conservation advice for the species (Threatened Species Scientific Committee, 2015)	No current data available on the species extent of occurrence.
Area of occupancy (ha)	No published information on area of occupancy.	Conservation advice for the species (Threatened Species Scientific Committee, 2015)	No Current data available on the species area of occupancy.
Number of threat-defined locations	There are currently no published threat-defined locations for this species. It is not known to occur in any conservation reserves in New South Wales, so current location is likely to be threat-defined. The main threats currently affecting *Caladenia arenaria* include: — grazing — collecting of plants — disturbance from quarrying — hybridisation.	Final determination for the species (Threatened Species Scientific Committee, 1997b) Conservation advice for the species (Threatened Species Scientific Committee, 2015) TBDC (NSW DCCEEW, 2025b)	N/A

Criteria	Data/information	Data sources	Details of data deficiency, assumptions, reasons for low confidence in information (e.g. TBDC indicates data is unknown or deficient)
Whether the species' population is likely to undergo extreme fluctuations	The species is not known to undergo population fluctuations, but has a total population estimate of 2000 individuals, and already experiences significant fragmentation. As such, small, isolated populations are at greater risk of chance events.	Final determination for the species (Threatened Species Scientific Committee, 1997b) Conservation advice for the species (Threatened Species Scientific Committee, 2015)	There is a general lack of ecological and distributional information for this species (NSW DCCEEW, 2025b).
Evidence that the species is unlikely to respond to management (Principle 4)			
Known reproductive characteristics severely limit the ability to increase the existing population on, or occupy new habitat (e.g. species is clonal) on, a biodiversity stewardship site	No known inhibiting characteristics reported for this species	Final determination for the species (Threatened Species Scientific Committee, 1997b) Conservation advice for the species (Threatened Species Scientific Committee, 2015) TBDC (NSW DCCEEW, 2025b)	Insufficient data available on the ecology of the species. Further research is required.
The species is reliant on abiotic habitats which cannot be restored or replaced (e.g. karst systems) on a biodiversity stewardship site, or	There are no known abiotic habitats on which the species is reliant. Like most Australian terrestrial orchids, the species is believed to be semi- or fully obligately dependent on a mycorrhizal symbiont.	Final determination for the species (Threatened Species Scientific Committee, 1997b)	Insufficient data available on the ecology of the species. Further research is required.
Life history traits and/or ecology is known but the ability to control key threatening processes at a biodiversity stewardship site is currently negligible (e.g. frogs severely impacted by chytrid fungus).	Currently, there is insufficient data available on the ecology of the species. However, associated key threatening processes are commonly controllable. One key threatening process to consider would be population decrease due to chance events occurring in populations known to be small and isolated.	Final determination for the species (Threatened Species Scientific Committee, 1997b) TBDC (NSW DCCEEW, 2025b)	Insufficient data available on the ecology of the species. Further research is required.

10.3.2.2 Impact assessment

Table 10.10 Impact assessment – Caladenia arenaria (Sand-hill Spider Orchid)

Impact	Data/information	Data sources	Details of data deficiency, assumptions or reasons for low confidence in information (e.g. TBDC indicates data is unknown or deficient)
Number of individuals (mature and immature) present in the subpopulation on the project footprint	Unknown, but likely to be none. *Caladenia arenaria* was not recorded on targeted surveys across the subject land, where it was restricted to the Inland Slopes IBRA subregion. However, the species was assumed present based on surveys in suitable habitat not being possible. Unsurveyed habitat impacts a total of 0.30 ha.	GIS analysis TBDC (NSW DCCEEW, 2025b)	Survey has not been undertaken to an extent that would allow for the number of individuals (mature and immature) present in the subpopulation on the subject land to be known. Calculation based on vegetation within subject land in unsurveyed areas.
Number of individuals (mature and immature) present as a percentage of total NSW population (per cent)	Unknown, but likely to be none. This species is assumed to occur based on the presence of potential habitat and absence of survey even though the likelihood of a subpopulation being present in the locality is low.	TBDC (NSW DCCEEW, 2025b) Conservation advice for the species (Threatened Species Scientific Committee, 2015)	Survey has not been undertaken to an extent that would allow for the number of individuals (mature and immature) present as a percentage of total NSW population (per cent) to be known.
Number of individuals (mature and immature) to be impacted by the project	Unknown, but likely to be none. This species is assumed to occur based on the presence of potential habitat and absence of survey even though the likelihood of a subpopulation being present in the locality is low.	TBDC (NSW DCCEEW, 2025b) Conservation advice for the species (Threatened Species Scientific Committee, 2015)	Survey has not been undertaken to an extent that would allow for the number of individuals (mature and immature) to be impacted by the project to be known.

Impact	Data/information	Data sources	Details of data deficiency, assumptions or reasons for low confidence in information (e.g. TBDC indicates data is unknown or deficient)
Individuals (mature and immature) to be impacted by the project as a percentage of total NSW population (per cent)	Unknown, but likely to be none. This species is assumed to occur based on the presence of potential habitat and absence of survey even though the likelihood of a subpopulation being present in the locality is low.	TBDC (NSW DCCEEW, 2025b) Conservation advice for the species (Threatened Species Scientific Committee, 2015)	Survey has not been undertaken to an extent that would allow for the number of individuals (mature and immature) to be impacted by the project as a percentage of total NSW population (per cent) to be known.
Area of habitat to be impacted (ha) (for species measured by area only)	Estimated area of assumed habitat for *caladenia arenaria* is approximately 0.30 ha.	Field survey and mapped species polygon based on areas of potential habitat unable to be surveyed.	Population based on vegetation within subject land in unsurveyed areas.
Area of the species' geographic range to be impacted by the project (ha)	Species is significantly data deficient, so the current geographic range is unknown. The species distribution is known to occur in the Riverina between Urana and Narranderra.	TBDC (NSW DCCEEW, 2025b) Conservation advice for the species (Threatened Species Scientific Committee, 2015)	Based on field survey and assumptions of potential habitat.
Area of the species' geographic range to be impacted as a percentage of the total area or extent of occupancy (per cent)			
Individuals impacted	No individuals would be directly impacted, some habitat would b impacted.	Field survey and mapped species polygon.	Importantly, this species is assumed to occur based on the presence of potential habitat even though the likelihood of a subpopulation being present in the locality is low.

Impact	Data/information	Data sources	Details of data deficiency, assumptions or reasons for low confidence in information (e.g. TBDC indicates data is unknown or deficient)
Viability of a fragmented population (see below)	There would be localised fragmentation of habitat due to the linear nature of the project. However known populations of the species is known to already be significantly isolated and fragmented, and thus, no evidence to suggest that the population would become unviable.	TBDC (NSW DCCEEW, 2025b) Conservation advice for the species (Threatened Species Scientific Committee, 2015)	Importantly, this species is assumed to occur based on the presence of potential habitat even though the likelihood of a subpopulation being present in the locality is low.
Changes in threats affecting remaining subpopulations and habitat if the proposed impact proceeds		Identified in BDAR section 9.1.	

10.3.3 *Calotis moorei (Burr-daisy)*

Calotis moorei (Burr-daisy) is listed as a SAII entity because an impact to this threatened species may be regarded as serious and irreversible if it is likely to contribute significantly to the risk of a threatened species becoming extinct because:

- it is an impact on the habitat of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to have a very limited geographic distribution (known as SAII Principle 3).

The following SAII principles are not applicable to this threatened species:

- it would cause a further decline of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to be in a rapid rate of decline (known as SAII Principle 1)
- it would further reduce the population size of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to have a very small population size (known as SAII Principle 2)
- the impacted species or ecological community is unlikely to respond to measures to improve its habitat and vegetation integrity and therefore its members are not replaceable (known as SAII Principle 4).

10.3.3.1 Actions to avoid and minimise direct and indirect impacts

Actions to avoid and minimise direct and indirect impacts to this threatened species at risk of an SAII is provided in section 9.3.7. This includes aspects of project location and design.

Current status (excluding impacts of the project)

Table 10.11 Current status – Calotis moorei (Burr-daisy)

Criteria	Data/information	Data sources	Details of data deficiency, assumptions, reasons for low confidence in information (e.g. TBDC indicates data is unknown or deficient)
Evidence of rapid decline (Principle 1)			
Change in population size in NSW in the past 10 years or 3 generations (indicate whether as a direct estimate of the population or if indicated by an index or surrogate)	Data deficient	-	Data deficient
Evidence of small population size (Principle 2)			
Current population size in NSW	Data deficient *Calotis moorei* is known from two populations, the type locality at Mt Muyah, northwest of Louth, and an earlier record at Zara, near Deniliquin. At Mt Mulyah there are three different localities where this species occurs. A population estimate is unavailable; however, a non-exhaustive survey, in 2003, located 45 individuals.	Recovery plan for the species (Department of Environment Climate Change and Water, 2009)	Data deficient

Criteria	Data/information	Data sources	Details of data deficiency, assumptions, reasons for low confidence in information (e.g. TBDC indicates data is unknown or deficient)
Decline in species' population size in 3 years or one generation Number or percentage of mature individuals in each subpopulation or whether the species is likely to undergo extreme fluctuations	Data deficient Only one of the Mt Mulyah populations have been surveyed recently in 2003. While the count wasn't exhaustive, it located 45 individuals.	Recovery plan for the species (Department of Environment Climate Change and Water, 2009)	Data deficient
Evidence of limited geographic range (Principle 3)			
Extent of occurrence (ha)	The Draft Recovery Plan (NSW DEC 2005) has two main collection points that give this species a range of occurrence of about 400 km². The Australian Virtual Herbarium (CHAH 2008) displays three main areas of collection that give this species a range of occurrence of about 80 000 km²	Recovery plan for the species (Department of Environment Climate Change and Water, 2009) TBDC (NSW DCCEEW, 2025b) AVH (AVH, 2025)	-
Area of occupancy (ha)	The area of occupancy for this species is difficult to estimate, however the area of Mt Mulyah is 49,000 ha	Recovery plan for the species (Department of Environment Climate Change and Water, 2009)	-

Criteria	Data/information	Data sources	Details of data deficiency, assumptions, reasons for low confidence in information (e.g. TBDC indicates data is unknown or deficient)
Number of threat-defined locations	Data deficient There are currently no known published threat-defined locations for this species. The most important site appears to be Mt Mulyah. Listed threats for *Calotis moorei* include: — land management practices — demographic threats — pest animals — overgrazing — lack of knowledge.	Recovery plan for the species (Department of Environment Climate Change and Water, 2009) TBDC (NSW DCCEEW, 2025b)	Data deficient
Whether the species' population is likely to undergo extreme fluctuations	There are no obvious threats to *Calotis moorei* at Mt Mulyah and it may not be in decline; however, weed invasion, clearing, agricultural activity, and grazing may impact this species. A very small, localised population is inherently at risk from chance events. If the species proves to be confined to Mt Mulyah, and the population is small, precautionary measures would be required. Small populations are also more susceptible to adverse genetic influences, such as inbreeding depression.	Recovery plan for the species (Department of Environment Climate Change and Water, 2009)	-

Criteria	Data/information	Data sources	Details of data deficiency, assumptions, reasons for low confidence in information (e.g. TBDC indicates data is unknown or deficient)
Evidence that the species is unlikely to respond to management (Principle 4)			
Known reproductive characteristics severely limit the ability to increase the existing population on, or occupy new habitat (e.g. species is clonal) on, a biodiversity stewardship site	No known inhibiting characteristics for this species	Recovery plan for the species (Department of Environment Climate Change and Water, 2009)	There is no specific information about the biology and ecology of *Calotis moorei* (Department of Environment Climate Change and Water, 2009)
The species is reliant on abiotic habitats which cannot be restored or replaced (e.g. karst systems) on a biodiversity stewardship site, or	There are no known abiotic habitats on which the species is reliant.	Recovery plan for the species (Department of Environment Climate Change and Water, 2009) TBDC (NSW DCCEEW, 2025b)	There is no specific information about the biology and ecology of *Calotis moorei* (Department of Environment Climate Change and Water, 2009)
Life history traits and/or ecology is known but the ability to control key threatening processes at a biodiversity stewardship site is currently negligible (e.g. frogs severely impacted by chytrid fungus).	Not applicable - There is no specific information about the biology and ecology of *Calotis moorei* (Department of Environment Climate Change and Water, 2009)	Recovery plan for the species (Department of Environment Climate Change and Water, 2009) TBDC (NSW DCCEEW, 2025b)	Data deficient

10.3.3.2 Impact assessment

Table 10.12 Impact assessment – Calotis moorei (Burr-daisy)

Impact	Data/information	Data sources	Details of data deficiency, assumptions or reasons for low confidence in information (e.g. TBDC indicates data is unknown or deficient)
Number of individuals (mature and immature) present in the subpopulation on the project footprint	Unknown, but likely to be none. *Calotis moorei* has been retained for assessment in parts of the subject land where associated PCTs occur, and survey could not be undertaken due to lack of access. This species is assumed to occur based on the presence of potential habitat and absence of survey even though the likelihood of a sub-population being present in the locality is low.	TBDC Recovery plan for the species (Department of Environment Climate Change and Water, 2009)	Survey has not been undertaken to an extent that would allow for the number of individuals (mature and immature) present in the subpopulation on the subject land to be known.
Number of individuals (mature and immature) present as a percentage of total NSW population (per cent)	Unknown, but likely none. *Calotis moorei* has not been recorded in surveys of the subject land, however presence has been assumed where suitable habitat occurs on land inaccessible for field verification. Unsurveyed habitat impacts total 12.14 ha	TBDC Recovery plan for the species (Department of Environment Climate Change and Water, 2009)	Survey has not been undertaken to an extent that would allow for the number of individuals (mature and immature) present as a percentage of total NSW population (per cent) to be known.
Number of individuals (mature and immature) to be impacted by the project	Unknown, but likely to be none. This species is assumed to occur based on the presence of potential habitat and absence of survey even though the likelihood of a subpopulation being present in the locality is low.	TBDC Recovery plan for the species (Department of Environment Climate Change and Water, 2009)	Survey has not been undertaken to an extent that would allow for the number of individuals (mature and immature) to be impacted by the project to be known.

Impact	Data/information	Data sources	Details of data deficiency, assumptions or reasons for low confidence in information (e.g. TBDC indicates data is unknown or deficient)
Individuals (mature and immature) to be impacted by the project as a percentage of total NSW population (per cent)	Unknown, but likely to be none. This species is assumed to occur based on the presence of potential habitat and absence of survey even though the likelihood of a subpopulation being present in the locality is low.	TBDC Recovery plan for the species (Department of Environment Climate Change and Water, 2009) TBDC Recovery plan for the species (Department of Environment Climate Change and Water, 2009)	Survey has not been undertaken to an extent that would allow for the number of individuals (mature and immature) to be impacted by the project as a percentage of total NSW population (per cent) to be known.
Area of habitat to be impacted (ha) (for species measured by area only)	Assumed presence in unsurveyed areas. Unsurveyed habitat impacts total 12.14 ha	Field survey and mapped species polygon based on areas of potential habitat unable to be surveyed.	Based on field survey and assumptions of potential habitat.
Area of the species' geographic range to be impacted by the project (ha) Area of the species' geographic range to be impacted as a percentage of the total area or extent of occupancy (per cent)	The Australian Virtual Herbarium (CHAH 2008) displays three main areas of collection that give this species a range of occurrence of about 80 000 km². Based on this, total habitat impacts from the project are <0.01% of the species range. The area of occupancy for this species is difficult to estimate, however the area of Mt Mulyah is 49,000 ha. Based on this, total habitat impacts from the project are <0.01 % of the species known range and approximately 0.01 % of the known extent of occupancy.	Recovery plan for the species (Department of Environment Climate Change and Water, 2009) AVH (AVH, 2025)	Based on field survey and assumptions of potential habitat.

Impact	Data/information	Data sources	Details of data deficiency, assumptions or reasons for low confidence in information (e.g. TBDC indicates data is unknown or deficient)
Individuals impacted	No individuals will be directly impacted, some habitat will be impacted	Field survey and mapped species polygon.	Importantly, this species is assumed to occur based on the presence of potential habitat, even though the likelihood of a sub-population being present in the locality is low.
Viability of a fragmented population (see below)	There would be localised fragmentation of habitat due to the linear nature of the project. However, the population is not currently considered to be severely fragmented based on Criterion 2 of the EPBC Act criteria and regulations. There is no evidence to suggest that the population would become unviable.	TBDC Recovery plan for the species (Department of Environment Climate Change and Water, 2009)	Importantly, this species is assumed to occur based on the presence of potential habitat, even though the likelihood of a sub-population being present in the locality is low.
Changes in threats affecting remaining subpopulations and habitat if the proposed impact proceeds	Identified in BDAR section 9.1.		

10.3.4 *Convolvulus tedmoorei (Bindweed)*

Convolvulus tedmoorei (Bindweed) is listed as a SAII entity because an impact to this threatened species may be regarded as serious and irreversible if it is likely to contribute significantly to the risk of a threatened species becoming extinct because:

- it would further reduce the population size of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to have a very small population size (known as SAII Principle 2).

The following SAII principles are not applicable to this threatened species:

- it would cause a further decline of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to be in a rapid rate of decline (known as SAII Principle 1)
- it is an impact on the habitat of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to have a very limited geographic distribution (known as SAII Principle 3)
- the impacted species or ecological community is unlikely to respond to measures to improve its habitat and vegetation integrity and therefore its members are not replaceable (known as SAII Principle 4).

10.3.4.1 Actions to avoid and minimise direct and indirect impacts

Actions to avoid and minimise direct and indirect impacts to this threatened species at risk of an SAII is provided in section 9.3.7. This includes aspects of project location and design.

Current status (excluding impacts of the project)

Table 10.13 Current status – *Convolvulus tedmoorei* (Bindweed)

Criteria	Data/information	Data sources	Details of data deficiency, assumptions, reasons for low confidence in information (e.g. TBDC indicates data is unknown or deficient)
Evidence of rapid decline (Principle 1)			
Change in population size in NSW in the past 10 years or 3 generations (indicate whether as a direct estimate of the population or if indicated by an index or surrogate)	There is a paucity of information regarding population trends for this species. There are few known records from NSW: two areas on the Murrumbidgee and Darling River floodplains in central-western NSW (from Toganmain Station, Darlington Point, and from a locality 8km north-west of Louth); and two other records from east of Broken Hill on the road to Wilcannia, and from the Menindee Road, Scarsdale.	TBDC (NSW DCCEEW, 2025b)	
Evidence of small population size (Principle 2)			
Current population size in NSW	No current population size is known. As this species meets SAII Principle 2 the NSW total population is <50 individuals or <250 individuals where threats are known.	TBDC (NSW DCCEEW, 2025b)	Data deficient. There is no current data published on the species current abundance.
Decline in species' population size in 3 years or one generation	There is a paucity of information regarding population trends for this species.	TBDC (NSW DCCEEW, 2025b)	Data deficient. There is insufficient quantitative data available to determine species decline.

Criteria	Data/information	Data sources	Details of data deficiency, assumptions, reasons for low confidence in information (e.g. TBDC indicates data is unknown or deficient)
Number or percentage of mature individuals in each subpopulation or whether the species is likely to undergo extreme fluctuations	Current number of mature individuals is unknown. Number or percentage of mature individuals in each subpopulation likely to be small but has not been quantified. As this species meets SAII Principle 2 the NSW total population is <50 individuals or <250 individuals where threats are known.	Final determination for the species (Threatened Species Scientific Committee, 2002) TBDC (NSW DCCEEW, 2025b)	Data deficient. There is no current data published on the species current abundance.
Evidence of limited geographic range (Principle 3)			
Extent of occurrence (ha)	No published information on extent of occurrence. Known records from NSW include two areas on the Murrumbidgee and Darling River floodplains in central-western NSW (from Toganmain Station, Darlington Point, and from a locality 8 km north-west of Louth); and two other records from east of Brocken Hill on the road to Wilcannia, and from the Menindee Rd, Scarsdale.	Final determination for the species (Threatened Species Scientific Committee, 2002) TBDC (NSW DCCEEW, 2025b)	There is a general lack of distributional information for this species (NSW DCCEEW, 2025b)
Area of occupancy (ha)	No published information on area of occupancy	Final determination for the species (Threatened Species Scientific Committee, 2002) TBDC (NSW DCCEEW, 2025b)	There is a general lack of distributional information for this species (NSW DCCEEW, 2025b)
Number of threat-defined locations	There are currently no published threat-defined locations for this species. It is not known to occur in any conservation reserves in New South Wales so current location is likely to be threat-defined.	Final determination for the species (Threatened Species Scientific Committee, 2002)	There is a general lack of distributional information for this species (NSW DCCEEW, 2025b)

Criteria	Data/information	Data sources	Details of data deficiency, assumptions, reasons for low confidence in information (e.g. TBDC indicates data is unknown or deficient)
Whether the species' population is likely to undergo extreme fluctuations	Not known to undergo population fluctuations however the species is threatened by environmental and demographic stochasticity due to the small size of known populations.	Final determination for the species (Threatened Species Scientific Committee, 2002)	There is a general lack of ecological and distributional information for this species (NSW DCCEEW, 2025b)
Evidence that the species is unlikely to respond to management (Principle 4)			
Known reproductive characteristics severely limit the ability to increase the existing population on, or occupy new habitat (e.g. species is clonal) on, a biodiversity stewardship site	There are no known inhibiting characteristics for this species		There is a general lack of ecological information for this species (NSW DCCEEW, 2025b)
The species is reliant on abiotic habitats which cannot be restored or replaced (e.g. karst systems) on a biodiversity stewardship site, or	Not known to be reliant on abiotic habitats.	Final determination for the species (Threatened Species Scientific Committee, 2002) TBDC (NSW DCCEEW, 2025b)	There is a general lack of ecological information for this species (NSW DCCEEW, 2025b)
Life history traits and/or ecology is known but the ability to control key threatening processes at a biodiversity stewardship site is currently negligible (e.g. frogs severely impacted by chytrid fungus).	The apparent small size and isolation of known populations renders it vulnerable to local extinction.	Final determination for the species (Threatened Species Scientific Committee, 2002) TBDC (NSW DCCEEW, 2025b)	There is a general lack of ecological information for this species (NSW DCCEEW, 2025b)

10.3.4.2 Impact assessment

Table 10.14 Impact assessment – *Convolvulus tedmoorei* (Bindweed)

Impact	Data/information	Data sources	Details of data deficiency, assumptions or reasons for low confidence in information (e.g. TBDC indicates data is unknown or deficient)
Number of individuals (mature and immature) present in the subpopulation on the project footprint	Unknown, but likely to be none. *Convolvulus tedmoorei* has not been recorded in surveys of the subject land, however presence has been assumed where suitable habitat occurs on land inaccessible for field verification. Unsurveyed habitat impacts total 28.92 ha.	GIS Analysis TBDC	Survey has not been undertaken to an extent that would allow for the number of individuals (mature and immature) present in the subpopulation on the subject land to be known.
Number of individuals (mature and immature) present as a percentage of total NSW population (per cent)	Unknown, but likely to be none. This species is assumed to occur based on the presence of potential habitat and absence of survey even though the likelihood of a subpopulation being present in the locality is low.	Final determination for the species (Threatened Species Scientific Committee, 2002) TBDC (NSW DCCEEW, 2025b)	Survey has not been undertaken to an extent that would allow for the number of individuals (mature and immature) present as a percentage of total NSW population (per cent) to be known
Number of individuals (mature and immature) to be impacted by the project	Unknown, but likely to be none. This species is assumed to occur based on the presence of potential habitat and absence of survey even though the likelihood of a subpopulation being present in the locality is low.	Final determination for the species (Threatened Species Scientific Committee, 2002) TBDC (NSW DCCEEW, 2025b)	Survey has not been undertaken to an extent that would allow for the number of individuals (mature and immature) to be impacted by the project to be known.
Individuals (mature and immature) to be impacted by the project as a percentage of total NSW population (per cent)	Unknown, but likely to be none. This species is assumed to occur based on the presence of potential habitat and absence of survey even though the likelihood of a subpopulation being present in the locality is low.	Final determination for the species (Threatened Species Scientific Committee, 2002) TBDC (NSW DCCEEW, 2025b)	Survey has not been undertaken to an extent that would allow for the number of individuals (mature and immature) to be impacted by the project as a percentage of total NSW population (per cent) to be known.

Impact	Data/information	Data sources	Details of data deficiency, assumptions or reasons for low confidence in information (e.g. TBDC indicates data is unknown or deficient)
Area of habitat to be impacted (ha) (for species measured by area only)	Assumed presence in unsurveyed areas. Unsurveyed habitat impacts total 28.92 ha.	Field survey and mapped species polygon based on areas of potential habitat unable to be surveyed.	Calculation based on vegetation within subject land in unsurveyed areas.
Area of the species' geographic range to be impacted by the project (ha)	Species is data deficient, so current geographic range and extent of occupancy is unknown.	Final determination for the species (Threatened Species Scientific Committee, 2002) TBDC (NSW DCCEEW, 2025b)	Based on field survey and assumptions of potential habitat. There is a general lack of distributional information for this species (NSW DCCEEW, 2025b)
Area of the species' geographic range to be impacted as a percentage of the total area or extent of occupancy (per cent)			
Individuals impacted	No individuals will be directly impacted, some habitat will be impacted	Field survey and mapped species polygon.	Importantly, this species is assumed to occur based on the presence of potential habitat even though the likelihood of a subpopulation being present in the locality is low.
Viability of a fragmented population (see below)	There would be localised fragmentation of habitat due to the linear nature of the project. However, the population is not currently considered to be severely fragmented based on Criterion 2 of the EPBC Act criteria and regulations. There is no evidence to suggest that the population would become unviable.	Final determination for the species (Threatened Species Scientific Committee, 2002) TBDC (NSW DCCEEW, 2025b)	Importantly, this species is assumed to occur based on the presence of potential habitat even though the likelihood of a subpopulation being present in the locality is low.
Changes in threats affecting remaining subpopulations and habitat if the proposed impact proceeds		Identified in BDAR section 9.1.	

10.3.5 *Grevillea wilkinsonii (Tumut grevillea)*

Grevillea wilkinsonii (Tumut grevillea) is listed as a SAII entity because an impact to this threatened species may be regarded as serious and irreversible if it is likely to contribute significantly to the risk of a threatened species becoming extinct because:

- it is an impact on the habitat of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to have a very limited geographic distribution (known as SAII Principle 3).

The following SAII principles are not applicable to this threatened species:

- it would cause a further decline of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to be in a rapid rate of decline (known as SAII Principle 1)
- it would further reduce the population size of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to have a very small population size (known as SAII Principle 2)
- the impacted species or ecological community is unlikely to respond to measures to improve its habitat and vegetation integrity and therefore its members are not replaceable (known as SAII Principle 4).

10.3.5.1 Actions to avoid and minimise direct and indirect impacts

Actions to avoid and minimise direct and indirect impacts to this threatened species at risk of an SAII is provided in section 9.3.7. This includes aspects of project location and design.

Current status (excluding impacts of the project)

Table 10.15 Current status – *Grevillea wilkinsonii* (Tumut grevillea)

Criteria	Data/information	Data sources	Details of data deficiency, assumptions, reasons for low confidence in information (e.g. TBDC indicates data is unknown or deficient)
Evidence of rapid decline (Principle 1)			
Change in population size in NSW in the past 10 years or 3 generations (indicate whether as a direct estimate of the population or if indicated by an index or surrogate)	Surveys targeting *Grevillea wilkinsonii* in the Goobarragandra River population were initiated in 1998, identifying 644 plants (298 mature). Repeat surveys recorded a decline in this population, with the 2017 survey only identifying 192 plants (97 mature). This represents a 70 % decrease in the total number of plants in the naturally occurring patches, and a 67 % decline in mature individuals over 19 years.	Final determination for the species (Threatened Species Scientific Committee, 2020b)	*Grevillea wilkinsonii* is not listed as a SAII entity due to Principle 1. As such, it is assumed that there is no evidence of recent rapid decline.
Evidence of small population size (Principle 2)			
Current population size in NSW	There are currently 2 known populations in NSW, Goobarragandra River (main population near Tumut) and Gundagai (8 mature individuals). These populations include natural sites and translocated sites. It's estimated that there is 105 naturally occurring mature individuals, with the total population in NSW estimated at 547 mature individuals when including translocated individuals.	Final determination for the species (Threatened Species Scientific Committee, 2020b)	There is no current data available on the species current abundance.

Criteria	Data/information	Data sources	Details of data deficiency, assumptions, reasons for low confidence in information (e.g. TBDC indicates data is unknown or deficient)
Decline in species' population size in 3 years or one generation	2017 survey of the Goobarragendra River identified a 70 % decrease in the total number of plants in the naturally occurring patches, and a 67 % decline in mature individuals over 19 years.	Final determination for the species (Threatened Species Scientific Committee, 2020b)	There is insufficient quantitative data available to determine the species decline since 2017.
Number or percentage of mature individuals in each subpopulation or whether the species is likely to undergo extreme fluctuations	The total number of mature individuals is 105, with 98 within the Goobarragendra River population and 8 within the Gundagai population.	Final determination for the species (Threatened Species Scientific Committee, 2020b)	There is no current data on the species current abundance. There is insufficient data available to determine whether the species undergoes extreme fluctuations.
Evidence of limited geographic range (Principle 3)			
Extent of occurrence (ha)	40 km2	Final determination for the species (Threatened Species Scientific Committee, 2020b)	No current data available on the species extent of occurrence.
Area of occupancy (ha)	16 km2	Final determination for the species (Threatened Species Scientific Committee, 2020b)	No current data available on the species area of occupancy.

Criteria	Data/information	Data sources	Details of data deficiency, assumptions, reasons for low confidence in information (e.g. TBDC indicates data is unknown or deficient)
Number of threat-defined locations	There are currently no known published threat-defined locations for this species. However, most of the known individuals are located in the Goobarragendra River population. 80 % of its population is located on private freehold land, with the remainder occurring on two Crown Land sites, and one site just within the boundary of Kosciuszko National Park. The main threats currently affecting *Grevillea wilkinsonii* include: — grazing — weed invasion — flooding — climate change — herbicide use and localised disturbances.	Final determination for the species (Threatened Species Scientific Committee, 2020b)	N/A
Whether the species' population is likely to undergo extreme fluctuations	Varied intensities of decline and germination have been observed due to flood events affecting the population. In the Goobarragendra population, most plants grow in close proximity to the river, often within the flood zone and almost always within the surviving belt of native riparian vegetation.	Final determination for the species (Threatened Species Scientific Committee, 2020b)	There is no current data on the species current abundance. There is insufficient data available to determine whether the species undergoes extreme fluctuations.

Criteria	Data/information	Data sources	Details of data deficiency, assumptions, reasons for low confidence in information (e.g. TBDC indicates data is unknown or deficient)
Evidence that the species is unlikely to respond to management (Principle 4)			
Known reproductive characteristics severely limit the ability to increase the existing population on, or occupy new habitat (e.g. species is clonal) on, a biodiversity stewardship site	There are no known inhibiting characteristics for this species	Final determination for the species (Threatened Species Scientific Committee, 2020b) Conservation advice for the species (Committee, 2021)	Insufficient data available on the ecology of the species. Further research is required.
The species is reliant on abiotic habitats which cannot be restored or replaced (e.g. karst systems) on a biodiversity stewardship site, or	Not known to be specifically reliant on abiotic habitats, however all known populations occur on rocky riverbanks and terraces.	Conservation advice for the species (Committee, 2021)	Insufficient data available on the ecology of the species. Further research is required.
Life history traits and/or ecology is known but the ability to control key threatening processes at a biodiversity stewardship site is currently negligible (e.g. frogs severely impacted by chytrid fungus).	Due to the preferred habitat of the species (riverbanks and slopes), populations may be more susceptible to intense flooding events and similar climate-related stochastic processes.	Final determination for the species (Threatened Species Scientific Committee, 2020b) Conservation advice for the species (Committee, 2021)	Insufficient data available on the ecology of the species. Further research is required.

10.3.5.2 Impact assessment

Table 10.16 Impact assessment – *Grevillea wilkinsonii* (Tumut grevillea)

Impact	Data/information	Data sources	Details of data deficiency, assumptions or reasons for low confidence in information (e.g. TBDC indicates data is unknown or deficient)
Number of individuals (mature and immature) present in the subpopulation on the project footprint	*Grevillea wilkinsonii* has not been recorded in surveys of the subject land, however presence has been assumed where suitable habitat occurs on land inaccessible for field verification. Unsurveyed habitat impacts total 0.10 ha	GIS analysis TBDC	Survey has not been undertaken to an extent that would allow for the number of individuals (mature and immature) present in the subpopulation on the subject land to be known. Calculation based on vegetation within subject land in unsurveyed areas.
Number of individuals (mature and immature) present as a percentage of total NSW population (per cent)	Unknown, but likely to be none. This species is assumed to occur based on the presence of potential habitat and absence of survey even though the likelihood of a subpopulation being present in the locality is low.	TBDC Final determination for the species (Threatened Species Scientific Committee, 2020b)	Survey has not been undertaken to an extent that would allow for the number of individuals (mature and immature) present as a percentage of total NSW population (per cent) to be known.
Number of individuals (mature and immature) to be impacted by the project	Unknown, but likely to be none. This species is assumed to occur based on the presence of potential habitat and absence of survey even though the likelihood of a subpopulation being present in the locality is low.	TBDC Final determination for the species (Threatened Species Scientific Committee, 2020b)	Survey has not been undertaken to an extent that would allow for the number of individuals (mature and immature) to be impacted by the project to be known.

Impact	Data/information	Data sources	Details of data deficiency, assumptions or reasons for low confidence in information (e.g. TBDC indicates data is unknown or deficient)
Individuals (mature and immature) to be impacted by the project as a percentage of total NSW population (per cent)	Unknown, but likely to be none. This species is assumed to occur based on the presence of potential habitat and absence of survey even though the likelihood of a subpopulation being present in the locality is low.	TBDC Final determination for the species (Threatened Species Scientific Committee, 2020b)	Survey has not been undertaken to an extent that would allow for the number of individuals (mature and immature) to be impacted by the project as a percentage of total NSW population (per cent) to be known.
Area of habitat to be impacted (ha) (for species measured by area only)	Assumed presence in unsurveyed areas, Unsurveyed habitat impacts total 0.10 ha	Field survey and mapped species polygon based on areas of potential habitat unable to be surveyed.	Calculation based on vegetation within subject land in unsurveyed areas.
Area of the species' geographic range to be impacted by the project (ha)	Estimated extent of occurrence is 40 km2 and area of occupancy is 16 km2. Impact to 0.10 ha of assumed habitat therefore represents <0.01 % of the species known range and <0.01 % of the species area of occupancy	TBDC Final determination for the species (Threatened Species Scientific Committee, 2020b)	Based on field survey and assumptions of potential habitat.
Area of the species' geographic range to be impacted as a percentage of the total area or extent of occupancy (per cent)			
Individuals impacted	No individuals will be directly impacted, some habitat will be impacted	Field survey and mapped species polygon.	Importantly, this species is assumed to occur based on the presence of potential habitat even though the likelihood of a subpopulation being present in the locality is low.

Impact	Data/information	Data sources	Details of data deficiency, assumptions or reasons for low confidence in information (e.g. TBDC indicates data is unknown or deficient)
Viability of a fragmented population (see below)	There would be localised fragmentation of habitat due to the linear nature of the project. However, the population is not currently considered to be severely fragmented based on Criterion 2 of the EPBC Act criteria and regulations. There is no evidence to suggest that the population would become unviable.	TBDC Final determination for the species (Threatened Species Scientific Committee, 2020b)	Importantly, this species is assumed to occur based on the presence of potential habitat even though the likelihood of a subpopulation being present in the locality is low.
Changes in threats affecting remaining subpopulations and habitat if the proposed impact proceeds		Identified in section 9.1	

10.3.6 *Prasophyllum sp. Moama*

Prasophyllum sp. Moama is listed as a SAII entity because an impact to this threatened species may be regarded as serious and irreversible if it is likely to contribute significantly to the risk of a threatened species becoming extinct because:

- it is an impact on the habitat of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to have a very limited geographic distribution (known as SAII Principle 3).

The following SAII principles are not applicable to this threatened species:

- it would cause a further decline of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to be in a rapid rate of decline (known as SAII Principle 1)
- it would further reduce the population size of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to have a very small population size (known as SAII Principle 2)
- the impacted species or ecological community is unlikely to respond to measures to improve its habitat and vegetation integrity and therefore its members are not replaceable (known as SAII Principle 4).

10.3.6.1 Actions to avoid and minimise direct and indirect impacts

Actions to avoid and minimise direct and indirect impacts to this threatened species at risk of an SAII is provided in section 9.4. This includes aspects of project location and design.

Current status (excluding impacts of the project)

Table 10.17 Current status – Prasophyllum sp. Moama

Criteria	Data/information	Data sources	Details of data deficiency, assumptions, reasons for low confidence in information (e.g. TBDC indicates data is unknown or deficient)
Evidence of rapid decline (Principle 1)			
Change in population size in NSW in the past 10 years or 3 generations (indicate whether as a direct estimate of the population or if indicated by an index or surrogate)	Population numbers can be difficult as Prasophyllum species die back annually to a tuber and may exhibit great variation in vegetative sprouting and especially in flowering from year to year though current estimates are several hundred to 1000. There is insufficient data on population decline, listing status is based on the species' extremely restricted distribution small population.	Final determination for the species (Threatened Species Scientific Committee, 2008a)	There is currently insufficient understanding of taxonomy for this species (TBDC (NSW DCCEEW, 2025b))
Evidence of small population size (Principle 2)			
Current population size in NSW	The population near Moama has been variously estimated as comprising several hundred to 1,000 plants (K. McDougall in litt. 2006, based on 2005 observations), or "closer to 10,000" plants (D. Jones pers. comm. 2007, based on 2006 observations). Estimation of numbers can be difficult, as outlined above.	Final determination for the species (Threatened Species Scientific Committee, 2008a)	There is currently insufficient understanding of taxonomy for this species (TBDC (NSW DCCEEW, 2025b))
Decline in species' population size in 3 years or one generation	Population numbers for this species are difficult to estimate and as such there has been no observable trend in population decline to this point.	Final determination for the species (Threatened Species Scientific Committee, 2008a)	There is currently insufficient understanding of taxonomy for this species (TBDC (NSW DCCEEW, 2025b))

Criteria	Data/information	Data sources	Details of data deficiency, assumptions, reasons for low confidence in information (e.g. TBDC indicates data is unknown or deficient)
Number or percentage of mature individuals in each subpopulation or whether the species is likely to undergo extreme fluctuations	The species is known from only one locality in NSW, near Moama where the population has been variously estimated as comprising several hundred to 1,000 plants to 10,000 plants.	Final determination for the species (Threatened Species Scientific Committee, 2008a)	There is currently insufficient understanding of taxonomy for this species (TBDC (NSW DCCEEW, 2025b))
Evidence of limited geographic range (Principle 3)			
Extent of occurrence (ha)	Extent of occurrence is not published; however, the species is only known from one locality in NSW where it extends over an area of about 20 hectares of fairly uniform but uncommon habitat. The species also occurs in Victoria in small – moderate populations within 50 km of Echuca.	Final determination for the species (Threatened Species Scientific Committee, 2008a)	There is currently insufficient understanding of taxonomy for this species (TBDC (NSW DCCEEW, 2025b))
Area of occupancy (ha)	The population near Moana extends over an area of about 20 ha of fairly uniform but uncommon habitat.	Final determination for the species (Threatened Species Scientific Committee, 2008a)	There is currently insufficient understanding of taxonomy for this species (TBDC (NSW DCCEEW, 2025b))
Number of threat-defined locations	There are currently no published threat-defined locations for this species. It is not known to occur in any conservation reserves in New South Wales so current location is likely to be threat-defined.	(Threatened Species Scientific Committee, 2008a)	There is currently insufficient understanding of taxonomy for this species (TBDC (NSW DCCEEW, 2025b))

Criteria	Data/information	Data sources	Details of data deficiency, assumptions, reasons for low confidence in information (e.g. TBDC indicates data is unknown or deficient)
Whether the species' population is likely to undergo extreme fluctuations	The species is thought to undergo natural fluctuations in numbers in response to rains in the previous winter and/or fires in the previous summer. The Moama site is currently managed, under short-term funding, as a high conservation value area on a Travelling Stock Reserve (TSR) but remains subject to discretionary grazing. Given the highly restricted distribution and population of the species within NSW the species is highly vulnerable to future fluctuations.	Final determination for the species (Threatened Species Scientific Committee, 2008a)	There is currently insufficient understanding of taxonomy for this species (TBDC (NSW DCCEEW, 2025b))
Evidence that the species is unlikely to respond to management (Principle 4)			
Known reproductive characteristics severely limit the ability to increase the existing population on, or occupy new habitat (e.g. species is clonal) on, a biodiversity stewardship site	No known inhibiting characteristics reported for this species.	Final determination for the species (Threatened Species Scientific Committee, 2008a) TBDC (NSW DCCEEW, 2025b)	There is currently insufficient understanding of taxonomy for this species (TBDC (NSW DCCEEW, 2025b))
The species is reliant on abiotic habitats which cannot be restored or replaced (e.g. karst systems) on a biodiversity stewardship site, or	There are no known abiotic habitats on which the species is reliant. Like most Australian terrestrial orchids, the species is believed to be semi- or fully obligately dependent on a mycorrhizal symbiont.	Final determination for the species (Threatened Species Scientific Committee, 2008a) TBDC (NSW DCCEEW, 2025b)	There is currently insufficient understanding of taxonomy for this species (TBDC (NSW DCCEEW, 2025b))
Life history traits and/or ecology is known but the ability to control key threatening processes at a biodiversity stewardship site is currently negligible (e.g. frogs severely impacted by chytrid fungus).	Key threatening processes for this species are typically controllable. However, the species is susceptible to extinction via stochastic processes due to its small known population size and restricted distribution.	TBDC (NSW DCCEEW, 2025b)	There is currently insufficient understanding of taxonomy for this species (TBDC (NSW DCCEEW, 2025b))

10.3.6.2 Impact assessment

Table 10.18 Impact assessment – *Prasophyllum* sp. Moama

Impact	Data/information	Data sources	Details of data deficiency, assumptions or reasons for low confidence in information (e.g. TBDC indicates data is unknown or deficient)
Number of individuals (mature and immature) present in the subpopulation on the project footprint	Unknown, but likely to be none. *Prasophyllum* sp. Moama has not been recorded in surveys of the subject land, however presence has been assumed where suitable habitat occurs on land inaccessible for field verification. Unsurveyed habitat impacts total 9.88 ha.	GIS analysis TBDC	Survey has not been undertaken to an extent that would allow for the number of individuals (mature and immature) present in the subpopulation on the subject land to be known. Calculation based on vegetation within subject land in unsurveyed areas.
Number of individuals (mature and immature) present as a percentage of total NSW population (per cent)	Unknown, but likely to be none. This species is assumed to occur based on the presence of potential habitat and absence of survey even though the likelihood of a subpopulation being present in the locality is low.	TBDC Final determination for the species (Threatened Species Scientific Committee, 2008a)	Survey has not been undertaken to an extent that would allow for the number of individuals (mature and immature) present as a percentage of total NSW population (per cent) to be known.
Number of individuals (mature and immature) to be impacted by the project.	Unknown, but likely to be none. This species is assumed to occur based on the presence of potential habitat and absence of survey even though the likelihood of a subpopulation being present in the locality is low.	TBDC Final determination for the species (Threatened Species Scientific Committee, 2008a)	Survey has not been undertaken to an extent that would allow for the number of individuals (mature and immature) to be impacted by the project l to be known.
Individuals (mature and immature) to be impacted by the project as a percentage of total NSW population (per cent)	Unknown, but likely to be none. This species is assumed to occur based on the presence of potential habitat and absence of survey even though the likelihood of a subpopulation being present in the locality is low.	TBDC Final determination for the species (Threatened Species Scientific Committee, 2008a)	Survey has not been undertaken to an extent that would allow for the number of individuals (mature and immature) to be impacted by the project as a percentage of total NSW population (per cent) to be known.

Impact	Data/information	Data sources	Details of data deficiency, assumptions or reasons for low confidence in information (e.g. TBDC indicates data is unknown or deficient)
Area of habitat to be impacted (ha) (for species measured by area only)	Assumed presence in unsurveyed areas. Unsurveyed habitat impacts total 9.88 ha.	Field survey and mapped species polygon based on areas of potential habitat unable to be surveyed.	Calculation based on vegetation within subject land in unsurveyed areas.
Area of the species' geographic range to be impacted by the project (ha)	Species is data deficient, so current geographic range is unknown. The species is known from only one locality in NSW, near Moama. The population near Moama extends over an area of about 20 ha of fairly uniform but uncommon habitat. Impact to 9.88 ha. of assumed habitat therefore represents around 50 % of the species known area of occupancy.	TBDC Final determination for the species (Threatened Species Scientific Committee, 2008a)	Based on field survey and assumptions of potential habitat. There is currently insufficient understanding of taxonomy for this species (TBDC (NSW DCCEEW, 2025b))
Area of the species' geographic range to be impacted as a percentage of the total area or extent of occupancy (per cent)			
Individuals impacted	No individuals will be directly impacted, some habitat will be impacted	Field survey and mapped species polygon.	Importantly, this species is assumed to occur based on the presence of potential habitat even though the likelihood of a subpopulation being present in the locality is low.
Viability of a fragmented population (see below)	There would be localised fragmentation of habitat due to the linear nature of the project. However, the population is not currently considered to be severely fragmented based on Criterion 2 of the EPBC Act criteria and regulations. There is no evidence to suggest that the population would become unviable.	TBDC Final determination for the species (Threatened Species Scientific Committee, 2008a)	Importantly, this species is assumed to occur based on the presence of potential habitat even though the likelihood of a subpopulation being present in the locality is low.
Changes in threats affecting remaining subpopulations and habitat if the proposed impact proceeds		Identified in BDAR section 9.1.	

10.3.7 *Pterostylis despectans*

Pterostylis despectans is listed as a SAII entity because an impact to this threatened species may be regarded as serious and irreversible if it is likely to contribute significantly to the risk of a threatened species becoming extinct because:

- it would further reduce the population size of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to have a very small population size (known as SAII Principle 2)
- it is an impact on the habitat of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to have a very limited geographic distribution (known as SAII Principle 3).

The following SAII principles are not applicable to this threatened species:

- it would cause a further decline of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to be in a rapid rate of decline (known as SAII Principle 1)
- the impacted species or ecological community is unlikely to respond to measures to improve its habitat and vegetation integrity and therefore its members are not replaceable (known as SAII Principle 4).

10.3.7.1 Actions to avoid and minimise direct and indirect impacts

Actions to avoid and minimise direct and indirect impacts to this threatened species at risk of an SAII is provided in section 9.3.7. This includes aspects of project location and design.

Current status (excluding impacts of the project)

Table 10.19 Current status – *Pterostylis despectans*

Criteria	Data/information	Data sources	Details of data deficiency, assumptions, reasons for low confidence in information (e.g. TBDC indicates data is unknown or deficient)
Evidence of rapid decline (Principle 1)			
Change in population size in NSW in the past 10 years or 3 generations (indicate whether as a direct estimate of the population or if indicated by an index or surrogate)	Little data is available on population trends for this species. In NSW the species is known only from a single population discovered in 2005 near Moama, in the Riverina Bioregion. The species is thought to be extremely rare in NSW and is currently susceptible to a number of threatening processes.	Final determination for the species (Threatened Species Scientific Committee, 2008b) Conservation advice for the species (Threatened Species Scientific Committee, 2016)	*Pterostylis despectans* is not listed as a SAII entity due to Principle 1. As such, it is assumed that there is no evidence of recent rapid decline.
Evidence of small population size (Principle 2)			
Current population size in NSW	The current population is NSW has been assessed as comprising between 20 and 60 individual plants.	TBDC (NSW DCCEEW, 2025b)	There is no current data available on the species current abundance.
Decline in species' population size in 3 years or one generation	Little data is available on population trends for this species. In NSW the species is known only from a single population discovered in 2005 near Moama, in the Riverina Bioregion. The species is thought to be extremely rare in NSW and is currently susceptible to a number of threatening processes.	Final determination for the species (Threatened Species Scientific Committee, 2008b) Conservation advice for the species (Threatened Species Scientific Committee, 2016)	There is insufficient quantitative data available to determine the species decline since 2016.

Criteria	Data/information	Data sources	Details of data deficiency, assumptions, reasons for low confidence in information (e.g. TBDC indicates data is unknown or deficient)
Number or percentage of mature individuals in each subpopulation or whether the species is likely to undergo extreme fluctuations	The species is only known from a single population in NSW near Moama. Current population size is estimated between 20 and 60 individual plants.	TBDC (NSW DCCEEW, 2025b)	There is no current data on the species current abundance. There is insufficient data available to determine whether the species undergoes extreme fluctuations.
Evidence of limited geographic range (Principle 3)			
Extent of occurrence (ha)	Extent of occurrence in NSW not documented. The only known population is restricted to a small area within the Yellow Water Hole to Barnes Crossing Travelling Stock Reserve. All plants known to date occur within an area of about one hectare, within an apparently suitable habitat patch-size of about 20 ha.	Conservation advice for the species (Threatened Species Scientific Committee, 2016) TBDC (NSW DCCEEW, 2025b)	No current data available on the species extent of occurrence.
Area of occupancy (ha)	Estimated to be 2500 m² in 2014	Conservation advice for the species (Threatened Species Scientific Committee, 2016)	No current data available on the species area of occupancy.
Number of threat-defined locations	There are currently no published threat-defined locations for this species. It is not known to occur in any conservation reserves in New South Wales so current location is likely to be threat-defined.	Final determination for the species (Threatened Species Scientific Committee, 2008b) Conservation advice for the species (Threatened Species Scientific Committee, 2016) TBDC (NSW DCCEEW, 2025b)	N/A

Criteria	Data/information	Data sources	Details of data deficiency, assumptions, reasons for low confidence in information (e.g. TBDC indicates data is unknown or deficient)
Whether the species' population is likely to undergo extreme fluctuations	The current population in NSW is subject to a number of threatening processes. The species is susceptible to extinction via stochastic processes due to its small known population size and restricted distribution.	Conservation advice for the species (Threatened Species Scientific Committee, 2016) TBDC (NSW DCCEEW, 2025b)	There is no current data on the species current abundance. There is insufficient data available to determine whether the species undergoes extreme fluctuations.
Evidence that the species is unlikely to respond to management (Principle 4)			
Known reproductive characteristics severely limit the ability to increase the existing population on, or occupy new habitat (e.g. species is clonal) on, a biodiversity stewardship site	No known inhibiting characteristics reported for this species.	Final determination for the species (Threatened Species Scientific Committee, 2008b) Conservation advice for the species (Threatened Species Scientific Committee, 2016) TBDC (NSW DCCEEW, 2025b)	Insufficient data available on the ecology of the species. Further research is required.
The species is reliant on abiotic habitats which cannot be restored or replaced (e.g. karst systems) on a biodiversity stewardship site, or	There are no known abiotic habitats on which the species is reliant. Like most Australian terrestrial orchids, the species is believed to be semi- or fully obligately dependent on a mycorrhizal symbiont.	Final determination for the species (Threatened Species Scientific Committee, 2008b)	Insufficient data available on the ecology of the species. Further research is required.
Life history traits and/or ecology is known but the ability to control key threatening processes at a biodiversity stewardship site is currently negligible (e.g. frogs severely impacted by chytrid fungus).	Key threatening processes for this species are typically controllable. However, the species is susceptible to extinction via stochastic processes due to its small known population size and restricted distribution.	Conservation advice for the species (Threatened Species Scientific Committee, 2016) TBDC (NSW DCCEEW, 2025b)	Insufficient data available on the ecology of the species. Further research is required.

10.3.7.2 Impact assessment

Table 10.20 Impact assessment – *Pterostylis despectans*

Impact	Data/information	Data sources	Details of data deficiency, assumptions or reasons for low confidence in information (e.g. TBDC indicates data is unknown or deficient)
Number of individuals (mature and immature) present in the subpopulation on the project footprint	Unknown, but likely to be none. *Pterostylis despectans* has not been recorded in surveys of the subject land, however presence has been assumed where suitable habitat occurs on land inaccessible for field verification. Unsurveyed habitat impacts total 9.88 ha	GIS analysis TBDC	Survey has not been undertaken to an extent that would allow for the number of individuals (mature and immature) present in the subpopulation on the subject land to be known. Calculation based on vegetation within subject land in unsurveyed areas.
Number of individuals (mature and immature) present as a percentage of total NSW population (per cent)	Unknown, but likely to be none. This species is assumed to occur based on the presence of potential habitat and absence of survey even though the likelihood of a subpopulation being present in the locality is low.	TBDC Conservation advice for the species (Threatened Species Scientific Committee, 2016)	Survey has not been undertaken to an extent that would allow for the number of individuals (mature and immature) present as a percentage of total NSW population (per cent) to be known.
Number of individuals (mature and immature) to be impacted by the project	Unknown, but likely to be none. This species is assumed to occur based on the presence of potential habitat and absence of survey even though the likelihood of a subpopulation being present in the locality is low.	TBDC Conservation advice for the species (Threatened Species Scientific Committee, 2016)	Survey has not been undertaken to an extent that would allow for the number of individuals (mature and immature) to be impacted by the project to be known.
Individuals (mature and immature) to be impacted by the project as a percentage of total NSW population (per cent)	Unknown, but likely to be none. This species is assumed to occur based on the presence of potential habitat and absence of survey even though the likelihood of a subpopulation being present in the locality is low.	TBDC Conservation advice for the species (Threatened Species Scientific Committee, 2016)	Survey has not been undertaken to an extent that would allow for the number of individuals (mature and immature) to be impacted by the project as a percentage of total NSW population (per cent) to be known.

Impact	Data/information	Data sources	Details of data deficiency, assumptions or reasons for low confidence in information (e.g. TBDC indicates data is unknown or deficient)
Area of habitat to be impacted (ha) (for species measured by area only)	Assumed presence in unsurveyed areas, Unsurveyed habitat impacts total 9.88 ha.	Field survey and mapped species polygon based on areas of potential habitat unable to be surveyed.	Calculation based on vegetation within subject land in unsurveyed areas.
Area of the species' geographic range to be impacted by the project (ha) Area of the species' geographic range to be impacted as a percentage of the total area or extent of occupancy (per cent)	Species is data deficient, so current geographic range is unknown. The species is known from only one locality in NSW, near Moama. The area of occupancy was estimated to be 2500 m² in 2014 (0.25 ha). Impact to 9.88 ha. of assumed habitat therefore exceeds the species known area of occupancy.	TBDC Conservation advice for the species (Threatened Species Scientific Committee, 2016)	Based on field survey and assumptions of potential habitat.
Individuals impacted	No individuals will be directly impacted, some habitat will be impacted	Field survey and mapped species polygon.	Importantly, this species is assumed to occur based on the presence of potential habitat even though the likelihood of a subpopulation being present in the locality is low.
Viability of a fragmented population (see below)	There would be localised fragmentation of habitat due to the linear nature of the project. However, the population is not currently considered to be severely fragmented based on Criterion 2 of the EPBC Act criteria and regulations. There is no evidence to suggest that the population would become unviable.	TBDC Conservation advice for the species (Threatened Species Scientific Committee, 2016)	Importantly, this species is assumed to occur based on the presence of potential habitat even though the likelihood of a subpopulation being present in the locality is low.
Changes in threats affecting remaining subpopulations and habitat if the proposed impact proceeds		Identified in BDAR section 9.1.	

10.4 Additional impact assessment provisions for threatened fauna species at risk of a SAII

Figure 15.13 shows the extent of threatened fauna species at risk of Serious and Irreversible Impacts within the subject land.

10.4.1 Pedionomous torquatus (Plains-wanderer)

Pedionomous torquatus (Plains-wanderer) is listed as a SAII entity because an impact to this threatened species may be regarded as serious and irreversible if it is likely to contribute significantly to the risk of a threatened species becoming extinct because:

- it would cause a further decline of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to be in a rapid rate of decline (known as SAII Principle 1).

The following SAII principles are not applicable to this threatened species:

- it would further reduce the population size of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to have a very small population size (known as SAII Principle 2).
- it is an impact on the habitat of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to have a very limited geographic distribution (known as SAII Principle 3)
- the impacted species or ecological community is unlikely to respond to measures to improve its habitat and vegetation integrity and therefore its members are not replaceable (known as SAII Principle 4).

10.4.1.1 Actions to avoid and minimise direct and indirect impacts

Actions to avoid and minimise direct and indirect impacts to this threatened species at risk of an SAII is provided in section 9.3.7. This includes aspects of project location and design.

Current status

Table 10.21 Current status – *Pedionomous torquatus* (Plains-wanderer)

Criteria	Data/information	Data sources	Details of data deficiency, assumptions, reasons for low confidence in information (e.g. TBDC indicates data is unknown or deficient)
Evidence of rapid decline (Principle 1)			
Change in population size in NSW in the past 10 years or 3 generations (indicate whether as a direct estimate of the population or if indicated by an index or surrogate)	Plains-wanderer has undergone a very severe reduction in numbers in under three-generation lengths (generation length = 7.3 years, decline documented in this assessment occurred over a ≤14-year period), equivalent to at least 93 % and the reduction has not ceased, the cause has not ceased and is not understood. This decline is prevalent for both strongholds in NSW and Victoria.	Conservation advice for the species (Department of the Environment, 2015)	Causes of decline in the species' populations are not well understood (Department of the Environment, 2015)
Evidence of small population size (Principle 2)			
Current population size in NSW	Total population size estimates vary and are thought to have undergone extreme fluctuations. Estimates range from 200 mature birds in NSW, though may be more due to lack of surveys in arid regions. Total population estimates (NSW and Victoria) are thought to be <2,500 mature individuals.	Conservation advice for the species (Department of the Environment, 2015)	Population numbers difficult to estimate - extreme fluctuations in the number of mature individuals in the species' in NSW have been reported (Department of the Environment, 2015)

Criteria	Data/information	Data sources	Details of data deficiency, assumptions, reasons for low confidence in information (e.g. TBDC indicates data is unknown or deficient)
Decline in species' population size in 3 years or one generation	There have also been extreme fluctuations in the number of mature individuals in the species' stronghold of the NSW Riverina, resulting in a net decline in the number of birds in less than three generations.	Conservation advice for the species (Department of the Environment, 2015)	Population numbers difficult to estimate - extreme fluctuations in the number of mature individuals in the species' in NSW have been reported (Department of the Environment, 2015)
Number or percentage of mature individuals in each subpopulation or whether the species is likely to undergo extreme fluctuations	The number of mature individuals in each subpopulation is ≤ 250 and there have been extreme fluctuations in the number of mature individuals in the species' NSW stronghold.	Conservation advice for the species (Department of the Environment, 2015)	Population numbers difficult to estimate - extreme fluctuations in the number of mature individuals in the species' in NSW have been reported (Department of the Environment, 2015)
Evidence of limited geographic range (Principle 3)			
Extent of occurrence (ha)	Species extent of occurrence is estimated at 930 000 km2	Conservation advice for the species (Department of the Environment, 2015)	Current sources include data up to 2015, more recent data lacking.
Area of occupancy (ha)	Species area of occupancy is estimated at 330 km2	Conservation advice for the species (Department of the Environment, 2015)	Current sources include data up to 2015, more recent data lacking.
Number of threat-defined locations	There are currently no published threat-defined locations for this species. However, habitat for the species appears to occur predominantly on private properties and not within conservation reserves.	Conservation advice for the species (Department of the Environment, 2015) TBDC (NSW DCCEEW, 2025b)	Current sources include data up to 2015, more recent data lacking.

Criteria	Data/information	Data sources	Details of data deficiency, assumptions, reasons for low confidence in information (e.g. TBDC indicates data is unknown or deficient)
Whether the species' population is likely to undergo extreme fluctuations	There have been extreme fluctuations in the number of mature individuals in the species' stronghold of the NSW Riverina, resulting in a net decline in the number of birds in less than three generations. There is an inferred continuing decline in the species' area of occupancy. The size of the plains-wanderer population is likely to vary with seasonal conditions.	Conservation advice for the species (Department of the Environment, 2015) Recovery plan for the species (Department of the Environment and the Government of South Australia Department of Environment Water and Natural Resources, 2016)	Current sources include data up to 2015, more recent data lacking.
Evidence that the species is unlikely to respond to management (Principle 4)			
Known reproductive characteristics severely limit the ability to increase the existing population on, or occupy new habitat (e.g. species is clonal) on, a biodiversity stewardship site	No known inhibiting characteristics reported for this species.	Conservation advice for the species (Department of the Environment, 2015) TBDC (NSW DCCEEW, 2025b) Recovery plan for the species (Department of the Environment and the Government of South Australia Department of Environment Water and Natural Resources, 2016)	Causes of decline in the species' populations are not well understood.

Criteria	Data/information	Data sources	Details of data deficiency, assumptions, reasons for low confidence in information (e.g. TBDC indicates data is unknown or deficient)
The species is reliant on abiotic habitats which cannot be restored or replaced (e.g. karst systems) on a biodiversity stewardship site, or	There are no known abiotic habitats on which the species is reliant.	Conservation advice for the species (Department of the Environment, 2015) TBDC (NSW DCCEEW, 2025b) Recovery plan for the species (Department of the Environment and the Government of South Australia Department of Environment Water and Natural Resources, 2016)	Causes of decline in the species' populations are not well understood.
Life history traits and/or ecology is known but the ability to control key threatening processes at a biodiversity stewardship site is currently negligible (e.g. frogs severely impacted by chytrid fungus).	Breeding success is often linked to environmental conditions. There may be no breeding during drought years and success can also be very low in years of heavy rainfall. The species is also susceptible to extinction via stochastic processes due to its small known population size, fluctuating numbers and ongoing threats to habitat.	Conservation advice for the species (Department of the Environment, 2015) Recovery plan for the species (Department of the Environment and the Government of South Australia Department of Environment Water and Natural Resources, 2016)	Causes of decline in the species' populations are not well understood.

10.4.1.2 Impact assessment

Table 10.22 Impact assessment – *Pedionomous torquatus* (Plains-wanderer)

Impact	Data/information	Data sources	Details of data deficiency, assumptions or reasons for low confidence in information (e.g. TBDC indicates data is unknown or deficient)
Number of individuals (mature and immature) present in the subpopulation on the project footprint	Unknown	NA	Surveys have recorded one individual of the species. The subject land crosses areas of mapped important habitat at three locations.
Number of individuals (mature and immature) present as a percentage of total NSW population (per cent)	Unknown	NA	Surveys have recorded one individual of the species, however, a full population estimate within the subject land is unknown.
Number of individuals (mature and immature) to be impacted by the project.	Unknown	NA	Surveys have recorded one individual of the species, however, a full population estimate within the subject land is unknown. The subject land crosses areas of mapped important habitat at three locations in which special biodiversity protections zones would be utilised to further reduce impacts to the species (refer to section 9.4.2).
Individuals (mature and immature) to be impacted by the project as a percentage of total NSW population (per cent)	Unknown	NA	Surveys have recorded one individual of the species, however, a full population estimate within the subject land is unknown.

Impact	Data/information	Data sources	Details of data deficiency, assumptions or reasons for low confidence in information (e.g. TBDC indicates data is unknown or deficient)
Area of habitat to be impacted (ha) (for species measured by area only)	1.19 ha of mapped important habitat area. Areas of habitat outside of mapped important habitat, including areas of grassland or chenopod shrubland seasonally identified to have adequate species composition, have not been quantified and are not included in this assessment.	TBDC Plains-wanderer mapped important habitat area within the subject land.	Plains-wanderer mapped important habitat area data assumed to be correct.
Area of the species' geographic range to be impacted by the project (ha)	1.19 ha of mapped important habitat area.	TBDC Plains-wanderer mapped important habitat area within the subject land.	Plains-wanderer mapped important habitat area data assumed to be correct.
Area of the species' geographic range to be impacted as a percentage of the total area or extent of occupancy (per cent)	Species extent of occurrence is estimated at 930,000 km2 and the area of occupancy is estimated at 330 km2. Impact of 1.19 ha = 0.0119 km2. Approximately 0.01 % of the species geographic range would be impacted (based on area of occupancy).	Conservation advice for the species (Department of the Environment, 2015)	Data in the Conservation advice for the species (Department of the Environment, 2015) is assumed to be correct.
Individuals impacted	No individuals will be directly impacted, some habitat will be impacted	N/A	Areas of important mapped habitat to be impacted by the project.

Impact	Data/information	Data sources	Details of data deficiency, assumptions or reasons for low confidence in information (e.g. TBDC indicates data is unknown or deficient)
Viability of a fragmented population (see below)	There would be minimal localised fragmentation of habitat due to the highly permeable nature of the project. The species and its populations already appear to be severely fragmented based on Criterion 2 of the EPBC Act criteria and regulations (see Department of the Environment, 2015). There have been extreme fluctuations in the number of mature individuals in the NSW Riverina, resulting in a net decline in the number of birds in less than three generations. While the project is expected to further fragment the local population, it's not considered that the local population would become unviable.	Conservation advice for the species (Department of the Environment, 2015)	Data in the Conservation advice for the species (Department of the Environment, 2015) is assumed to be correct.
Changes in threats affecting remaining subpopulations and habitat if the proposed impact proceeds		Identified in BDAR Chapter 9.	

11 Impact summary

11.1 Determine an offset requirement for impacts

The project is expected to require 25,710 ecosystem credits and 82,817 species credits to offset its impacts.

- Murray Fans: 3,102 ecosystem credits and 19,512 species credits
- Murrumbidgee: 22,495 ecosystem credits and 62,652 species credits
- Inland Slopes: 113 ecosystem credits and 653 species credits.

Additional offsets are also required for scattered trees along with indirect and prescribed impacts.

11.1.1 Impacts on native vegetation, TECs and ecosystem credits

Table 11.1 to Table 11.3 outline the impacts that require an offset. The impacts that do not require an offset (identified with a number 0 in the Ecosystem credits column) are also shown here.

Figure 15.14 illustrates the areas that require offsetting of impacts.

Table 11.1 Impacts that require an offset – ecosystem credits for the Murray Fans IBRA subregion

Zone BAM-C #	Vegetation zone name	Vegetation integrity loss	Area	Sensitivity to loss	Sensitivity to loss (Justification)	Species sensitivity to gain class	Biodiversity risk weighting	Potential SAII	Ecosystem credits
2 - River Red Gum-sedge dominated very tall open forest in frequently flooded forest wetland along major rivers and floodplains in south-western NSW									
22	2_SVTM	55.1	0.12 hectares	Low Sensitivity to Loss	PCT Cleared - 14 %	Low Sensitivity to Gain	1	No	2
Subtotal: 2									
7 - River Red Gum - Warrego Grass - herbaceous riparian tall open forest wetland mainly in the Riverina Bioregion									
1	7_Moderate-good	55.4	4.67 hectares	Low Sensitivity to Loss	PCT Cleared - 15 %	Low Sensitivity to Gain	1	No	65
Subtotal: 65									
10 - River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)									
3	10_Moderate-good	28.2	13.47 hectares	Low Sensitivity to Loss	PCT Cleared - 43 %	Low Sensitivity to Gain	1	No	95
4	10_Thinned	27.3	12.66 hectares	Low Sensitivity to Loss	PCT Cleared - 43 %	Low Sensitivity to Gain	1	No	79
23	10_SVTM	60.5	1.39 hectares	Low Sensitivity to Loss	PCT Cleared - 43 %	Low Sensitivity to Gain	1	No	21
2	10_Derived	8.7	3.52 hectares	Low Sensitivity to Loss	PCT Cleared - 43 %	Low Sensitivity to Gain	1	No	0
33	10_Derived_LCV	9	5.20 hectares	Low Sensitivity to Loss	PCT Cleared - 43 %	Low Sensitivity to Gain	1	No	0
Subtotal: 195									

Zone BAM-C #	Vegetation zone name	Vegetation integrity loss	Area	Sensitivity to loss	Sensitivity to loss (Justification)	Species sensitivity to gain class	Biodiversity risk weighting	Potential SAII	Ecosystem credits
11 - River Red Gum - Lignum very tall open forest or woodland wetland on floodplains of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)									
5	11_Moderate-good	30.1	0.49 hectares	Low Sensitivity to Loss	PCT Cleared - 42 %	Low Sensitivity to Gain	1	No	4
Subtotal: 4									
13 - Black Box - Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)									
7	13_Moderate-good	46.1	59.66 hectares	Moderate Sensitivity to Loss	PCT Cleared - 57 %	Low Sensitivity to Gain	1.25	No	859
8	13_Thinned	43.4	21.96 hectares	Moderate Sensitivity to Loss	PCT Cleared - 57 %	Low Sensitivity to Gain	1.25	No	300
24	13_SVTM	75.3	14.35 hectares	Moderate Sensitivity to Loss	PCT Cleared - 57 %	Low Sensitivity to Gain	1.25	No	337
34	13_Planted_NatVeg	48.1	0.20 hectares	Moderate Sensitivity to Loss	PCT Cleared - 57 %	Low Sensitivity to Gain	1.25	No	3
31	13_Derived	8.7	15.11 hectares	Moderate Sensitivity to Loss	PCT Cleared - 57 %	Low Sensitivity to Gain	1.25	No	0
6	13_Derived_LCV	13.3	49.33 hectares	Moderate Sensitivity to Loss	PCT Cleared - 57 %	Low Sensitivity to Gain	1.25	No	0
Subtotal: 1,499									

Zone BAM-C #	Vegetation zone name	Vegetation integrity loss	Area	Sensitivity to loss	Sensitivity to loss (Justification)	Species sensitivity to gain class	Biodiversity risk weighting	Potential SAII	Ecosystem credits
15 - Black Box open woodland wetland with chenopod understorey mainly on the outer floodplains in south-western NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion)									
10	15_Moderate-good	51.1	12.44 hectares	Moderate Sensitivity to Loss	PCT Cleared - 50 %	Low Sensitivity to Gain	1.25	No	199
11	15_Thinned	32.7	2.64 hectares	Moderate Sensitivity to Loss	PCT Cleared - 50 %	Low Sensitivity to Gain	1.25	No	27
25	15_SVTM	67.7	1.58 hectares	Moderate Sensitivity to Loss	PCT Cleared - 50 %	Low Sensitivity to Gain	1.25	No	33
32	15_Derived	14.5	5.23 hectares	Moderate Sensitivity to Loss	PCT Cleared - 50 %	Low Sensitivity to Gain	1.25	No	0
9	15_Derived_LCV	6.7	6.36 hectares	Moderate Sensitivity to Loss	PCT Cleared - 50 %	Low Sensitivity to Gain	1.25	No	0
Subtotal: 259									
17 - Lignum shrubland wetland of the semi-arid (warm) plains (mainly Riverina Bioregion and Murray Darling Depression Bioregion)									
12	17_Moderate-good	64.8	0.14 hectares	Moderate Sensitivity to Loss	PCT Cleared - 63 %	Low Sensitivity to Gain	1.25	No	3
Subtotal: 3									

Zone BAM-C #	Vegetation zone name	Vegetation integrity loss	Area	Sensitivity to loss	Sensitivity to loss (Justification)	Species sensitivity to gain class	Biodiversity risk weighting	Potential SAII	Ecosystem credits
19 - Cypress Pine woodland of source-bordering dunes mainly on the Murray and Murrumbidgee River floodplains									
26	19_SVTM	56.1	1.59 hectares	High Sensitivity to Loss	Biodiversity Conservation Act listing status	High Sensitivity to Gain	2	No	45
Subtotal: 45									
28 - White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone									
13	28_Derived	6.1	0.20 hectares	High Sensitivity to Loss	Biodiversity Conservation Act listing status	Low Sensitivity to Gain	1.5	No	0
14	28_Derived_TS	14.1	0.67 hectares	High Sensitivity to Loss	Biodiversity Conservation Act listing status	Low Sensitivity to Gain	1.5	No	4
Subtotal: 4									
44 - Forb-rich Speargrass - Windmill Grass - White Top grassland of the Riverina Bioregion									
27	44_SVTM	100	10.16 hectares	High Sensitivity to Loss	Environment Protection and Conservation Act listing status	Low Sensitivity to Gain	2	No	509
Subtotal: 509									
86 - Yellow Gum tall woodland of the Murray River floodplain, Riverina Bioregion									
35	86_Moderate-good	100	0.05 hectares	High Sensitivity to Loss	PCT Cleared - 75 %	High Sensitivity to Gain	2	No	3
Subtotal: 3									

Zone BAM-C #	Vegetation zone name	Vegetation integrity loss	Area	Sensitivity to loss	Sensitivity to loss (Justification)	Species sensitivity to gain class	Biodiversity risk weighting	Potential SAII	Ecosystem credits
160 - Nitre Goosefoot shrubland wetland on clays of the inland floodplains									
15	160_Moderate-good	46.2	0.14 hectares	Low Sensitivity to Loss	PCT Cleared - 28 %	Low Sensitivity to Gain	1	No	2
28	160_SVTM	100	0.04 hectares	Low Sensitivity to Loss	PCT Cleared - 28 %	Low Sensitivity to Gain	1	No	1
Subtotal: 3									
163 - Dillon Bush (Nitre Bush) shrubland of the semi-arid and arid zones									
17	163_Moderate-good	83.2	14.08 hectares	Low Sensitivity to Loss	PCT Cleared - 26 %	Low Sensitivity to Gain	1	No	293
29	163_SVTM	100	1.02 hectares	Low Sensitivity to Loss	PCT Cleared - 26 %	Low Sensitivity to Gain	1	No	26
16	163_Derived_LCV	62.7	0.68 hectares	Low Sensitivity to Loss	PCT Cleared - 26 %	Low Sensitivity to Gain	1	No	11
Subtotal: 330									
164 - Cotton Bush open shrubland of the semi-arid (warm) zone									
19	164_Moderate-good	87.6	3.46 hectares	Low Sensitivity to Loss	PCT Cleared - 8 %	Low Sensitivity to Gain	1	No	76
30	164_SVTM	100	0.09 hectares	Low Sensitivity to Loss	PCT Cleared - 8 %	Low Sensitivity to Gain	1	No	2
18	164_Derived_LCV	58.7	5.48 hectares	Low Sensitivity to Loss	PCT Cleared - 8 %	Low Sensitivity to Gain	1	No	80
Subtotal: 158									

Zone BAM-C #	Vegetation zone name	Vegetation integrity loss	Area	Sensitivity to loss	Sensitivity to loss (Justification)	Species sensitivity to gain class	Biodiversity risk weighting	Potential SAII	Ecosystem credits
216 - Black Roly Poly low open shrubland of the Riverina Bioregion and Murray Darling Depression Bioregion									
20	216_Moderate-good	38.7	0.66 hectares	Low Sensitivity to Loss	PCT Cleared - 0 %	Low Sensitivity to Gain	1	No	12
Subtotal: 12									
237 - Riverine Western Grey Box grassy woodland of the semi-arid (warm) climate zone									
21	237_Moderate-good	36.4	0.84 hectares	High Sensitivity to Loss	Biodiversity Conservation Act listing status	Low Sensitivity to Gain	1.5	No	11
Subtotal:11									
Total									**3,102**

Table 11.2 Impacts that require an offset – ecosystem credits for the Murrumbidgee IBRA subregion

Zone BAM-C #	Vegetation zone name	Vegetation integrity loss	Area	Sensitivity to loss	Sensitivity to loss (Justification)	Species sensitivity to gain class	Biodiversity risk weighting	Potential SAII	Ecosystem credits
13 - Black Box - Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)									
1	13_Moderate_good	47.4	3.75 hectares	Moderate Sensitivity to Loss	PCT Cleared - 57 %	Low Sensitivity to Gain	1.25	No	56
31	13_SVTM	43.3	0.01 hectares	Moderate Sensitivity to Loss	PCT Cleared - 57 %	Low Sensitivity to Gain	1.25	No	1
Subtotal: 57									
15 - Black Box open woodland wetland with chenopod understorey mainly on the outer floodplains in south-western NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion)									
3	15_Moderate_good	45	62.45 hectares	Moderate Sensitivity to Loss	PCT Cleared - 50 %	Low Sensitivity to Gain	1.25	No	879
46	15_Thinned	85.8	0.72 hectares	Moderate Sensitivity to Loss	PCT Cleared - 50 %	Low Sensitivity to Gain	1.25	No	19
32	15_SVTM	100	0.33 hectares	Moderate Sensitivity to Loss	PCT Cleared - 50 %	Low Sensitivity to Gain	1.25	No	10
2	15_Derived	29.2	7.95 hectares	Moderate Sensitivity to Loss	PCT Cleared - 50 %	Low Sensitivity to Gain	1.25	No	73
Subtotal: 981									

Zone BAM-C #	Vegetation zone name	Vegetation integrity loss	Area	Sensitivity to loss	Sensitivity to loss (Justification)	Species sensitivity to gain class	Biodiversity risk weighting	Potential SAII	Ecosystem credits
17 - Lignum shrubland wetland of the semi-arid (warm) plains (mainly Riverina Bioregion and Murray Darling Depression Bioregion)									
4	17_Moderate_good	81.6	12.49 hectares	Moderate Sensitivity to Loss	PCT Cleared - 63 %	Low Sensitivity to Gain	1.25	No	298
33	17_SVTM	100	2.38 hectares	Moderate Sensitivity to Loss	PCT Cleared - 63 %	Low Sensitivity to Gain	1.25	No	74
Subtotal: 372									
20 - Buloke - Moonah - Black Box open woodland on sandy rises of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)									
6	20_Thinned	23.7	0.16 hectares	High Sensitivity to Loss	Population size	Low Sensitivity to Gain	1.5	Yes	1
5	20_Derived	18.9	0.99 hectares	High Sensitivity to Loss	Population size	Low Sensitivity to Gain	1.5	Yes	8
47	20_Derived_LCV	5.2	0.77 hectares	High Sensitivity to Loss	Population size	Low Sensitivity to Gain	1.5	Yes	0
Subtotal: 9									

Zone BAM-C #	Vegetation zone name	Vegetation integrity loss	Area	Sensitivity to loss	Sensitivity to loss (Justification)	Species sensitivity to gain class	Biodiversity risk weighting	Potential SAII	Ecosystem credits
23 - Yarran tall open shrubland of the sandplains and plains of the semi-arid (warm) and arid climate zones									
9	23_Moderate_good	45.6	3.41 hectares	High Sensitivity to Loss	Biodiversity Conservation Act listing status	Low Sensitivity to Gain	1.5	No	60
49	23_Thinned	50.6	0.20 hectares	High Sensitivity to Loss	Biodiversity Conservation Act listing status	Low Sensitivity to Gain	1.5	No	6
7	23_Derived	20.5	2.71 hectares	High Sensitivity to Loss	Biodiversity Conservation Act listing status	Low Sensitivity to Gain	1.5	No	21
8	23_Derived_LCV	16.6	3.54 hectares	High Sensitivity to Loss	Biodiversity Conservation Act listing status	Low Sensitivity to Gain	1.5	No	22
Subtotal: 109									
24 - Canegrass swamp tall grassland wetland of drainage depressions, lakes and pans of the inland plains									
10	24_Moderate_good	72	7.02 hectares	Low Sensitivity to Loss	PCT Cleared - 20 %	Low Sensitivity to Gain	1	No	126
Subtotal: 126									
26 - Weeping Myall open woodland of the Riverina Bioregion and NSW South Western Slopes Bioregion									
13	26_Moderate_good	48.7	91.32 hectares	Very High Sensitivity to Loss	Environment Protection and Conservation Act listing status	Low Sensitivity to Gain	1.5	No	1,757

Zone BAM-C #	Vegetation zone name	Vegetation integrity loss	Area	Sensitivity to loss	Sensitivity to loss (Justification)	Species sensitivity to gain class	Biodiversity risk weighting	Potential SAII	Ecosystem credits
14	26_Thinned	40.5	84.09 hectares	Very High Sensitivity to Loss	Environment Protection and Conservation Act listing status	Low Sensitivity to Gain	1.5	No	1,311
34	26_SVTM	100	1.33 hectares	Very High Sensitivity to Loss	Environment Protection and Conservation Act listing status	Low Sensitivity to Gain	1.5	No	50
11	26_Derived	15.4	138.90 hectares	Very High Sensitivity to Loss	Environment Protection and Conservation Act listing status	Low Sensitivity to Gain	1.5	No	0
12	26_Derived_LCV	9.6	1.29 hectares	Very High Sensitivity to Loss	Environment Protection and Conservation Act listing status	Low Sensitivity to Gain	1.5	No	0
Subtotal: 3,118									
28 - White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone									
48	28_Moderate-good	100	2.94 hectares	High Sensitivity to Loss	Biodiversity Conservation Act listing status	Low Sensitivity to Gain	1.5	No	71
18	28_Thinned	16.1	5.65 hectares	High Sensitivity to Loss	Biodiversity Conservation Act listing status	Low Sensitivity to Gain	1.5	No	36
35	28_SVTM	100	6.04 hectares	High Sensitivity to Loss	Biodiversity Conservation Act listing status	Low Sensitivity to Gain	1.5	No	227

Zone BAM-C #	Vegetation zone name	Vegetation integrity loss	Area	Sensitivity to loss	Sensitivity to loss (Justification)	Species sensitivity to gain class	Biodiversity risk weighting	Potential SAII	Ecosystem credits
15	28_Derived	21	19.63 hectares	High Sensitivity to Loss	Biodiversity Conservation Act listing status	Low Sensitivity to Gain	1.5	No	154
16	28_Derived_TS	35.4	0.64 hectares	High Sensitivity to Loss	Biodiversity Conservation Act listing status	Low Sensitivity to Gain	1.5	No	8
17	28_Derived_LCV	17.9	5.03 hectares	High Sensitivity to Loss	Biodiversity Conservation Act listing status	Low Sensitivity to Gain	1.5	No	39
Subtotal: 535									
44 - Forb-rich Speargrass - Windmill Grass - White Top grassland of the Riverina Bioregion									
19	44_Moderate_good	96.3	14.77 hectares	High Sensitivity to Loss	Environment Protection and Conservation Act listing status	Low Sensitivity to Gain	2	No	711
36	44_SVTM	100	8.79 hectares	High Sensitivity to Loss	Environment Protection and Conservation Act listing status	Low Sensitivity to Gain	2	No	440
Subtotal: 1,151									

Zone BAM-C #	Vegetation zone name	Vegetation integrity loss	Area	Sensitivity to loss	Sensitivity to loss (Justification)	Species sensitivity to gain class	Biodiversity risk weighting	Potential SAII	Ecosystem credits
45 - Plains Grass grassland on alluvial mainly clay soils in the Riverina Bioregion and NSW South Western Slopes Bioregion									
20	45_Moderate_good	84.3	3.58 hectares	Moderate Sensitivity to Loss	Environment Protection and Conservation Act listing status	Low Sensitivity to Gain	2	No	153
37	45_SVTM	100	5.96 hectares	Moderate Sensitivity to Loss	Environment Protection and Conservation Act listing status	Low Sensitivity to Gain	2	No	298
Subtotal: 451									
46 - Curly Windmill Grass - speargrass - wallaby grass grassland on alluvial clay and loam on the Hay Plain, Riverina Bioregion									
21	46_Moderate_good	92.7	39.35 hectares	Low Sensitivity to Loss	Environment Protection and Conservation Act listing status	Low Sensitivity to Gain	2	No	1,824
44	46_SVTM	100	19.07 hectares	Low Sensitivity to Loss	Environment Protection and Conservation Act listing status	Low Sensitivity to Gain	2	No	954
Subtotal: 2,778									
47 - Swamp grassland wetland of the Riverine Plain									
22	47_Moderate_good	87.5	0.17 hectares	Moderate Sensitivity to Loss	Environment Protection and Conservation Act listing status	High Sensitivity to Gain	2.5	No	9
Subtotal: 9									

Zone BAM-C #	Vegetation zone name	Vegetation integrity loss	Area	Sensitivity to loss	Sensitivity to loss (Justification)	Species sensitivity to gain class	Biodiversity risk weighting	Potential SAII	Ecosystem credits
58 - Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion									
23	58_Moderate_good	37.4	0.26 hectares	Moderate Sensitivity to Loss	PCT Cleared - 50 %	Low Sensitivity to Gain	1.25	No	5
24	58_Thinned	34.7	0.70 hectares	Moderate Sensitivity to Loss	PCT Cleared - 50 %	Low Sensitivity to Gain	1.25	No	7
Subtotal: 12									
70 - White Cypress Pine woodland on sandy loams in central NSW wheatbelt									
38	70_SVTM	100	0.16 hectares	Moderate Sensitivity to Loss	PCT Cleared - 65 %	Low Sensitivity to Gain	1.25	No	5
Subtotal: 5									
157 - Bladder Saltbush shrubland on alluvial plains in the semi-arid (warm) zone including Riverina Bioregion									
25	157_Moderate_good	85.3	91.91 hectares	Moderate Sensitivity to Loss	PCT Cleared - 60 %	Low Sensitivity to Gain	1.25	No	2450
39	157_SVTM	100	7.55 hectares	Moderate Sensitivity to Loss	PCT Cleared - 60 %	Low Sensitivity to Gain	1.25	No	236
Subtotal: 2,686									

Zone BAM-C #	Vegetation zone name	Vegetation integrity loss	Area	Sensitivity to loss	Sensitivity to loss (Justification)	Species sensitivity to gain class	Biodiversity risk weighting	Potential SAII	Ecosystem credits
159 - Old Man Saltbush shrubland mainly of the semi-arid (warm) climate zone (south western NSW)									
40	159_SVTM	100	0.05 hectares	Very High Sensitivity to Loss	PCT Cleared - 92 %	Low Sensitivity to Gain	2	No	3
Subtotal: 3									
160 - Nitre Goosefoot shrubland wetland on clays of the inland floodplains									
26	160_Moderate_good	88.7	15.32 hectares	Low Sensitivity to Loss	PCT Cleared - 28 %	Low Sensitivity to Gain	1	No	340
45	160_SVTM	100	1.37 hectares	Low Sensitivity to Loss	PCT Cleared - 28 %	Low Sensitivity to Gain	1	No	34
Subtotal: 374									
163 - Dillon Bush (Nitre Bush) shrubland of the semi-arid and arid zones									
27	163_Moderate_good	97.7	51.98 hectares	Low Sensitivity to Loss	PCT Cleared - 26 %	Low Sensitivity to Gain	1	No	1,270
41	163_SVTM	100	11.26 hectares	Low Sensitivity to Loss	PCT Cleared - 26 %	Low Sensitivity to Gain	1	No	282
Subtotal: 1,552									
164 - Cotton Bush open shrubland of the semi-arid (warm) zone									
28	164_Moderate_good	86.9	253.05 hectares	Low Sensitivity to Loss	PCT Cleared - 8 %	Low Sensitivity to Gain	1	No	5,499
43	164_SVTM	100	95.65 hectares	Low Sensitivity to Loss	PCT Cleared - 8 %	Low Sensitivity to Gain	1	No	2,391
Subtotal: 7,890									

Zone BAM-C #	Vegetation zone name	Vegetation integrity loss	Area	Sensitivity to loss	Sensitivity to loss (Justification)	Species sensitivity to gain class	Biodiversity risk weighting	Potential SAII	Ecosystem credits
170 - Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones									
30	170_Thinned	28.7	4.17 hectares	Low Sensitivity to Loss	PCT Cleared - 41 %	Low Sensitivity to Gain	1	No	30
29	170_Derived	12.3	1.42 hectares	Low Sensitivity to Loss	PCT Cleared - 41 %	Low Sensitivity to Gain	1	No	0
Subtotal: 30									
216 - Black Roly Poly low open shrubland of the Riverina Bioregion and Murray Darling Depression Bioregion									
42	216_Moderate-good	100	9.80 hectares	Low Sensitivity to Loss	PCT Cleared - 0 %	Low Sensitivity to Gain	1	No	245
Subtotal: 245									
Total									**22,493**

Table 11.3 Impacts that require an offset – ecosystem credits for the Inland Slopes IBRA subregion

Zone BAM-C #	Vegetation zone name	Vegetation integrity loss	Area	Sensitivity to loss	Sensitivity to loss (Justification)	Species sensitivity to gain class	Biodiversity risk weighting	Potential SAII	Ecosystem credits
76 - Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions									
1	76_Thinned	36.8	0.30 hectares	Very High Sensitivity to Loss	Biodiversity Conservation Act listing status	Low Sensitivity to Gain	1.5	No	4
Subtotal: 4									
266 - White Box grassy woodland in the upper slopes subregion of the NSW South Western Slopes Bioregion									
2	266_Moderate-good	53.4	0.16 hectares	Very High Sensitivity to Loss	Population size	Low Sensitivity to Gain	2	Yes	4
3	266_Thinned	26.4	0.02 hectares	Very High Sensitivity to Loss	Population size	Low Sensitivity to Gain	2	Yes	1
Subtotal: 5									
277 - Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion									
9	277_Moderate-good	100	0.19 hectares	Very High Sensitivity to Loss	Population size	Low Sensitivity to Gain	2	Yes	10
5	277_Thinned	54.2	3.01 hectares	Very High Sensitivity to Loss	Population size	Low Sensitivity to Gain	2	Yes	82
4	277_Derived_LCV	14	40.86 hectares	Very High Sensitivity to Loss	Population size	Low Sensitivity to Gain	2	Yes	0
Subtotal: 92									

Zone BAM-C #	Vegetation zone name	Vegetation integrity loss	Area	Sensitivity to loss	Sensitivity to loss (Justification)	Species sensitivity to gain class	Biodiversity risk weighting	Potential SAII	Ecosystem credits
319 - Tumbledown Red Gum - White Cypress Pine hill woodland in the southern part of the NSW South Western Slopes Bioregion									
7	319_Thinned	29.1	0.83 hectares	Moderate Sensitivity to Loss	PCT Cleared - 60 %	High Sensitivity to Gain	1.75	No	11
6	319_Derived_LCV	8.8	11.66 hectares	Moderate Sensitivity to Loss	PCT Cleared - 60 %	Low Sensitivity to Gain	1.25	No	0
Subtotal: 11									
343 - Mugga Ironbark - Red Box - Red Stringybark - Western Grey Box grass/shrub woodland on metamorphic substrates in the Tarcutta - Gundagai region, NSW South Western Slopes Bioregion									
10	343_Moderate-good	60	0.01 hectares	High Sensitivity to Loss	PCT Cleared - 88 %	High Sensitivity to Gain	2		1
8	343_Derived_LCV	8.5	3.79 hectares	High Sensitivity to Loss	PCT Cleared - 88 %	Low Sensitivity to Gain	1.5		0
Subtotal: 1									
Total									**113**

11.1.2 Impacts on threatened species and their habitat (species credits)

The impacts to threatened species and their habitats for species credit species for each IBRA subregion are presented in Table 11.4 to Table 11.9.

Table 11.4 Impacts that require an offset – threatened flora species credits for the Murray Fans IBRA subregion

Scientific name	Common name	BC Act status[1]	EPBC Act status[2]	Loss of habitat (ha) or individuals	Biodiversity risk weighting	Number of species credits required
Amphibromus fluitans	River Swamp Wallaby-grass	V	V	0.43	2	11
Austrostipa metatoris	-	V	V	1.24	2	26
Austrostipa wakoolica	-	E	E	0.39	2	2
Eleocharis obicis	Spike Rush	V	V	29.27	2	559
Eucalyptus leucoxylon subsp. *pruinosa*[3]	Yellow Gum	V	-	30.23	2	8
Lepidium monoplocoides	Winged Peppercress	E	E	28.37	2	609
Maireana cheelii	Chariot Wheels	V	V	10.02	2	500
Pilularia novae-hollandiae	Austral Pillwort	E	-	41.57	2	1,165
Prasophyllum sp. *Moama*	-	CE	-	9.88	3	741
Pterostylis despectans	Lowly Greenhood	CE	E	9.88	3	741
Total						**4,362**

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

(2) M = Migratory, V = Vulnerable, E = Endangered, CE = Critically Endangered under the EPBC Act

(3) Species are a 'count' species under the BAM where the assumed loss of habitat (ha) is a representation of areas not subject to targeted flora surveys where suitable habitat for the species may occur. A representative one individual has been entered for each vegetation zone subject to impact where suitable habitat has been identified.

Table 11.5 Impacts that require an offset – threatened fauna species credits for the Murray Fans IBRA subregion

Scientific name	Common name	BC Act status[1]	EPBC Act status[2]	Loss of habitat (ha) or individuals	Biodiversity risk weighting	Number of species credits required
Ardeotis australis	Australian Bustard	E	-	11.07	2	570
Burhinus grallarius	Bush Stone-curlew	E	-	59.43	2	1,399
Haliaeetus leucogaster	White-bellied Sea-Eagle	V	-	29.75	2	944
Hamirostra melanosternon	Black-breasted Buzzard	V	-	2.38	1.5	49
Hemiaspis damelii	Grey Snake	E	E	61.97	2	1,478
Hieraaetus morphnoides	Little Eagle	V	-	41.88	1.5	1,043
Litoria raniformis	Southern Bell Frog	E	V	8.57	2	213
Lophochroa leadbeateri	Pink Cockatoo	V	E	43.66	2	1,470
Lophoictinia isura	Square-tailed Kite	V	-	38.92	1.5	986
Myotis macropus	Southern Myotis	V	-	20.73	2	333
Ninox connivens	Barking Owl	V	-	51.83	2	1,659
Phascolarctos cinereus	Koala	E	E	145.25	2	3,330
Polytelis swainsonii	Superb Parrot	V	V	25.20	2	539
Tyto novaehollandiae	Masked Owl	V	-	45.62	2	1,430
Total						**15,443**

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

(2) M = Migratory, V = Vulnerable, E = Endangered, CE = Critically Endangered under the EPBC Act

Table 11.6 Impacts that require an offset – threatened flora species credits for the Murrumbidgee IBRA subregion

Scientific name	Common name	BC Act status[1]	EPBC Act status[2]	Loss of habitat (ha) or individuals	Biodiversity risk weighting	Number of species credits required
Austrostipa wakoolica	-	E	E	28.42	2	587
Brachyscome muelleroides	Mueller Daisy	V	V	1.04	3	78
Brachyscome papillosa	Mossgiel Daisy	V	V	141.26	2	6,941
Calotis moorei	Burr-daisy	E	E	12.14	3	827
Convolvulus tedmoorei	Bindweed	E	-	28.92	3	2,013
Cullen parvum	Small Scurf-pea	E	-	23.51	2	1,148
Eleocharis obicis	Spike Rush	V	V	128.04	2	6,146
Eucalyptus leucoxylon subsp. *pruinosa*[3]	Yellow Gum	V	-	1	2	2
Lepidium monoplocoides	Winged Peppercress	E	E	52.17	2	1,764
Leptorhynchos orientalis	Lanky Buttons	E	-	43.70	2	1,352
Maireana cheelii	Chariot Wheels	V	V	146.82	2	6,460
Pilularia novae-hollandiae	Austral Pillwort	E	-	72.52	2	994
Sclerolaena napiformis	Turnip Copperburr	E	E	43.39	2	1,336
Solanum karsense	Menindee Nightshade	V	V	0.24	1.5	3
Swainsona murrayana	Slender Darling-pea	V	V	340.46	2	13,995
Swainsona plagiotropis	Red Darling-pea	V	V	45.67	2	1,448
Swainsona sericea	Silky Swainson-pea	V	-	45.31	2	1,433
Total						**46,527**

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

(2) M = Migratory, V = Vulnerable, E = Endangered, CE = Critically Endangered under the EPBC Act

(3) Species are a 'count' species under the BAM where the assumed loss of habitat (ha) is a representation of areas not subject to targeted flora surveys where suitable habitat for the species may occur. A representative one individual has been entered for each vegetation zone subject to impact where suitable habitat has been identified.

Table 11.7 Impacts that require an offset – threatened fauna species credits for the Murrumbidgee IBRA subregion

Scientific name	Common name	BC Act status[1]	EPBC Act status[2]	Loss of habitat (ha) or individuals	Biodiversity risk weighting	Number of species credits required
Ardeotis australis	Australian Bustard	E	-	105.03	2	5,225
Burhinus grallarius	Bush Stone-curlew	E	-	190.65	2	4,549
Hemiaspis damelii	Grey Snake	E	E	128.33	2	5,099
Hieraaetus morphnoides	Little Eagle	V	-	0.92	1.5	35
Litoria raniformis	Southern Bell Frog	E	V	1.68	2	73
Lophochroa leadbeateri	Pink Cockatoo	V	E	6.60	2	330
Lophoictinia isura	Square-tailed Kite	V	-	0.92	1.5	35
Ninox connivens	Barking Owl	V	-	28.32	2	1,018
Pedionomus torquatus	Plains-wanderer	E	CE	1.19	3	70
Polytelis swainsonii	Superb Parrot	V	V	0.92	2	46
Tyto novaehollandiae	Masked Owl	V	-	7.36	2	271
Total						**16,751**

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

(2) M = Migratory, V = Vulnerable, E = Endangered, CE = Critically Endangered under the EPBC Act

Table 11.8 Impacts that require an offset – threatened flora species credits for the Inland Slopes IBRA subregion

Scientific name	Common name	BC Act status[1]	EPBC Act status[2]	Loss of habitat (ha) or individuals	Biodiversity risk weighting	Number of species credits required
Ammobium craspedioides[3]	Yass Daisy	V	V	2.08	2	8
Austrostipa wakoolica	-	E	E	0.30	2	6
Caladenia arenaria	Sand-hill Spider Orchid	E	E	0.30	3	8
Cullen parvum	Small Scurf-pea	E	-	1.98	2	57
Diuris tricolor	Pine Donkey Orchid	V	-	0.30	1.5	4
Grevillea wilkinsonii	Tumut Grevillea	CE	CE	0.10	3	4
Prasophyllum petilum	Tarengo Leek Orchid	E	E	1.98	2	57
Swainsona recta	Small Purple-pea	E	E	2.08	2	60
Swainsona sericea	Silky Swainson-pea	V	-	2.08	2	60
Total						**264**

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

(2) M = Migratory, V = Vulnerable, E = Endangered, CE = Critically Endangered under the EPBC Act

(3) Species are a 'count' species under the BAM where the assumed loss of habitat (ha) is a representation of areas not subject to targeted flora surveys where suitable habitat for the species may occur. A representative one individual has been entered for each vegetation zone subject to impact where suitable habitat has been identified.

Table 11.9 Impacts that require an offset – threatened fauna species credits for the Inland Slopes IBRA subregion

Scientific name	Common name	BC Act status[1]	EPBC Act status[2]	Loss of habitat (ha) or individuals	Biodiversity risk weighting	Number of species credits required
Aprasia parapulchella	Pink-tailed Worm-lizard	V	V	0.62	2	9
Burhinus grallarius	Bush Stone-curlew	E	-	3.61	2	99
Callocephalon fimbriatum	Gang-gang Cockatoo	E	E	0.06	2	5
Petaurus norfolcensis – endangered population	Squirrel Glider in the Wagga Wagga LGA	E	-	0.92	2	23
Phascolarctos cinereus	Koala	E	E	4.53	2	132
Polytelis swainsonii	Superb Parrot	V	V	3.70	2	119
Total						**387**

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

(2) M = Migratory, V = Vulnerable, E = Endangered, CE = Critically Endangered under the EPBC Act

11.1.3 Impacts on scattered trees

A total of 16 scattered trees were recorded within the subject land with 14 trees occurring within the Murray Fans IBRA subregion, one tree occurring within the Murrumbidgee IBRA subregion and one tree occurring in the Inland Slopes IBRA subregion. Impacts that require an offset for scattered trees are summarised in Table 11.10, Table 11.11 and Table 11.12.

Table 11.10 Impacts that require an offset – scattered tree credits for the Murray Fans IBRA subregion

Class	Species	Number of trees	Contain hollows	Ecosystem credits required per tree	Credits required
13 - Black Box - Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)					
3	*Eucalyptus largiflorens*	5	Yes (estimated)	1.00	5
3	*Eucalyptus largiflorens*	4	No (visual assessment)	0.75	3
3	*Alectryon oleifolius*	2	Yes (visual assessment)	1.00	2
3	*Alectryon oleifolius*	3	No (visual assessment)	0.75	2
Total					**12**

Table 11.11 Impacts that require an offset – scattered tree credits for the Murrumbidgee IBRA subregion

Class	Species	Number of trees	Contain hollows	Ecosystem credits required per tree	Credits required
58 - Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion					
3	*Casuarina pauper*	1	No (visual assessment)	0.75	1
Total					**1**

Table 11.12 Impacts that require an offset – scattered tree credits for the Inland Slopes IBRA subregion

Class	Species	Number of trees	Contain hollows	Ecosystem credits required per tree	Credits required
343 - Mugga Ironbark - Red Box - Red Stringybark - Western Grey Box grass/shrub woodland on metamorphic substrates in the Tarcutta - Gundagai region, NSW South Western Slopes Bioregion					
3	*Eucalyptus sideroxylon*	1	No (visual assessment)	0.75	1
Total					**1**

11.1.4 Indirect and prescribed impacts

11.1.4.1 Additional credit obligation for indirect impacts due to bird strike and EMF

The proposed additional credit obligation for impacts to threatened bird species through indirect impacts due to line strike and EMF are provided in Table 11.13. An additional 273 ecosystem credits are proposed to be provided to account for indirect impacts to threatened bird species through indirect impacts due to line strike and EMF.

Table 11.13 Summary of indirect impacts on threatened fauna species for combined subregions

Scientific name	Common name	Total impact to habitat (ha)	10 % habitat impact (ha)	Credits per ha based on project BAM-C calculations	Proposed additional species credits
Haliaeetus leucogaster	White-bellied Sea-Eagle	29.76	2.98	37.5	112
Hieraaetus morphnoides	Little Eagle	42.82	4.28	19.5	84
Lophoictinia isura	Square-tailed Kite	39.84	3.98	19.5	78
Total proposed additional species credits for indirect impacts					**273**

11.1.4.2 Additional credit obligation for prescribed impacts to habitat connectivity

The proposed additional credit obligation for impacts to habitat connectivity are provided in Table 11.14. Additional credits are to be provided for areas at which habitat for the species has been identified by species expert report (Appendix I).

Table 11.14 Proposed additional species credits for impacts to prescribed impact species connectivity

Scientific name	Common name	Total impact to habitat (ha)	10 % habitat impact (ha)	Credits per ha based on project BAM-C calculations	Proposed additional species credits
Petaurus norfolcensis – endangered population	Squirrel Glider in the Wagga Wagga LGA	0.92	0.09	28	3
Total proposed additional species credits for indirect impacts					**3**

11.2 Impacts that do not need further assessment

In accordance with BAM Section 9.3(1), areas within the subject land that do not contain native vegetation do not need to be assessed for ecosystem credits.

BAM Section 9.3(2) states that areas of land that do not contain native vegetation must still be assessed for threatened species habitat in accordance with Chapter 5 of the BAM and prescribed biodiversity impacts in accordance with Chapter 6 of the BAM. There were no areas of land that do not contain native vegetation that were considered suitable as threatened species habitat.

As outlined in Appendix D of the BAM, if native vegetation (including individuals of a threatened flora species) have been planted for functional, aesthetic, horticultural or plantation forestry purposes (e.g. windbreaks in agricultural landscapes, roadside plantings (including street trees, median strips, roadside batters), landscaping in parks, gardens and sport fields/complexes, macadamia plantations or tea tree farms)) then only an assessment of planted native vegetation for threatened species habitat is required. The use of Chapters 4 and 5 of the BAM are not required to be applied.
As outlined in Appendix D.2 of the BAM, if there is evidence that threatened species are using the planted native vegetation as habitat, the assessor must apply Section 8.4 of the BAM to mitigate and manage impacts on these species. Impacts to planted native vegetation must be mitigated but biodiversity credits are not required to offset the proposed impacts on planted native vegetation.

In addition, an ecosystem credit obligation is not required for a vegetation zone with a VI score of either:

- <15 where the PCT is representative of an endangered ecological community (EEC) or critically endangered ecological community (CEEC)
- <17 where the PCT is associated with threatened species habitat (as represented by ecosystem credits) or represents a vulnerable ecological community
- <20 where the PCT does not represent a TEC and is not associated with threatened species habitat (as represented by ecosystem credits).

A summary of impacts that do not need further assessment for ecosystem credits is presented in Table 11.15.

Table 11.15 Impacts that do not need further assessment for ecosystem credits

Zone BAM-C #	Vegetation zone name	Area (ha)	Vegetation integrity score	Justification why no further assessment is required
Murray Fans				
2	10_Derived	3.52	4.9	VI score <17 where the PCT is associated with threatened species habitat (as represented by ecosystem credits) or represents a vulnerable ecological community
33	10_Derived_LCV	5.20	9	
31	13_Derived	15.11	8.7	
6	13_Derived_LCV	49.33	12.6	
32	15_Derived	5.23	12	
9	15_Derived_LCV	6.38	6.7	
13	28_Derived	0.20	6.1	<15 where the PCT is representative of an endangered ecological community (EEC) or critically endangered ecological community (CEEC)
Murrumbidgee				
29	170_Derived	1.42	12.3	VI score <17 where the PCT is associated with threatened species habitat (as represented by ecosystem credits) or represents a vulnerable ecological community
47	20_Derived_LCV	0.77	5.2	<15 where the PCT is representative of an endangered ecological community (EEC) or critically endangered ecological community (CEEC)
12	26_Derived_LCV	1.29	11.4	

Zone BAM-C #	Vegetation zone name	Area (ha)	Vegetation integrity score	Justification why no further assessment is required
Inland slopes				
6	319_Derived_LCV	36.9	8.8	VI score <17 where the PCT is associated with threatened species habitat (as represented by ecosystem credits) or represents a vulnerable ecological community
8	343_Derived_LCV	22.6	8.5	
4	277_Derived_LCV	40.86	14	<15 where the PCT is representative of an endangered ecological community (EEC) or critically endangered ecological community (CEEC)

11.3 Aquatic impact assessment

Aquatic habitats as a result of the project have been assessed as being minimally impacted from the construction and operations of the transmission infrastructure but will be moderately impacted during the construction and upgrades of access tracks. The proposed access tracks are known to cross key fish habitat and the construction, particularly instream works, can result in both direct and indirect impacts to the surrounding aquatic habitat.

Direct and indirect impacts resulting for the project may include:

- introduction of invasive species and diseases
- removal of riparian vegetation, change in habitat structure and cover, and/or direct removal of fish or Key Fish Habitat
- change in quantity and quality of food supply
- reduction in water quality
- direct impact to fish, eggs or ova
- blockage of fish passage
- potential mortality of fish/eggs/ova due to direct impacts by vehicles or plant and equipment
- change in water flows within a watercourse.

Impacts to key fish habitat resulting from the project may result in the requirement of offsets. During the detailed design potential impacts to key fish habitat will be minimised wherever practicable and where residual impacts are identified these will be quantified and offset in accordance with Policy and guidelines for fish habitat conservation and management (Update 2013) (DPI, 2013).

11.4 Cumulative impact assessment

The cumulative impact assessment assessed the potential combined impacts on biodiversity across the current project and other future relevant projects in the region.

The assessment identified biodiversity values that have potential for cumulative impacts from the project and relevant future projects. These included native vegetation, threatened species and TECs. A review of available data from projects with published EIS indicated the following:

- the known or estimated cumulative native vegetation impacts equate to 11,110.97 hectares
- the cumulative ecosystem credit requirement equates to 270,067 credits
- the cumulative species credit requirement equates to 555,237 credits.

A total of four threatened flora species, four threatened fauna species, six BC Act listed TECs and six EPBC Act Listed TECs are impacted by the current project and at least one other relevant future project, indicating potential cumulative impacts for all of these threatened entities.

Other cumulative impacts associated with this impact assessment include Groundwater Dependent Ecosystems, wildlife and habitat connectivity and protected lands. VNI West (NSW) and other surrounding projects are not anticipated to impact groundwater during construction, operation or decommissioning due to the limited amount of subsurface disturbance activities required during the installation and decommissioning of project infrastructure. This project would be unlikely to contribute to the cumulative impacts on GDEs.

VNI West (NSW) is likely to have minor impacts to connectivity and would be unlikely to significantly contribute to the cumulative impacts to wildlife connectivity and habitat corridors. The project is located adjacent to two protected lands (Murray Valley National Park (including the Wetuppa Forest within the Noorong-Wetuppa area) and South West Woodland Nature Reserve) and is likely to have local prescribed impacts on these areas. These two protected areas are not impacted, however, by any of the future relevant projects under consideration and as such cumulative impacts on protected lands are not anticipated.

The cumulative impact assessment for the project is provided in Appendix O.

11.5 Biodiversity Offset Strategy

The biodiversity offset strategy for this project includes three primary options to fulfill credit obligations:

- creating Biodiversity Stewardship Agreements (BSAs) on land, including Transgrid-owned or third-party private land
- the purchase and retirement of existing biodiversity credits, including existing surplus credits owned by Transgrid, credits currently available on the biodiversity credit register and/or other sources of credits available to the open market
- making contributions to the Biodiversity Conservation Fund (BCF).

Additional strategies include acquiring land to establish BSAs dedicated to the National Parks and Wildlife Service (NPWS), partnerships with the NSW Credit Supply Taskforce (CST) for sourcing credit liabilities, and funding biodiversity conservation actions. Transgrid may also seek to enter into a strategic offset delivery agreement (SODA) under section 6.2(2)(f) of the Biodiversity Conservation Regulation 2017.

Transgrid has previously established a series of BSAs across the region of the project for the delivery of its biodiversity offset obligations under EnergyConnect projects. These BSAs have generated significant surplus credits (46,635 ecosystem credits) that are “like for like” with the project’s liability. In addition, Transgrid has acquired a significant land holding (Concord property offset) specifically for the established of offsets for this project. Cumulatively, these BSAs have demonstrated that the project is likely to have secured approximately 65 per cent of the project’s ecosystem credit liability prior to approval (Table 11.16).

Of the projects 35 per cent residual ecosystem credits yet to be sourced, the majority are widespread and/or associated with offset trading groups (OTGs) that have been previously sourced through BSAs by Transgrid for EnergyConnect projects.

Transgrid are also actively progressing a number of additional potential BSAs that have been identified to contain like for like biodiversity values to those residual ecosystem liabilities.

Where the establishment of BSAs would not generate sufficient credits to fulfill the credit obligation, purchasing and retiring biodiversity credits from the biodiversity credit register would be the next choice. The purchase and retirement of existing biodiversity credits is required to be undertaken based on like for like trading rules as outlined under the BC Regulations and as identified by the BAM calculator output for the project.

The third and last option considered is a payment into the Biodiversity Conservation Fund to fulfil the offset obligations that cannot be met through BSA establishment or by purchasing credits off the open market. This option may need to be considered for very rare species that are only known from few localities and are unlikely to be found on a BSA site or have credits available for purchase on the open market.

11.5.1 Proposed project specific biodiversity stewardship agreements

Under the BC Act, land with biodiversity values can be established under a biodiversity stewardship agreement to allow for in-perpetuity conservation and management. BSAs allow the landholder to create biodiversity credits that can be traded to offset development impacts. Transgrid are actively progressing a number of potential BSAs that have been identified to contain like for like biodiversity values to those identified within the disturbance area.

Transgrid has purchased a property, (referred to as the Concord property) and is progressing with establishing a BSA, while investigating the potential viability of a number of other sites. A summary of the Concord property offset is provided below.

11.5.1.1 Concord Property Offset

The proposed Concord property offset area covers an area of approximately 1,489ha, adjacent to the Murray Valley National Park joining the northern bank of the Wakool River.

More than half of the property covered by Red Gum Woodland and Black Box Woodland including numerous rivers, creeks and channels winding through the landscape. There are many large River Red Gum and Black Box trees throughout and a reasonably intact understorey dominated by chenopods, herbs, grasses and saltbushes, Tangled Lignum and rushes.

There is abundant wildlife and birdlife evident throughout the area. Birds such as Brown Treecreeper, Striated Pardalotes and Red-rumped Parrots were observed in the subject land and the presence of many large trees with hollows provides habitat for these and other fauna species. In addition, the connectivity of habitats in the adjacent Murray Valley National Park and other private land holdings forms part of a larger network of riverine communities

A summary of the key features and conservation outcomes of the Concord property BSA is provided below.

Vegetation and PCTs

Field verification has confirmed the presence of seven PCTs across the Concord property (refer to Table 11.16).
The vegetation is dominated by Inland Riverine Forests and Inland Floodplain Woodlands, including area of old growth hollow producing trees. The general condition of the PCTs inspected were characterised by a relatively intact understorey with high native species diversity. The distribution of PCTs within the site is shown in Table 11.16 below.

The initial credit generation potential of this BSA is over 4,500 ecosystem credits that would satisfy 13 per cent of the projects like for like credit requirement.

Table 11.16 Vegetation recorded and potential credit generation

PCT ID	PCT Name	OTG	Listed status BC Act/ EPBC Act	Area (ha)	Potential credit generation
2	River Red Gum-sedge dominated very tall open forest in frequently flooded forest wetland along major rivers and floodplains in south-western NSW	Inland Riverine Forests less than 50% cleared	NA	1	4
10	River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Inland Riverine Forests less than 50% cleared	NA	222.09	888.36
11	River Red Gum - Lignum very tall open forest or woodland wetland on floodplains of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Inland Riverine Forests less than 50% cleared	NA	0.27	1.08
12	Shallow marsh wetland of regularly flooded depressions on floodplains mainly in the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Inland Floodplain Swamps >=50% and <70%	NA	0.28	1.12
13	Black Box - Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Inland Floodplain Woodlands >=50% and <70%	NA	604.36	2417.44
17	Lignum shrubland wetland of the semi-arid (warm) plains (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Inland Floodplain Shrublands >=50% and <70%	NA	5.99	23.96
216	Black Roly Poly low open shrubland of the Riverina Bioregion and Murray Darling Depression Bioregion	Riverine Chenopod Shrublands <50%	NA	8.03	32.12
Total				**842.02**	**4544.52**

11.5.2 Overall summary of offset liability required

The project is expected to require 25,708 ecosystem credits and 83,699 species credits (being 51,153 threatened flora species credits and 29,584 threatened fauna species credits) to offset its impacts. This comprises of:

- Murray Fans: 3,102 ecosystem credits and 19,805 species credits of which 4,362 credits are for threatened flora species and 12,481 credits are for threatened fauna species.
- Murrumbidgee: 22,493 ecosystem credits and 63, 243 species credits of which 46,527 credits are for threatened flora species and 16,716 credits are for threatened fauna species.
- Inland Slopes: 113 ecosystem credits and 651 species credits of which 264 credits are for threatened flora species and 387 credits are for threatened fauna species.

In addition to these credits:

- 14 ecosystem credits for impacts to scattered trees
- 237 proposed additional species credits for indirect impacts due to bird strike and EMF
- three proposed additional species credits for prescribed impacts to habitat connectivity.

Full details of attributes associated with each ecosystem credit including sensitivity to loss, sensitivity to gain class, biodiversity risk weighting, potential SAII, like for like options, credit trading groups and IBRA regions is provided in Appendix E.

This liability is based on the BAM-C report from 10 June 2025. Changes have occurred within the BAM-C late in June as a result of a regulator calculator error. Due to the timing of this error being advised the changes have not been able to be considered for this version of the BDAR. The changes to the calculator are expected to result in an increased liability for the project. Where changes are required, these will be considered during the Response to Submission phase for the project.

11.5.3 Progress of BOS delivery prior to approval

The calculations in this BDAR are based on disturbance areas only, as design finalisation for the proposal has not yet been completed. Accordingly, the final biodiversity offset liability is subject to the timing of finalisation of the proposal design and would be determined at that stage.

The proposed BOS would deliver retirement of the proposals credit liability, through the establishment of a series of BSAs and /or purchase of existing credits from the market. Any residual credit liability not met through these offset strategies would met through the payment into the BCF.

To date the project can demonstrate substantial progress of the BOS meeting 65 per cent of its ecosystem credit liability prior to approval. A summary of how these credits would be sourced through Transgrid currently available surplus credits combined with an estimated credit generation from proposed BSA establishment on Concord offsets is provided in Table 11.17.

The progress of species credits generation requires further surveys on the Concord offset and confirmation of final species credit liability following post approval survey of assumed habitat.

Table 11.17 Credit summary

OTG	Project credit liability	Estimated PEC available surplus credits 07/05/25	Concord estimated credits 20/10/23	Balance of credits required
Inland Floodplain Shrublands <50%	377	424	0	0
Inland Floodplain Shrublands >=50% and <70%	375	505	0	0
Inland Floodplain Swamps >=50% and <70%	9	57	0	0
Inland Floodplain Woodlands >=50% and <70%	2,796	398	2,417	0
Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions	20	0	0	20
Inland Riverine Forests <50% (no hollows)	4	0	0	0
Inland Riverine Forests <50% (hollows)	262	254	888	0
Inland Rocky Hill Woodlands < 50% cleared	12	109	0	0
Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions	3,118	1,508	0	1,610
Riverine Chenopod Shrublands <50%	10,187	5,954	32	4,233
Riverine Chenopod Shrublands 50%-70%	2,686	13	0	2,673
Riverine Chenopod Shrublands >90%	3	3	0	0
Riverine Plain Grasslands <50%	2,904	8,339	0	0
Riverine Plain Grasslands >=50% and <70%	451	2,214	0	0
Riverine Plain Grasslands >=70% and <90%	1,660	9,241	0	0
Riverine Sandhill Woodlands <50%	3	0	0	3
Riverine Sandhill Woodlands >=70% and <90% or Acacia melvillei Shrubland in the Riverina and Murray-Darling Depression bioregions	109	0	0	109
Riverine Sandhill Woodlands >=70% and <90% or Allocasuarina luehmannii Woodland in the Riverina and Murray-Darling Depression Bioregions	9	0	0	9
Sand Plain Mallee Woodlands <50%	30	15,723	0	0
Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregions	584	349	0	235

OTG	Project credit liability	Estimated PEC available surplus credits 07/05/25	Concord estimated credits 20/10/23	Balance of credits required
Semi-arid Sand Plain Woodlands >=50% and <70% or Acacia loderi shrublands or Acacia melvillei Shrubland in the Riverina and Murray-Darling Depression bioregions	12	311	0	0
White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions	97	1,233	0	0
Grand Total	**25,708**	**46,635**	**3,337**	**8,894**
% of project offset liability			**13%**	**35%**

11.5.4 Timing of biodiversity offset provision

Due to the time required to finalise BSAs and establish biodiversity stewardship sites and opportunities to significantly reducing species credit liabilities associated with assumed presence through post approval surveys, Transgrid would not be in a position to retire the full offset credit liability for the proposal prior to the commencement of construction. Transgrid anticipates that the full credit liability would be retired 3 years following approval and this would confirm timing when all proposed biodiversity stewardship sites are confirmed.

Transgrid has formally requested access to the NSW Department of Planning, Housing and Infrastructure (DPHI) Conditions for Deferred Offset Obligations policy for the project. A parallel request for concurrence has been sent to the Minister for Environment, as required under section 7.14(3A) of the recently amended BC Act.

Prior to the commencement of construction, Transgrid would provide DPHI with security for the biodiversity offset strategy. The security would reflect the projects liability to be used to address any residual credit liabilities if Transgrid does not implement the proposed biodiversity offset measures within appropriate timeframes.

12 Biodiversity credit report

12.1 Overall summary of credits required

The project is expected to require 25,708 ecosystem credits and 83,699 species credits to offset its impacts.
This comprises of:

- Murray Fans: 3,102 ecosystem credits and 19,805 species credits of which 4,362 credits are for threatened flora species and 12,481 credits are for threatened fauna species.
- Murrumbidgee: 22,493 ecosystem credits and 63, 243 species credits of which 46,527 credits are for threatened flora species and 16,716 credits are for threatened fauna species.
- Inland Slopes: 113 ecosystem credits and 651 species credits of which 264 credits are for threatened flora species and 387 credits are for threatened fauna species.

In addition to these credits:

- 14 ecosystem credits for impacts to scattered trees
- 273 proposed additional species credits for indirect impacts due to bird strike and EMF
- three proposed additional species credits for prescribed impacts to habitat connectivity.

Full details of attributes associated with each ecosystem credit including sensitivity to loss, sensitivity to gain class, biodiversity risk weighting, potential SAII, like for like options, credit trading groups and IBRA regions is provided in Appendix E. Credit liabilities presented here are considered 'worst case' scenario where under a conservative approach credit liability has been generated for species assumed present within the subject land in areas not subject to targeted survey effort. Residual impacts to threatened entities listed under the EPBC Act have been assessed under the NSW Bilateral Agreement and no additional credit liability for MNES matters apply.

A summary of the total biodiversity credits required for the project is provided in Table 12.1 to Table 12.3.

Table 12.1 Summary of the total ecosystem credits required

Plant Community Type	Credits required
2 - River Red Gum-sedge dominated very tall open forest in frequently flooded forest wetland along major rivers and floodplains in south-western NSW	2
7 - River Red Gum - Warrego Grass - herbaceous riparian tall open forest wetland mainly in the Riverina Bioregion	65
10 - River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	195
11 - River Red Gum - Lignum very tall open forest or woodland wetland on floodplains of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	4
13 - Black Box - Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	1,556
15-Black Box open woodland wetland with chenopod understorey mainly on the outer floodplains in south-western NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	1,240
17-Lignum shrubland wetland of the semi-arid (warm) plains (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	375

Plant Community Type	Credits required
19-Cypress Pine woodland of source-bordering dunes mainly on the Murray and Murrumbidgee River floodplains	45
20-Buloke - Moonah - Black Box open woodland on sandy rises of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	9
23-Yarran tall open shrubland of the sandplains and plains of the semi-arid (warm) and arid climate zones	109
24-Canegrass swamp tall grassland wetland of drainage depressions, lakes and pans of the inland plains	126
26-Weeping Myall open woodland of the Riverina Bioregion and NSW South Western Slopes Bioregion	3,118
28-White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone	539
44-Forb-rich Speargrass - Windmill Grass - White Top grassland of the Riverina Bioregion	1,660
45-Plains Grass grassland on alluvial mainly clay soils in the Riverina Bioregion and NSW South Western Slopes Bioregion	451
46-Curly Windmill Grass - speargrass - wallaby grass grassland on alluvial clay and loam on the Hay Plain, Riverina Bioregion	2,778
47-Swamp grassland wetland of the Riverine Plain	9
58-Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion	12
70-White Cypress Pine woodland on sandy loams in central NSW wheatbelt	5
76 - Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	4
86-Yellow Gum tall woodland of the Murray River floodplain, Riverina Bioregion	3
157-Bladder Saltbush shrubland on alluvial plains in the semi-arid (warm) zone including Riverina Bioregion	2,686
159-Old Man Saltbush shrubland mainly of the semi-arid (warm) climate zone (south western NSW)	3
160-Nitre Goosefoot shrubland wetland on clays of the inland floodplains	377
163-Dillon Bush (Nitre Bush) shrubland of the semi-arid and arid zones	1,882
164-Cotton Bush open shrubland of the semi-arid (warm) zone	8,048
170-Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones	30
216-Black Roly Poly low open shrubland of the Riverina Bioregion and Murray Darling Depression Bioregion	257
237-Riverine Western Grey Box grassy woodland of the semi-arid (warm) climate zone	11
266 - White Box grassy woodland in the upper slopes subregion of the NSW South Western Slopes Bioregion	5
277-Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	92
319-Tumbledown Red Gum - White Cypress Pine hill woodland in the southern part of the NSW South Western Slopes Bioregion	11
343-Mugga Ironbark - Red Box - Red Stringybark - Western Grey Box grass/shrub woodland on metamorphic substrates in the Tarcutta - Gundagai region, NSW South Western Slopes Bioregion	1
Total	**25,708**

Table 12.2 Summary of the total threatened flora species credits required

Scientific name	Common name	BC Act[1]	EPBC Act[2]	SAII	Area (ha)/ count	Credits required
Ammobium craspedioides[3]	Yass Daisy	V	V	Yes	4	8
Amphibromus fluitans	River Swamp Wallaby-grass	V	V	No	0.43	11
Austrostipa metatoris	-	V	V	No	1.24	26
Austrostipa wakoolica	-	E	E	No	29.11	595
Brachyscome muelleroides	Mueller Daisy	V	V	Yes	1.04	78
Brachyscome papillosa	Mossgiel Daisy	V	V	No	141.26	6,941
Caladenia arenaria	Sand-hill Spider Orchid	E	E	Yes	0.30	8
Calotis moorei	Burr-daisy	E	E	Yes	12.14	827
Convolvulus tedmoorei	Bindweed	E	-	Yes	28.92	2,013
Cullen parvum	Small Scurf-pea	E	-	No	25.49	1,205
Diuris tricolor	Pine Donkey Orchid	V	-	No	0.30	4
Eleocharis obicis	Spike Rush	V	V	No	157.23	6,705
Eucalyptus leucoxylon subsp. *pruinosa*[3]	Yellow Gum	V	-	No	5	10
Grevillea wilkinsonii	Tumut Grevillea	CE	CE	Yes	0.10	4
Lepidium monoplocoides	Winged Peppercress	E	E	No	80.54	2,373
Leptorhynchos orientalis	Lanky Buttons	E	-	No	52.17	1,352
Maireana cheelii	Chariot Wheels	V	V	No	156.84	6,960
Pilularia novae-hollandiae	Austral Pillwort	E	-	No	134.09	2,159
Prasophyllum petilum	Tarengo Leek Orchid	E	E	No	1.98	57
Prasophyllum sp. Moama	-	CE	-	Yes	9.88	741
Pterostylis despectans	Lowly Greenhood	CE	E	Yes	9.88	741
Sclerolaena napiformis	Turnip Copperburr	E	E	No	43.39	1,336
Solanum karsense	Menindee Nightshade	V	V	No	0.24	3
Swainsona murrayana	Slender Darling-pea	V	V	No	340.46	13,995
Swainsona plagiotropis	Red Darling-pea	V	V	No	45.67	1,448
Swainsona recta	Small Purple-pea	E	E	No	2.08	60
Swainsona sericea	Silky Swainson-pea	V	-	No	47.39	1,493
Total						**50,236**

(1) V = Vulnerable, E = Endangered, EP = Endangered Population, CE = Critically Endangered under the BC Act

(2) M = Migratory, V = Vulnerable, E = Endangered, CE = Critically Endangered under the EPBC Act

(3) Species are a 'count' species under the BAM where the assumed loss of habitat (ha) is a representation of areas not subject to targeted flora surveys where suitable habitat for the species may occur. A representative one individual has been entered for each vegetation zone subject to impact where suitable habitat has been identified.

Table 12.3 Summary of the total threatened fauna species credits required

Scientific name	Common name	BC Act[1]	EPBC Act[2]	SAII	Area (ha)	Credits required
Aprasia parapulchella	Pink-tailed Worm-lizard	V	V	No	0.62	9
Ardeotis australis	Australian Bustard	E	-	No	116.10	5,795
Burhinus grallarius	Bush Stone-curlew	E	-	No	261.07	6,047
Callocephalon fimbriatum	Gang-gang Cockatoo	E	E	No	0.06	5
Haliaeetus leucogaster	White-bellied Sea-Eagle	V	-	No	29.75	944
Hamirostra melanosternon	Black-breasted Buzzard	V	-	No	2.38	49
Hemiaspis damelii	Grey Snake	E	E	No	190.31	6,577
Hieraaetus morphnoides	Little Eagle	V	-	No	42.80	1,078
Litoria raniformis	Southern Bell Frog	E	V	No	10.25	286
Lophochroa leadbeateri	Pink Cockatoo	V	E	No	50.26	1,800
Lophoictinia isura	Square-tailed Kite	V	-	No	39.84	986
Myotis macropus	Southern Myotis	V	-	No	20.73	333
Ninox connivens	Barking Owl	V	-	No	80.15	2,677
Pedionomus torquatus	Plains-wanderer	E	CE	Yes	1.19	70
Petaurus norfolcensis - *endangered* population	Squirrel Glider in the Wagga Wagga LGA	E	-	No	0.92	23
Phascolarctos cinereus	Koala	E	E	No	149.77	3,462
Polytelis swainsonii	Superb Parrot	V	V	No	29.81	704
Tyto novaehollandiae	Masked Owl	V	-	No	52.98	1,701
Total						**32,581**

(1) V = Vulnerable, E = Endangered, EP = Endangered Population, CE = Critically Endangered under the BC Act

(2) M = Migratory, V = Vulnerable, E = Endangered, CE = Critically Endangered under the EPBC Act

12.2 Ecosystem credits

12.2.1 Ecosystem credit requirement for the Murray Fans IBRA subregion

The ecosystem credit requirements, including offset trading group and hollow bearing tree credit profile, for impact to native vegetation within the Murray Fans IBRA subregion are summarised in Table 12.4 with the like for like trading options presented in Table 12.5. The full BAM calculator credit report is provided in Appendix E.

Table 12.4 Ecosystem credit class and matching credit profile summary for the Murray Fans IBRA subregion

PCT	Offset trading group	Area (ha)	HBT credits	No HBT credits	Credits
2 - River Red Gum-sedge dominated very tall open forest in frequently flooded forest wetland along major rivers and floodplains in south-western NSW	Inland Riverine Forests - < 50 % cleared group (including Tier 4 or higher threat status)	0.12	0	2	2
7 - River Red Gum - Warrego Grass - herbaceous riparian tall open forest wetland mainly in the Riverina Bioregion	Inland Riverine Forests - < 50 % cleared group (including Tier 4 or higher threat status)	4.7	65	0	65
10 - River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Inland Riverine Forests - < 50 % cleared group (including Tier 4 or higher threat status)	36.2	174	21	195
11 - River Red Gum - Lignum very tall open forest or woodland wetland on floodplains of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Inland Riverine Forests - < 50 % cleared group (including Tier 4 or higher threat status)	0.49	4	0	4
13 - Black Box - Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Inland Floodplain Woodlands - ≥ 50 % – < 70 % cleared group (including Tier 3 or higher threat status)	160.6	859	640	1499
15-Black Box open woodland wetland with chenopod understorey mainly on the outer floodplains in south-western NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Inland Floodplain Woodlands - ≥ 50 % – < 70 % cleared group (including Tier 3 or higher threat status)	28.3	199	60	259

PCT	Offset trading group	Area (ha)	HBT credits	No HBT credits	Credits
17-Lignum shrubland wetland of the semi-arid (warm) plains (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Inland Floodplain Shrublands - ≥ 50 % – < 70 % cleared group (including Tier 3 or higher threat status)	0.14	0	3	3
19-Cypress Pine woodland of source-bordering dunes mainly on the Murray and Murrumbidgee River floodplains	Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregions	1.6	0	45	45
28-White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone	Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregions	0.87	0	4	4
44-Forb-rich Speargrass - Windmill Grass - White Top grassland of the Riverina Bioregion	Natural Grasslands of the Murray Valley Plains	10.2	0	509	509
86-Yellow Gum tall woodland of the Murray River floodplain, Riverina Bioregion	Riverine Sandhill Woodlands - ≥ 70 % – <90 % cleared group (including Tier 2 or higher threat status)	0.05	0	3	3
160-Nitre Goosefoot shrubland wetland on clays of the inland floodplains	Inland Floodplain Shrublands - < 50 % cleared group (including Tier 4 or higher threat status)	0.18	0	3	3
163-Dillon Bush (Nitre Bush) shrubland of the semi-arid and arid zones	Riverine Chenopod Shrublands - < 50 % cleared group (including Tier 4 or higher threat status)	15.8	0	330	330
164-Cotton Bush open shrubland of the semi-arid (warm) zone	Riverine Chenopod Shrublands - < 50 % cleared group (including Tier 4 or higher threat status)	9	0	158	158
216-Black Roly Poly low open shrubland of the Riverina Bioregion and Murray Darling Depression Bioregion	Riverine Chenopod Shrublands - < 50 % cleared group (including Tier 4 or higher threat status)	0.7	0	12	12
237-Riverine Western Grey Box grassy woodland of the semi-arid (warm) climate zone	Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions	0.84	11	0	11
Totals					**3,102**

Table 12.5 Ecosystem credit like for like trading options for the Murray Fans IBRA subregion

Ecosystem credit (PCT)	Like for like option for vegetation class and PCT	Trading group	HBT	Credits	IBRA region
2 - River Red Gum-sedge dominated very tall open forest in frequently flooded forest wetland along major rivers and floodplains in south-western NSW	Inland Riverine Forests This includes PCT's: 2, 5, 7, 8, 9, 10, 11, 36, 78, 79, 112, 233, 234, 249, 356, 362, 4088, 4089	Inland Riverine Forests - < 50 % cleared group (including Tier 4 or higher threat status)	No	2	Murray Fans, Inland Slopes, Lower Slopes, Murrumbidgee, Robinvale Plains, South Olary Plain and Robinvale Plains. or Any IBRA subregion that is within 100 kilometres of the outer edge of the impacted site.
7 - River Red Gum - Warrego Grass - herbaceous riparian tall open forest wetland mainly in the Riverina Bioregion	Inland Riverine Forests This includes PCT's: 2, 5, 7, 8, 9, 10, 11, 36, 78, 79, 112, 233, 234, 249, 356, 362, 4088, 4089	Inland Riverine Forests - < 50 % cleared group (including Tier 4 or higher threat status)	Yes	65	Murray Fans, Inland Slopes, Lower Slopes, Murrumbidgee, Robinvale Plains, South Olary Plain and Robinvale Plains. or Any IBRA subregion that is within 100 kilometres of the outer edge of the impacted site.
10 - River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Inland Riverine Forests This includes PCT's: 2, 5, 7, 8, 9, 10, 11, 36, 78, 79, 112, 233, 234, 249, 356, 362, 4088, 4089	Inland Riverine Forests - < 50 % cleared group (including Tier 4 or higher threat status)	No	0	Murray Fans, Inland Slopes, Lower Slopes, Murrumbidgee, Robinvale Plains, South Olary Plain and Robinvale Plains. or Any IBRA subregion that is within 100 kilometres of the outer edge of the impacted site.
			Yes	95	
			Yes	79	
			No	21	
			No	0	

Ecosystem credit (PCT)	Like for like option for vegetation class and PCT	Trading group	HBT	Credits	IBRA region
11 - River Red Gum - Lignum very tall open forest or woodland wetland on floodplains of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Inland Riverine Forests This includes PCT's: 2, 5, 7, 8, 9, 10, 11, 36, 78, 79, 112, 233, 234, 249, 356, 362, 4088, 4089	Inland Riverine Forests - < 50 % cleared group (including Tier 4 or higher threat status)	Yes	4	Murray Fans, Inland Slopes, Lower Slopes, Murrumbidgee, Robinvale Plains, South Olary Plain and Robinvale Plains. or Any IBRA subregion that is within 100 kilometres of the outer edge of the impacted site.
13 - Black Box - Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Inland Floodplain Woodlands This includes PCT's: 13, 15, 16, 83, 438, 454, 630	Inland Floodplain Woodlands - ≥ 50 % - < 70 % cleared group (including Tier 3 or higher threat status)	No	0	Murray Fans, Inland Slopes, Lower Slopes, Murrumbidgee, Robinvale Plains, South Olary Plain and Robinvale Plains. or Any IBRA subregion that is within 100 kilometres of the outer edge of the impacted site.
			Yes	859	
			No	300	
			No	337	
			No	0	
			No	3	
15-Black Box open woodland wetland with chenopod understorey mainly on the outer floodplains in south-western NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Inland Floodplain Woodlands This includes PCT's: 13, 15, 16, 83, 438, 454, 630	Inland Floodplain Woodlands - ≥ 50 % - < 70 % cleared group (including Tier 3 or higher threat status)	No	0	Murray Fans, Inland Slopes, Lower Slopes, Murrumbidgee, Robinvale Plains, South Olary Plain and Robinvale Plains. or Any IBRA subregion that is within 100 kilometres of the outer edge of the impacted site.
			Yes	199	
			No	27	
			No	33	
			No	0	

Ecosystem credit (PCT)	Like for like option for vegetation class and PCT	Trading group	HBT	Credits	IBRA region
17-Lignum shrubland wetland of the semi-arid (warm) plains (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Inland Floodplain Shrublands This includes PCT's: 17, 115, 161, 241, 247, 375	Inland Floodplain Shrublands - ≥ 50 % - < 70 % cleared group (including Tier 3 or higher threat status)	No	3	Murray Fans, Inland Slopes, Lower Slopes, Murrumbidgee, Robinvale Plains, South Olary Plain and Robinvale Plains. or Any IBRA subregion that is within 100 kilometres of the outer edge of the impacted site.
19-Cypress Pine woodland of source-bordering dunes mainly on the Murray and Murrumbidgee River floodplains	Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregions This includes PCT's: 19, 21, 28, 48, 75	Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregions	No	45	Murray Fans, Inland Slopes, Lower Slopes, Murrumbidgee, Robinvale Plains, South Olary Plain and Robinvale Plains. or Any IBRA subregion that is within 100 kilometres of the outer edge of the impacted site.
28-White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone	Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregions This includes PCT's: 19, 21, 28, 48, 75	Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregions	No No	0 4	Murray Fans, Inland Slopes, Lower Slopes, Murrumbidgee, Robinvale Plains, South Olary Plain and Robinvale Plains. or Any IBRA subregion that is within 100 kilometres of the outer edge of the impacted site.

Ecosystem credit (PCT)	Like for like option for vegetation class and PCT	Trading group	HBT	Credits	IBRA region
44-Forb-rich Speargrass - Windmill Grass - White Top grassland of the Riverina Bioregion	Natural Grasslands of the Murray Valley Plains This includes PCT's: 44, 45, 46	Natural Grasslands of the Murray Valley Plains	No	509	Murray Fans, Inland Slopes, Lower Slopes, Murrumbidgee, Robinvale Plains, South Olary Plain and Robinvale Plains. or Any IBRA subregion that is within 100 kilometres of the outer edge of the impacted site.
86-Yellow Gum tall woodland of the Murray River floodplain, Riverina Bioregion	Riverine Sandhill Woodlands This includes PCT's: 19, 20, 21, 22, 23, 28, 48, 75, 86	Riverine Sandhill Woodlands - ≥ 70 % - <90 % cleared group (including Tier 2 or higher threat status)	No	3	Murray Fans, Inland Slopes, Lower Slopes, Murrumbidgee, Robinvale Plains, South Olary Plain and Robinvale Plains. or Any IBRA subregion that is within 100 kilometres of the outer edge of the impacted site.
160-Nitre Goosefoot shrubland wetland on clays of the inland floodplains	Inland Floodplain Shrublands This includes PCT's: 17, 24, 25, 115, 160, 161, 240, 241, 247, 261, 271, 375	Inland Floodplain Shrublands - < 50 % cleared group (including Tier 4 or higher threat status)	No	2	Murray Fans, Inland Slopes, Lower Slopes, Murrumbidgee, Robinvale Plains, South Olary Plain and Robinvale Plains. or Any IBRA subregion that is within 100 kilometres of the outer edge of the impacted site.
			No	1	

Ecosystem credit (PCT)	Like for like option for vegetation class and PCT	Trading group	HBT	Credits	IBRA region
163-Dillon Bush (Nitre Bush) shrubland of the semi-arid and arid zones	Riverine Chenopod Shrublands This includes PCT's: 157, 158, 159, 163, 164, 168, 195, 196, 211, 212, 216, 236, 254, 377, 466	Riverine Chenopod Shrublands - < 50 % cleared group (including Tier 4 or higher threat status)	No	11	Murray Fans, Inland Slopes, Lower Slopes, Murrumbidgee, Robinvale Plains, South Olary Plain and Robinvale Plains. or Any IBRA subregion that is within 100 kilometres of the outer edge of the impacted site.
			No	293	
			No	26	
164-Cotton Bush open shrubland of the semi-arid (warm) zone	Riverine Chenopod Shrublands This includes PCT's: 157, 158, 159, 163, 164, 168, 195, 196, 211, 212, 216, 236, 254, 377, 466	Riverine Chenopod Shrublands - < 50 % cleared group (including Tier 4 or higher threat status)	No	80	Murray Fans, Inland Slopes, Lower Slopes, Murrumbidgee, Robinvale Plains, South Olary Plain and Robinvale Plains. or Any IBRA subregion that is within 100 kilometres of the outer edge of the impacted site.
			No	76	
			No	2	
216-Black Roly Poly low open shrubland of the Riverina Bioregion and Murray Darling Depression Bioregion	Riverine Chenopod Shrublands This includes PCT's: 157, 158, 159, 163, 164, 168, 195, 196, 211, 212, 216, 236, 254, 377, 466	Riverine Chenopod Shrublands - < 50 % cleared group (including Tier 4 or higher threat status)	No	12	Murray Fans, Inland Slopes, Lower Slopes, Murrumbidgee, Robinvale Plains, South Olary Plain and Robinvale Plains. or Any IBRA subregion that is within 100 kilometres of the outer edge of the impacted site.
237-Riverine Western Grey Box grassy woodland of the semi-arid (warm) climate zone	Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions This includes PCT's: 76, 80, 81, 82, 101, 110, 237, 248, 267, 3405	Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions	Yes	11	Murray Fans, Inland Slopes, Lower Slopes, Murrumbidgee, Robinvale Plains, South Olary Plain and Robinvale Plains. or Any IBRA subregion that is within 100 kilometres of the outer edge of the impacted site.

12.2.2 Ecosystem credit requirement for the Murrumbidgee IBRA subregion

The ecosystem credit requirements, including offset trading group and hollow bearing tree credit profile, for impact to native vegetation within the Murrumbidgee IBRA subregion are summarised in Table 12.6 with the like for like trading options presented in Table 12.7. The full BAM calculator credit report is provided in Appendix E.

Table 12.6 Ecosystem credit class and matching credit profile summary for the Murrumbidgee IBRA subregion

PCT	Offset trading group	Area (ha)	HBT credits	No HBT credits	Credits
13-Black Box - Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Inland Floodplain Woodlands – ≥ 50% - < 70% cleared group (including Tier 3 or higher threat status)	3.8	56	1	57
15-Black Box open woodland wetland with chenopod understorey mainly on the outer floodplains in south-western NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Inland Floodplain Woodlands – ≥ 50% - < 70% cleared group (including Tier 3 or higher threat status)	71.5	879	102	981
17-Lignum shrubland wetland of the semi-arid (warm) plains (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Inland Floodplain Shrublands – ≥ 50% - < 70% cleared group (including Tier 3 or higher threat status)	14.9	0	372	372
20-Buloke - Moonah - Black Box open woodland on sandy rises of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	*Allocasuarina luehmannii* Woodland in the Riverina and Murray-Darling Depression Bioregions	2	0	9	9
23-Yarran tall open shrubland of the sandplains and plains of the semi-arid (warm) and arid climate zones	*Acacia melvillei* Shrubland in the Riverina and Murray-Darling Depression bioregions	9.9	0	109	109
24-Canegrass swamp tall grassland wetland of drainage depressions, lakes and pans of the inland plains	Inland Floodplain Shrublands – < 50% cleared group (including Tier 4 or higher threat status)	7	0	126	126
26-Weeping Myall open woodland of the Riverina Bioregion and NSW South Western Slopes Bioregion	Weeping Myall Woodlands	316.9	1,311	1,807	3,118
28-White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone	Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregions	39.9	0	535	535
44-Forb-rich Speargrass - Windmill Grass - White Top grassland of the Riverina Bioregion	Natural Grasslands of the Murray Valley Plains	23.6	0	1,151	1,151

PCT	Offset trading group	Area (ha)	HBT credits	No HBT credits	Credits
45-Plains Grass grassland on alluvial mainly clay soils in the Riverina Bioregion and NSW South Western Slopes Bioregion	Natural Grasslands of the Murray Valley Plains	9.5	0	451	451
46-Curly Windmill Grass - speargrass - wallaby grass grassland on alluvial clay and loam on the Hay Plain, Riverina Bioregion	Natural Grasslands of the Murray Valley Plains	58.4	0	2,778	2,778
47-Swamp grassland wetland of the Riverine Plain	Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains	0.17	0	9	9
58-Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion	Semi-arid Sand Plain Woodlands – ≥ 50% - < 70% cleared group (including Tier 3 or higher threat status)	1.0	7	5	12
70-White Cypress Pine woodland on sandy loams in central NSW wheatbelt	Floodplain Transition Woodlands – ≥ 50% - < 70% cleared group (including Tier 3 or higher threat status)	0.16	0	5	5
157-Bladder Saltbush shrubland on alluvial plains in the semi-arid (warm) zone including Riverina Bioregion	Riverine Chenopod Shrublands – ≥ 50% - < 70% cleared group (including Tier 3 or higher threat status)	99.46	0	2,686	2,686
159-Old Man Saltbush shrubland mainly of the semi-arid (warm) climate zone (south western NSW)	Riverine Chenopod Shrublands – ≥ 90% cleared group (including Tier 1 or higher threat status)	0.05	0	3	3
160-Nitre Goosefoot shrubland wetland on clays of the inland floodplains	Inland Floodplain Shrublands – < 50% cleared group (including Tier 4 or higher threat status)	16.7	0	374	374
163-Dillon Bush (Nitre Bush) shrubland of the semi-arid and arid zones	Riverine Chenopod Shrublands – < 50% cleared group (including Tier 4 or higher threat status)	63.24	0	1,552	1,552
164-Cotton Bush open shrubland of the semi-arid (warm) zone	Riverine Chenopod Shrublands – < 50% cleared group (including Tier 4 or higher threat status)	348.7	0	7,890	7,890
170-Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones	Sand Plain Mallee Woodlands – < 50% cleared group (including Tier 4 or higher threat status)	5.6	30	0	30
216-Black Roly Poly low open shrubland of the Riverina Bioregion and Murray Darling Depression Bioregion	Riverine Chenopod Shrublands – < 50% cleared group (including Tier 4 or higher threat status)	9.8	0	245	245
Total					**22,493**

Table 12.7 Ecosystem credit like for like trading options for the Murrumbidgee IBRA subregion

Ecosystem credit (PCT)	Like for like option for vegetation class and PCT	Trading group	HBT	Credits	IBRA region
13 - Black Box - Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Inland Floodplain Woodlands This includes PCT's: 13, 15, 16, 83, 438, 454, 630	Inland Floodplain Woodlands - ≥ 50 % - < 70 % cleared group (including Tier 3 or higher threat status).	Yes	56	Murrumbidgee, Darling Depression, Lachlan, Lachlan Plains, Lower Slopes, Murray Fans, Robinvale Plains and South Olary Plain. or Any IBRA subregion that is within 100 kilometres of the outer edge of the impacted site.
			No	1	
15 - Black Box open woodland wetland with chenopod understorey mainly on the outer floodplains in south-western NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Inland Floodplain Woodlands This includes PCT's: 13, 15, 16, 83, 438, 454, 630	Inland Floodplain Woodlands - ≥ 50 % - < 70 % cleared group (including Tier 3 or higher threat status)	No	73	Murrumbidgee, Darling Depression, Lachlan, Lachlan Plains, Lower Slopes, Murray Fans, Robinvale Plains and South Olary Plain. or Any IBRA subregion that is within 100 kilometres of the outer edge of the impacted site.
			Yes	876	
			No	10	
			No	19	
17 - Lignum shrubland wetland of the semi-arid (warm) plains (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Inland Floodplain Shrublands This includes PCT's: 17, 115, 161, 241, 247, 375	Inland Floodplain Shrublands - ≥ 50 % - < 70 % cleared group (including Tier 3 or higher threat status)	No	298	Murrumbidgee, Darling Depression, Lachlan, Lachlan Plains, Lower Slopes, Murray Fans, Robinvale Plains and South Olary Plain. or Any IBRA subregion that is within 100 kilometres of the outer edge of the impacted site.
			No	74	

Ecosystem credit (PCT)	Like for like option for vegetation class and PCT	Trading group	HBT	Credits	IBRA region
20 - Buloke - Moonah - Black Box open woodland on sandy rises of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	*Allocasuarina luehmannii* Woodland in the Riverina and Murray-Darling Depression Bioregions This includes PCT's: 20, 22	*Allocasuarina luehmannii* Woodland in the Riverina and Murray-Darling Depression Bioregions	No	8	Murrumbidgee, Darling Depression, Lachlan, Lachlan Plains, Lower Slopes, Murray Fans, Robinvale Plains and South Olary Plain. or Any IBRA subregion that is within 100 kilometres of the outer edge of the impacted site.
			No	1	
			No	0	
23 - Yarran tall open shrubland of the sandplains and plains of the semi-arid (warm) and arid climate zones	*Acacia melvillei* Shrubland in the Riverina and Murray-Darling Depression bioregions This includes PCT's: 23, 28, 58, 128, 170, 173	*Acacia melvillei* Shrubland in the Riverina and Murray-Darling Depression bioregions	No	21	Murrumbidgee, Darling Depression, Lachlan, Lachlan Plains, Lower Slopes, Murray Fans, Robinvale Plains and South Olary Plain. or Any IBRA subregion that is within 100 kilometres of the outer edge of the impacted site.
			No	22	
			No	60	
			No	6	
24 - Canegrass swamp tall grassland wetland of drainage depressions, lakes and pans of the inland plains	Inland Floodplain Shrublands This includes PCT's: 17, 24, 25, 115, 160, 161, 240, 241, 247, 261, 271, 375	Inland Floodplain Shrublands - < 50 % cleared group (including Tier 4 or higher threat status)	No	126	Murrumbidgee, Darling Depression, Lachlan, Lachlan Plains, Lower Slopes, Murray Fans, Robinvale Plains and South Olary Plain. or Any IBRA subregion that is within 100 kilometres of the outer edge of the impacted site.

Ecosystem credit (PCT)	Like for like option for vegetation class and PCT	Trading group	HBT	Credits	IBRA region
26 - Weeping Myall open woodland of the Riverina Bioregion and NSW South Western Slopes Bioregion	Weeping Myall Woodlands This includes PCT's: 26, 27, 1766	Weeping Myall Woodlands	No	0	Murrumbidgee, Darling Depression, Lachlan, Lachlan Plains, Lower Slopes, Murray Fans, Robinvale Plains and South Olary Plain. or Any IBRA subregion that is within 100 kilometres of the outer edge of the impacted site.
			No	0	
			No	1,757	
			No	1,311	
			No	50	
28 - White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone	Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregions This includes PCT's: 19, 21, 28, 48, 75	Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregions	No	154	Murrumbidgee, Darling Depression, Lachlan, Lachlan Plains, Lower Slopes, Murray Fans, Robinvale Plains and South Olary Plain. or Any IBRA subregion that is within 100 kilometres of the outer edge of the impacted site.
			No	8	
			No	39	
			No	36	
			No	227	
			No	71	
44 - Forb-rich Speargrass - Windmill Grass - White Top grassland of the Riverina Bioregion	Natural Grasslands of the Murray Valley Plains This includes PCT's: 44, 45, 46	Natural Grasslands of the Murray Valley Plains	No	711	Murrumbidgee, Darling Depression, Lachlan, Lachlan Plains, Lower Slopes, Murray Fans, Robinvale Plains and South Olary Plain. or Any IBRA subregion that is within 100 kilometres of the outer edge of the impacted site.
			No	440	

Ecosystem credit (PCT)	Like for like option for vegetation class and PCT	Trading group	HBT	Credits	IBRA region
45 - Plains Grass grassland on alluvial mainly clay soils in the Riverina Bioregion and NSW South Western Slopes Bioregion	Natural Grasslands of the Murray Valley Plains This includes PCT's: 44, 45, 46	Natural Grasslands of the Murray Valley Plains	No	153	Murrumbidgee, Darling Depression, Lachlan, Lachlan Plains, Lower Slopes, Murray Fans, Robinvale Plains and South Olary Plain. or Any IBRA subregion that is within 100 kilometres of the outer edge of the impacted site.
			No	298	
46 - Curly Windmill Grass - speargrass - wallaby grass grassland on alluvial clay and loam on the Hay Plain, Riverina Bioregion	Natural Grasslands of the Murray Valley Plains This includes PCT's: 44, 45, 46	Natural Grasslands of the Murray Valley Plains	No	1,824	Murrumbidgee, Darling Depression, Lachlan, Lachlan Plains, Lower Slopes, Murray Fans, Robinvale Plains and South Olary Plain. or Any IBRA subregion that is within 100 kilometres of the outer edge of the impacted site.
			No	954	
47 - Swamp grassland wetland of the Riverine Plain	Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains This includes PCT's: 47, 360	Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains	No	9	Murrumbidgee Darling Depression, Lachlan, Lachlan Plains, Lower Slopes, Murray Fans, Robinvale Plains and South Olary Plain. or Any IBRA subregion that is within 100 kilometres of the outer edge of the impacted site.

Ecosystem credit (PCT)	Like for like option for vegetation class and PCT	Trading group	HBT	Credits	IBRA region
58 - Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion	Semi-arid Sand Plain Woodlands This includes PCT's: 58, 252	Semi-arid Sand Plain Woodlands - ≥ 50 % - < 70 % cleared group (including Tier 3 or higher threat status)	Yes	5	Murrumbidgee, Darling Depression, Lachlan, Lachlan Plains, Lower Slopes, Murray Fans, Robinvale Plains and South Olary Plain. or Any IBRA subregion that is within 100 kilometres of the outer edge of the impacted site.
			No	7	
70 - White Cypress Pine woodland on sandy loams in central NSW wheatbelt	Floodplain Transition Woodlands This includes PCT's: 56, 70, 74, 76, 80, 81, 82, 101, 237, 244, 248, 251, 628	Floodplain Transition Woodlands - ≥ 50 % - < 70 % cleared group (including Tier 3 or higher threat status)	No	5	Murrumbidgee, Darling Depression, Lachlan, Lachlan Plains, Lower Slopes, Murray Fans, Robinvale Plains and South Olary Plain. or Any IBRA subregion that is within 100 kilometres of the outer edge of the impacted site.
157 - Bladder Saltbush shrubland on alluvial plains in the semi-arid (warm) zone including Riverina Bioregion	Riverine Chenopod Shrublands This includes PCT's: 157, 158, 159, 195, 196, 211, 377	Riverine Chenopod Shrublands - ≥ 50 % - < 70 % cleared group (including Tier 3 or higher threat status)	No	2,450	Murrumbidgee, Darling Depression, Lachlan, Lachlan Plains, Lower Slopes, Murray Fans, Robinvale Plains and South Olary Plain. or Any IBRA subregion that is within 100 kilometres of the outer edge of the impacted site.
			No	236	

Ecosystem credit (PCT)	Like for like option for vegetation class and PCT	Trading group	HBT	Credits	IBRA region
159 - Old Man Saltbush shrubland mainly of the semi-arid (warm) climate zone (south western NSW)	Riverine Chenopod Shrublands This includes PCT's: 159, 195	Riverine Chenopod Shrublands - ≥ 90 % cleared group (including Tier 1 or higher threat status)	No	3	Murrumbidgee, Darling Depression, Lachlan, Lachlan Plains, Lower Slopes, Murray Fans, Robinvale Plains and South Olary Plain. or Any IBRA subregion that is within 100 kilometres of the outer edge of the impacted site.
160 - Nitre Goosefoot shrubland wetland on clays of the inland floodplains	Inland Floodplain Shrublands This includes PCT's: 17, 24, 25, 115, 160, 161, 240, 241, 247, 261, 271, 375	Inland Floodplain Shrublands - < 50 % cleared group (including Tier 4 or higher threat status)	No	340	Murrumbidgee, Darling Depression, Lachlan, Lachlan Plains, Lower Slopes, Murray Fans, Robinvale Plains and South Olary Plain. or Any IBRA subregion that is within 100 kilometres of the outer edge of the impacted site.
			No	34	
163 - Dillon Bush (Nitre Bush) shrubland of the semi-arid and arid zones	Riverine Chenopod Shrublands This includes PCT's: 157, 158, 159, 163, 164, 168, 195, 196, 211, 212, 216, 236, 254, 377, 466	Riverine Chenopod Shrublands - < 50 % cleared group (including Tier 4 or higher threat status)	No	1,270	Murrumbidgee, Darling Depression, Lachlan, Lachlan Plains, Lower Slopes, Murray Fans, Robinvale Plains and South Olary Plain. or Any IBRA subregion that is within 100 kilometres of the outer edge of the impacted site.
			No	282	

Ecosystem credit (PCT)	Like for like option for vegetation class and PCT	Trading group	HBT	Credits	IBRA region
164 - Cotton Bush open shrubland of the semi-arid (warm) zone	Riverine Chenopod Shrublands This includes PCT's: 157, 158, 159, 163, 164, 168, 195, 196, 211, 212, 216, 236, 254, 377, 466	Riverine Chenopod Shrublands - < 50 % cleared group (including Tier 4 or higher threat status)	No	5,499	Murrumbidgee, Darling Depression, Lachlan, Lachlan Plains, Lower Slopes, Murray Fans, Robinvale Plains and South Olary Plain. or Any IBRA subregion that is within 100 kilometres of the outer edge of the impacted site.
			No	2,391	
170 - Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones	Sand Plain Mallee Woodlands This includes PCT's: 142, 170, 173, 174, 190, 193, 355, 474	Sand Plain Mallee Woodlands - < 50 % cleared group (including Tier 4 or higher threat status)	No	0	Murrumbidgee, Darling Depression, Lachlan, Lachlan Plains, Lower Slopes, Murray Fans, Robinvale Plains and South Olary Plain. or Any IBRA subregion that is within 100 kilometres of the outer edge of the impacted site.
			Yes	30	
216 - Black Roly Poly low open shrubland of the Riverina Bioregion and Murray Darling Depression Bioregion	Riverine Chenopod Shrublands This includes PCT's: 157, 158, 159, 163, 164, 168, 195, 196, 211, 212, 216, 236, 254, 377, 466	Riverine Chenopod Shrublands - < 50 % cleared group (including Tier 4 or higher threat status)	No	245	Murrumbidgee, Darling Depression, Lachlan, Lachlan Plains, Lower Slopes, Murray Fans, Robinvale Plains and South Olary Plain. or Any IBRA subregion that is within 100 kilometres of the outer edge of the impacted site.

12.2.3 Ecosystem credit requirement for the Inland Slopes IBRA subregion

The ecosystem credit requirements, including offset trading group and hollow bearing tree credit profile, for impact to native vegetation within the Inland Slopes IBRA subregion are summarised in Table 12.8 with the like for like trading options presented in Table 12.9. The full BAM calculator credit report is provided in Appendix E.

Table 12.8 Ecosystem credit class and matching credit profile summary for the Inland Slopes IBRA subregion

PCT	Offset trading group	Area (ha)	HBT credits	No HBT credits	Credits
76 - Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions	0.3	4	0	4
266 - White Box grassy woodland in the upper slopes subregion of the NSW South Western Slopes Bioregion	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands	0.18	5	0	5
277-Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands	44.09	82	10	92
319-Tumbledown Red Gum - White Cypress Pine hill woodland in the southern part of the NSW South Western Slopes Bioregion	Inland Rocky Hill Woodlands - ≥ 50 % - < 70 % cleared group (including Tier 3 or higher threat status)	12.53	0	11	11
343-Mugga Ironbark - Red Box - Red Stringybark - Western Grey Box grass/shrub woodland on metamorphic substrates in the Tarcutta - Gundagai region, NSW South Western Slopes Bioregion	Western Slopes Dry Sclerophyll Forests - ≥ 70 % - <90 % cleared group (including Tier 2 or higher threat status)	0.01	0	1	1
Total					**113**

Table 12.9 Ecosystem credit like for like trading options for the Inland Slopes IBRA subregion

Ecosystem credit (PCT)	Like for like option for vegetation class and PCT	Trading group	HBT	Credits	IBRA region
76 - Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions This includes PCT's: 76, 80, 81, 82, 101, 110, 237, 248, 267, 3405	Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions	Yes	4	Inland Slopes, Bogan-Macquarie, Bondo, Capertee Uplands, Capertee Valley, Crookwell, Hill End, Kerrabee, Lower Slopes, Murray Fans, Murrumbateman, Orange, Pilliga, Talbragar Valley and Wollemi. or Any IBRA subregion that is within 100 kilometres of the outer edge of the impacted site.
266 - White Box grassy woodland in the upper slopes subregion of the NSW South Western Slopes Bioregion	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands This includes PCT's: 74, 75, 83, 250, 266, 267, 268, 270, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 286, 298, 302, 312, 341, 342, 347, 350, 352, 356, 367, 381, 382, 395, 401, 403, 421, 433, 434, 435, 436, 437, 451, 483, 484, 488, 492, 496, 508, 509, 510, 511, 516, 528, 538, 544, 563, 567, 571, 589, 590, 597, 599, 618, 619, 622, 633, 654, 702, 703, 704, 705, 710, 711, 796, 797, 799, 847, 851, 921, 1099, 1303, 1304, 1307, 1324, 1329, 1330, 1332, 1383, 1606, 1608, 1611, 1691, 1693, 1695, 1698, 3314, 3359, 3363, 3373, 3376, 3387, 3388, 3394, 3395, 3396, 3397, 3398, 3399, 3406, 3415, 3533, 4147, 4149, 4150	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands	Yes Yes	4 1	Inland Slopes, Bogan-Macquarie, Bondo, Capertee Uplands, Capertee Valley, Crookwell, Hill End, Kerrabee, Lower Slopes, Murray Fans, Murrumbateman, Orange, Pilliga, Talbragar Valley and Wollemi. or Any IBRA subregion that is within 100 kilometres of the outer edge of the impacted site.

Ecosystem credit (PCT)	Like for like option for vegetation class and PCT	Trading group	HBT	Credits	IBRA region
277-Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands This includes PCT's: 74, 75, 83, 250, 266, 267, 268, 270, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 286, 298, 302, 312, 341, 342, 347, 350, 352, 356, 367, 381, 382, 395, 401, 403, 421, 433, 434, 435, 436, 437, 451, 483, 484, 488, 492, 496, 508, 509, 510, 511, 516, 528, 538, 544, 563, 567, 571, 589, 590, 597, 599, 618, 619, 622, 633, 654, 702, 703, 704, 705, 710, 711, 796, 797, 799, 847, 851, 921, 1099, 1303, 1304, 1307, 1324, 1329, 1330, 1332, 1383, 1606, 1608, 1611, 1691, 1693, 1695, 1698, 3314, 3359, 3363, 3373, 3376, 3387, 3388, 3394, 3395, 3396, 3397, 3398, 3399, 3406, 3415, 3533, 4147, 4149, 4150	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands	No	0	Inland Slopes, Bogan-Macquarie, Bondo, Capertee Uplands, Capertee Valley, Crookwell, Hill End, Kerrabee, Lower Slopes, Murray Fans, Murrumbateman, Orange, Pilliga, Talbragar Valley and Wollemi. or Any IBRA subregion that is within 100 kilometres of the outer edge of the impacted site.
			Yes	82	
			No	10	
319-Tumbledown Red Gum - White Cypress Pine hill woodland in the southern part of the NSW South Western Slopes Bioregion	Inland Rocky Hill Woodlands This includes PCT's: 177, 178, 318, 319	Inland Rocky Hill Woodlands - ≥ 50 % - < 70 % cleared group (including Tier 3 or higher threat status)	No	0	Inland Slopes, Bogan-Macquarie, Bondo, Capertee Uplands, Capertee Valley, Crookwell, Hill End, Kerrabee, Lower Slopes, Murray Fans, Murrumbateman, Orange, Pilliga, Talbragar Valley and Wollemi. or Any IBRA subregion that is within 100 kilometres of the outer edge of the impacted site.
			No	11	

Ecosystem credit (PCT)	Like for like option for vegetation class and PCT	Trading group	HBT	Credits	IBRA region
319-Tumbledown Red Gum - White Cypress Pine hill woodland in the southern part of the NSW South Western Slopes Bioregion	Western Slopes Dry Sclerophyll Forests This includes PCT's: 54, 110, 333, 341, 343, 358, 472, 1279, 1668	Western Slopes Dry Sclerophyll Forests - ≥ 70 % - <90 % cleared group (including Tier 2 or higher threat status)	No	0	Inland Slopes, Bogan-Macquarie, Bondo, Capertee Uplands, Capertee Valley, Crookwell, Hill End, Kerrabee, Lower Slopes, Murray Fans, Murrumbateman, Orange, Pilliga, Talbragar Valley and Wollemi. or Any IBRA subregion that is within 100 kilometres of the outer edge of the impacted site.
			No	1	

12.3 Species credits

12.3.1 Species credit requirement for the Murray Fans IBRA subregion

The species credit requirements, for impact to native vegetation within the Murray Fans IBRA subregion are summarised in Table 12.10. The full BAM calculator credit report is provided in Appendix E.

Table 12.10 Species credit classes and summary for the Murray Fans IBRA subregion

Species credit	Vegetation Zone/s names	Area (ha) / Count[1]	Credits	IBRA region
Amphibromus fluitans / Floating Swamp Wallaby-grass	11_Moderate-good, 17_Moderate-good, 160_Moderate-good, 2_SVTM	0.43	11	Any in NSW
Ardeotis australis / Australian Bustard	15_SVTM, 44_SVTM, 163_Moderate-good, 163_SVTM	11.07	570	Any in NSW
Austrostipa metatoris / A spear-grass	7_Moderate-good, 28_Derived_TS, 19_SVTM, 28_Derived	1.24	26	Any in NSW
Austrostipa wakoolica / A spear-grass	28_Derived, 28_Derived_TS	0.39	2	Any in NSW
Burhinus grallarius / Bush Stone-curlew	7_Moderate-good, 10_Moderate-good, 10_Thinned, 13_Moderate-good, 13_Thinned, 15_Moderate-good, 15_Thinned, 216_Moderate-good, 2_SVTM, 10_SVTM, 13_SVTM, 15_SVTM	59.43	1,399	Any in NSW
Eleocharis obicis / Spike-Rush	10_Derived, 10_Moderate-good, 10_Thinned, 13_Moderate-good, 13_Thinned, 164_Moderate-good, 10_SVTM, 13_SVTM, 163_SVTM, 13_Derived	29.27	559	Any in NSW
Eucalyptus leucoxylon subsp. *pruinosa* / Yellow Gum[2]	13_SVTM, 15_SVTM, 19_SVTM, 86_Moderate-good	4	8	Any in NSW
Haliaeetus leucogaster / White-bellied Sea-Eagle	7_Moderate-good, 10_Moderate-good, 10_Thinned, 13_Moderate-good, 13_Thinned, 2_SVTM, 10_SVTM, 13_SVTM, 15_SVTM	29.75	944	Any in NSW
Hamirostra melanosternon / Black-breasted Buzzard	10_Moderate-good, 10_SVTM, 13_Moderate-good, 13_SVTM, 15_SVTM	2.38	49	Any in NSW

Species credit	Vegetation Zone/s names	Area (ha) / Count[1]	Credits	IBRA region
Hemiaspis damelii / Grey Snake	7_Moderate-good, 10_Moderate-good, 10_Thinned, 11_Moderate-good, 13_Moderate-good, 13_Thinned, 15_Moderate-good, 15_Thinned, 17_Moderate-good, 2_SVTM, 10_SVTM, 13_SVTM, 15_SVTM, 19_SVTM	61.97	1,478	Any in NSW
Hieraaetus morphnoides / Little Eagle	7_Moderate-good, 10_Moderate-good, 10_Thinned, 13_Moderate-good, 13_Thinned, 2_SVTM, 10_SVTM, 13_SVTM, 15_SVTM, 19_SVTM	41.90	1,043	Any in NSW
Lepidium monoplocoides / Winged Peppercress	13_Moderate-good, 13_Thinned, 13_SVTM, 15_SVTM, 163_SVTM, 13_Derived	28.37	609	Any in NSW
Litoria raniformis / Southern Bell Frog	7_Moderate-good, 10_Derived, 10_Moderate-good, 10_Thinned, 11_Moderate-good, 13_Derived_LCV, 13_Moderate-good, 13_Thinned, 15_Derived_LCV, 15_Moderate-good, 15_Thinned, 160_Moderate-good, 163_Moderate-good, 237_Moderate-good, 13_SVTM, 44_SVTM, 13_Derived, 15_Derived, 163_Derived_LCV, 13_Planted Native Vegetation	8.57	213	Any in NSW
Lophochroa leadbeateri / Pink Cockatoo	7_Moderate-good, 10_Moderate-good, 10_Thinned, 13_Moderate-good, 13_Thinned, 2_SVTM, 10_SVTM, 13_SVTM, 15_SVTM, 19_SVTM	43.66	1,470	Any in NSW
Lophoictinia isura / Square-tailed Kite	2_SVTM, 10_Moderate-good, 10_Thinned, 10_SVTM, 13_Moderate-good, 13_Thinned, 13_SVTM, 15_SVTM	38.92	986	Any in NSW
Maireana cheelii / Chariot Wheels	164_Moderate-good, 44_SVTM	10.02	500	Any in NSW
Myotis macropus / Southern Myotis	7_Moderate-good, 10_Derived, 10_Moderate-good, 10_Thinned, 11_Moderate-good, 237_Moderate-good, 2_SVTM, 10_SVTM	20.73	333	Any in NSW
Ninox connivens / Barking Owl	7_Moderate-good, 10_Moderate-good, 13_Moderate-good, 13_Thinned, 15_Moderate-good, 15_Thinned, 2_SVTM, 10_SVTM, 13_SVTM, 15_SVTM	51.83	1,659	Any in NSW

Species credit	Vegetation Zone/s names	Area (ha) / Count[1]	Credits	IBRA region
Phascolarctos cinereus / Koala	7_Moderate-good, 10_Moderate-good, 10_Thinned, 11_Moderate-good, 13_Moderate-good, 13_Thinned, 15_Moderate-good, 15_Thinned, 237_Moderate-good, 2_SVTM, 10_SVTM, 13_SVTM, 15_SVTM	145.25	3,330	Any in NSW
Pilularia novae-hollandiae / Austral Pillwort	13_Moderate-good, 13_Thinned, 15_Moderate-good, 2_SVTM, 13_SVTM, 15_SVTM, 44_SVTM, 13_Derived, 13_Planted Native Vegetation	41.57	1,165	Any in NSW
Polytelis swainsonii / Superb Parrot	10_SVTM, 13_SVTM	25.20	539	Any in NSW
Prasophyllum sp. Moama / *Prasophyllum* sp. Moama	44_SVTM	9.88	741	Any in NSW
Pterostylis despectans / Pterostylis despectans	44_SVTM	9.88	741	Any in NSW
Tyto novaehollandiae / Masked Owl	7_Moderate-good, 10_Moderate-good, 10_Thinned, 13_Moderate-good, 13_Thinned, 10_SVTM, 13_SVTM	45.62	1,430	Any in NSW

(1) Area (ha) rounding as per BAM-C case 00053398/BAAS23009/24/00053401 output

(2) Species are a 'count' species under the BAM where the assumed loss of habitat (ha) is a representation of areas not subject to targeted flora surveys where suitable habitat for the species may occur. A representative one individual has been entered for each vegetation zone subject to impact where suitable habitat has been identified.

12.3.2 Species credit requirements for the Murrumbidgee IBRA subregion

The species credit requirements, for impact to native vegetation within the Murrumbidgee IBRA subregion are summarised in Table 12.11. The full BAM calculator credit report is provided in Appendix E.

Table 12.11 Species credit classes and summary for the Murrumbidgee IBRA subregion

Species credit	Vegetation Zone/s names	Area (ha) / Count[1]	Credits	IBRA region
Austrostipa wakoolica / A spear-grass	26_Derived, 26_Moderate-good, 26_Thinned, 17_SVTM, 26_SVTM, 28_SVTM	28.42	587	Any in NSW
Ardeotis australis / Australian Bustard	28_SVTM, 46_SVTM, 157_Moderate-good, 157_SVTM, 160_SVTM, 163_Moderate-good, 163_SVTM, 164_SVTM	105.03	5,225	Any in NSW
Brachyscome muelleroides / Mueller Daisy	44_SVTM, 45_SVTM	1.04	78	Any in NSW
Brachyscome papillosa / Mossgiel Daisy	15_Derived, 15_Moderate_good, 46_Moderate_good, 157_Moderate-good, 163_Moderate_good, 164_Moderate_good, 15_SVTM, 44_SVTM, 45_SVTM, 157_SVTM, 163_SVTM, 164_SVTM, 46_SVTM, 160_SVTM	141.26	6,941	Any in NSW
Burhinus grallarius / Bush Stone-curlew	15_Moderate-good, 20_Thinned, 23_Moderate-good, 26_Moderate-good, 26_Thinned, 28_Thinned, 58_Moderate-good, 58_Thinned, 15_SVTM, 26_SVTM, 28_SVTM, 70_SVTM, 15_Thinned, 28_Moderate-good, 23_Thinned	190.66	4,549	Any in NSW
Calotis moorei / A burr-daisy	23_Derived, 23_Moderate-good, 157_Moderate-good, 157_SVTM	12.14	827	Any in NSW
Convolvulus tedmoorei / Bindweed	44_Moderate-good, 157_Moderate-good, 160_Moderate-good, 163_Moderate-good, 164_Moderate-good, 17_SVTM, 44_SVTM, 45_SVTM, 157_SVTM, 160_SVTM	28.92	2,013	Any in NSW
Cullen parvum / Small Scurf-pea	44_Moderate_good, 44_SVTM	23.51	1,148	Any in NSW
Eleocharis obicis / Spike-Rush	24_Moderate-good, 157_Moderate-good, 163_Moderate-good, 164_Moderate_good, 17_SVTM, 157_SVTM, 163_SVTM, 164_SVTM, 160_SVTM	128.04	6,146	Any in NSW

Species credit	Vegetation Zone/s names	Area (ha) / Count[1]	Credits	IBRA region
Eucalyptus leucoxylon subsp. *pruinosa* / Yellow Gum[2]	15_SVTM	1	2	Any in NSW
Hemiaspis damelii / Grey Snake	13_Moderate_good, 15_Moderate_good, 17_Moderate_good, 24_Moderate_good, 46_Moderate_good, 47_Moderate_good, 160_Moderate_good, 15_SVTM, 17_SVTM, 46_SVTM, 160_SVTM, 15_Thinned	128.33	5,099	Any in NSW
Hieraaetus morphnoides / Little Eagle	28_SVTM	0.92	35	Any in NSW
Lepidium monoplocoides / Winged Peppercress	15_Derived, 26_Derived, 26_Moderate-good, 26_Thinned, 46_Moderate-good, 163_Moderate-good, 15_SVTM, 26_SVTM, 45_SVTM, 163_SVTM, 46_SVTM, 160_SVTM	52.17	1,764	Any in NSW
Leptorhynchos orientalis / Lanky Buttons	26_Derived, 26_Moderate-good, 26_Thinned, 26_SVTM, 44_SVTM, 45_SVTM, 46_SVTM	43.70	1,352	Any in NSW
Litoria raniformis / Southern Bell Frog	15_Moderate_good, 163_Moderate_good, 163_SVTM	1.68	73	Any in NSW
Lophochroa leadbeateri / Pink Cockatoo	15_Moderate_good, 28_SVTM, 45_SVTM	6.60	330	Any in NSW
Maireana cheelii / Chariot Wheels	24_Moderate_good, 26_Derived, 26_Moderate-good, 26_Thinned, 44_Moderate_good, 157_Moderate_good, 163_Moderate_good, 164_Moderate_good, 26_SVTM, 44_SVTM, 157_SVTM, 164_SVTM, 46_SVTM	146.82	6,460	Any in NSW
Ninox connivens / Barking Owl	15_Moderate_good, 15_SVTM, 70_SVTM, 15_Thinned	28.3	1,018	Any in NSW
Pedionomus torquatus / Plains-wanderer	26_Derived, 46_Moderate-good, 164_Moderate_good, 44_SVTM, 163_SVTM, 216_Moderate-good, 164_SVTM	1.19	70	Any in NSW
Pilularia novae-hollandiae / Austral Pillwort	15_Moderate_good, 17_Moderate_good, 26_Derived, 26_Moderate_good, 26_Thinned, 26_SVTM, 44_SVTM, 45_SVTM	72.52	994	Any in NSW
Polytelis swainsonii / Superb Parrot	28_SVTM	0.92	46	Any in NSW

Species credit	Vegetation Zone/s names	Area (ha) / Count[1]	Credits	IBRA region
Sclerolaena napiformis / Turnip Copperburr	26_Derived, 26_Moderate-good, 26_Thinned, 26_SVTM, 44_SVTM, 46_SVTM	43.39	1,336	Any in NSW
Solanum karsense / Menindee Nightshade	15_Derived	0.24	3	Any in NSW
Swainsona murrayana / Slender Darling Pea	15_Derived, 17_Moderate_good, 23_Derived, 23_Moderate-good, 24_Moderate_good, 26_Derived, 26_Moderate_good, 26_Thinned, 28_Derived, 44_Moderate_good, 46_Moderate_good, 157_Moderate_good, 163_Moderate-good, 164_Moderate_good, 15_SVTM, 26_SVTM, 28_SVTM, 44_SVTM, 45_SVTM, 157_SVTM, 163_SVTM, 164_SVTM, 46_SVTM	340.46	13,995	Any in NSW
Swainsona plagiotropis / Red Darling Pea	26_Derived, 26_Moderate-good, 26_Thinned, 44_Moderate-good, 163_Moderate-good, 26_SVTM, 44_SVTM, 45_SVTM, 46_SVTM	45.67	1,448	Any in NSW
Swainsona sericea / Silky Swainson-pea	26_Derived, 26_Moderate-good, 26_Thinned, 26_SVTM, 28_SVTM, 44_SVTM, 45_SVTM, 46_SVTM	45.31	1,433	Any in NSW
Tyto novaehollandiae / Masked Owl	26_Moderate-good, 26_Thinned, 70_SVTM	7.36	271	Any in NSW

(1) Area (ha) rounding as per BAM-C case 00041510/BAAS19078/25/00054312 output

(2) Species are a 'count' species under the BAM where the assumed loss of habitat (ha) is a representation of areas not subject to targeted flora surveys where suitable habitat for the species may occur. A representative one individual has been entered for each vegetation zone subject to impact where suitable habitat has been identified.

12.3.3 Species credit requirement for the Inland Slopes IBRA subregion

The species credit requirements, for impact to native vegetation within the Inland Slopes IBRA subregion are summarised in Table 12.12. The full BAM calculator credit report is provided in Appendix E.

Table 12.12 Species credit classes and summary for the Inland Slopes IBRA subregion

Species credit	Vegetation Zone/s names	Area (ha) / Count[1]	Credits	IBRA region
Ammobium craspedioides / Yass Daisy[2]	266_Moderate-good, 266_Thinned, 277_Thinned, 277_Moderate-good	4	8	Any in NSW
Aprasia parapulchella / Pink-tailed Legless Lizard	319_Thinned	0.62	9	Any in NSW
Austrostipa wakoolica	76_Thinned	0.30	6	Any in NSW
Burhinus grallarius / Bush Stone-curlew	76_Thinned, 266_Moderate-good, 266_Thinned, 277_Thinned, 277_Moderate-good, 343_Moderate-good	3.60	99	Any in NSW
Caladenia arenaria / Sand-hill Spider Orchid	76_Thinned	0.3	8	Any in NSW
Callocephalon fimbriatum / Gang-gang Cockatoo	277_Moderate-good	0.09	5	Any in NSW
Cullen parvum / Small Scurf-pea	277_Thinned, 277_Moderate-good	1.98	57	Any in NSW
Diuris tricolor / Pine Donkey Orchid	76_Thinned	0.3	4	Any in NSW
Grevillea wilkinsonii / Tumut Grevillea	266_Moderate-good, 266_Thinned	0.10	4	Any in NSW
Petaurus norfolcensis - endangered population / Squirrel Glider in the Wagga Wagga Local Government Area	76_Thinned, 266_Moderate-good, 266_Thinned, 277_Derived_LCV, 277_Thinned, 319_Derived_LCV, 319_Thinned, 277_Moderate-good	0.92	23	Any in NSW
Phascolarctos cinereus / Koala	76_Thinned, 266_Moderate-good, 266_Thinned, 277_Thinned, 319_Thinned, 277_Moderate-good, 343_Moderate-good	4.53	132	Any in NSW
Polytelis swainsonii / Superb Parrot	76_Thinned, 266_Moderate-good, 266_Thinned, 277_Thinned, 277_Moderate-good, 343_Moderate-good	3.70	119	Any in NSW

Species credit	Vegetation Zone/s names	Area (ha) / Count[1]	Credits	IBRA region
Prasophyllum petilum / Tarengo Leek Orchid	277_Thinned, 277_Moderate-good	1.96	57	Any in NSW
Swainsona recta / Small Purple-pea	266_Moderate-good, 266_Thinned, 277_Thinned, 277_Moderate-good	2.06	60	Any in NSW
Swainsona sericea / Silky Swainson-pea	266_Moderate-good, 266_Thinned, 277_Thinned, 277_Moderate-good	2.06	60	Any in NSW

(1) Area (ha) rounding as per BAM-C case 00047237/BAAS23009/24/00047238 output

(2) Species are a 'count' species under the BAM where the assumed loss of habitat (ha) is a representation of areas not subject to targeted flora surveys where suitable habitat for the species may occur. A representative one individual has been entered for each vegetation zone subject to impact where suitable habitat has been identified.

12.4 Scattered tree credits

This section provides a summary of the ecosystem credits required for scattered trees.

Full details of attributes associated with each ecosystem credit including sensitivity to loss, sensitivity to gain class, biodiversity risk weighting, potential SAII, like for like options, credit trading groups and IBRA regions is provided in Appendix E.

A total of 14 ecosystem credits are required to offset the impact to 16 scattered trees with 7 requiring hollow bearing tree credit offsets and seven credits with no hollow bearing trees. A summary of ecosystem credit offset obligation for each IBRA subregions are presented in Table 12.13, Table 12.14 and Table 12.15.

Table 12.13 Ecosystem credit summary for impacts to scattered trees in the Murray Fans IBRA subregion

PCT	TEC	HBT Cr	No HBT Cr	Credits
13 - Black Box - Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Not a TEC	7	5	12
Total ecosystem credits		**7**	**5**	**12**

Table 12.14 Ecosystem credit summary for impacts to scattered trees in the Murray Fans IBRA subregion

PCT	TEC	HBT Cr	No HBT Cr	Credits
58-Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion	Not a TEC	0	1	1
Total ecosystem credits		**0**	**1**	**1**

Table 12.15 Ecosystem credit summary for impacts to scattered trees in the Murrumbidgee IBRA subregion

PCT	TEC	HBT Cr	No HBT Cr	Credits
343-Mugga Ironbark - Red Box - Red Stringybark - Western Grey Box grass/shrub woodland on metamorphic substrates in the Tarcutta - Gundagai region, NSW South Western Slopes Bioregion	Not a TEC	0	1	1
Total ecosystem credits		**0**	**1**	**1**

12.5 Additional credit obligation for indirect impacts to habitat connectivity

The proposed additional credit obligation for impacts to threatened bird species through indirect impacts due to line strike and EMF are provided in Table 12.16. An additional 273 ecosystem credits are proposed to be provided to account for indirect impacts to threatened bird species through indirect impacts due to line strike and EMF.

Table 12.16 Summary of indirect impacts on threatened fauna species for combined subregions

Scientific name	Common name	Total impact to habitat (ha)	10 % habitat impact (ha)	Credits per ha based on project BAM-C calculations	Proposed additional species credits
Haliaeetus leucogaster	White-bellied Sea-Eagle	29.76	2.98	37.5	112
Hieraaetus morphnoides	Little Eagle	42.80	4.28	19.5	83
Lophoictinia isura	Square-tailed Kite	39.84	3.98	19.5	78
Total proposed additional species credits for indirect impacts					**273**

12.6 Additional credit obligation for prescribed impacts to habitat connectivity

The proposed additional credit obligation for impacts to habitat connectivity are provided in Table 12.17. Additional credits are to be provided for areas of suitable habitat for the species identified by species expert report (Appendix I).

Table 12.17 Summary of additional species credits for prescribed impacts to habitat connectivity

Scientific name	Common name	Total impact to habitat (ha)	10 % habitat impact (ha)	Credits per ha based on project BAM-C calculations	Proposed additional species credits
Petaurus norfolcensis - endangered population	Squirrel Glider in the Wagga Wagga LGA	0.92	0.09	28	3
Total proposed additional species credits for prescribed impacts					**3**

12.7 Offset for aquatic species and environments

As per the Policy and guidelines for fish habitat conservation and management (Update 2013) (DPI, 2013) habitat compensation for aquatic habitats must be completed on a minimum 2:1 basis for all key fish habitat (including type 1–3), however a greater compensation ratio may be considered if opportunities for compensation are not available in the vicinity of, or of the type of, habitat that has been lost. Offsets would be required if a project is deemed to have significant environmental impacts. Compensation to offset fisheries resource or habitat losses would be considered only after it is demonstrated that the proposed loss is unavoidable.

During the detailed design and micro-siting process, potential impacts to key fish habitat would be minimised wherever practicable and where residual impacts are identified these would be quantified and offset in accordance with Policy and guidelines for fish habitat conservation and management (Update 2013) (DPI, 2013).

13 Limitations

This Report is provided by WSP Australia Pty Limited (WSP) for Transgrid (*Client*) in response to specific instructions from the Client and in accordance with WSP's proposal dated 10 August 2023 and agreement with the Client dated 20 October 2023 (*Agreement*).

13.1 Permitted purpose

This Report is provided by WSP for the purpose described in the Agreement and no responsibility is accepted by WSP for the use of the Report in whole or in part, for any other purpose (*Permitted Purpose*).

13.2 Qualifications and assumptions

The services undertaken by WSP in preparing this Report were limited to those specifically detailed in the Report and are subject to the scope, qualifications, assumptions and limitations set out in the Report or otherwise communicated to the Client.

Except as otherwise stated in the Report and to the extent that statements, opinions, facts, conclusion and/or recommendations in the Report (Conclusions) are based in whole or in part on information provided by the Client and other parties identified in the report (Information), those Conclusions are based on assumptions by WSP of the reliability, adequacy, accuracy and completeness of the Information and have not been verified. WSP accepts no responsibility for the Information.

WSP has prepared the Report without regard to any special interest of any person other than the Client when undertaking the services described in the Agreement or in preparing the Report.

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