

Native Vegetation Clearance

Mallee Highway Upgrades

MM 43.5 to MM 65.0

VS 2020/40

Data Report

Clearance under the *Native Vegetation Regulations 2017*

07/11/2022

Prepared by J. Skewes – EBS Ecology (NVC Accredited Consultant)



Native Vegetation Clearance Mallee Highway Upgrades MM 43.5 to MM 65.0 VS 2020/40 Clearance Data Report

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Prepared by EBS Ecology for WSP Australia Pty. Ltd.

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Cover photograph: Example of vegetation condition within the Project Area along the Mallee Highway.

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Glossary and abbreviations

BAM	Bushland Assessment Method
BDBSA	Biological Database of South Australia (maintained by DEW)
DCCEEW	Department of Climate Change, Energy the Environment and Water (Commonwealth)
DEW	Department for Environment and Water (South Australia)
DIT	Department of Infrastructure and Transport (South Australia)
EBS	Environment and Biodiversity Services Pty Ltd
edge-line	the painted line, demarcating the edge of the existing paved road.
EPBC Act	<i>Environmental Protection and Biodiversity Conservation Act 1999</i>
ha	Hectare(s)
IBRA	Interim Biogeographical Regionalisation of Australia
km	Kilometre(s)
LGA	Local Government Area
LMR	Land Management Region
LSA Act	<i>Landscape South Australia Act 2019</i> (replacing the <i>Natural Resources Management Act 2004</i>)
MAZ	Maintenance Activity Zone – an approved area up to 3.5 m from the existing road edge-line, for which DIT can undertake regular road maintenance activities without NVC approval, as part of an existing management plan.
MBC	Mallee Bird Community of the Murray Darling Depression Bioregion Threatened Ecological Community (EPBC Act)
MDD (B)	Murray Darling Depression (Bioregion)
MM	Maintenance Marker
MNES	Matters of National Environmental Significance
NatureMaps	Initiative of DEW that provides a common access point to maps and geographic information about South Australia's natural resources in an interactive online mapping format
Non-frangible	Refers to plant species with a stem diameter (at maturity) of 100 mm or greater with rigid, large or sturdy stems which will not readily break upon impact by a typical passenger vehicle, and thereby expected to cause significant damage to the vehicle and occupants.
NPW Act	<i>National Parks and Wildlife Act 1972</i>
NV Act	<i>Native Vegetation Act 1991</i>

NVC	Native Vegetation Council
PMST	Protected Matters Search Tool (under the EPBC Act; maintained by DAWE)
Project	Road safety upgrades including road widening, culvert upgrades and road safety barrier (guard-fence) installation.
Project Area	A section of the Mallee Highway between MM43.5 and MM 65.0
SA	South Australia(n)
Search Area	5 km buffer of the Project Area considered in the desktop assessment database searches
SEB	Significant Environmental Benefit
sp.	Species
spp.	Species (plural)
ssp.	Sub-species
STAM	Scattered Tree Assessment Method
TEC	Threatened Ecological Community
var.	Variety (a taxonomic rank below that of species and subspecies, but above that of form)
WSP	WSP Australia Pty Ltd

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- Attachment 1 – BAM Scoresheets associated with the Project Area (Excel)
- Attachment 2 – Shapefiles associated with the Project Area

1. Application information

Table 1. Application details.

Applicant:	Department for Infrastructure and Transport (DIT)		
Key contact:	[REDACTED], Email [REDACTED]@wsp.com, Phone: (08) [REDACTED]		
Landowner:	Department for Infrastructure and Transport (DIT)		
Site Address:	Mallee Highway MM 43.5 to MM 65.0		
Local Government Area:	Coorong and Southern Mallee	Hundred:	Geranium
Title ID:	NA	Parcel ID	NA

Table 2. Summary of the proposed clearance.

Purpose of clearance:	Clearance required for safety upgrades to the Mallee Highway from Maintenance Marker (MM) 43.5 to MM 65.0. Where no safety barrier exists or is proposed, clearance of up to 1.5 metres (m) outside of the existing 3.5 m maintenance activity zone (MAZ) is required to ensure safe passage for vehicles where non-frangible vegetation occurs.
Native Vegetation Regulation:	Regulation 12, Schedule 1; clause 32, Works on Behalf of the Commissioner of Highways Regulation
Description of the vegetation under application:	<u>Size, type and general condition</u> Clearance will include non-frangible vegetation only, including pruning over overhanging vegetation within 5 metres (m) of the existing edge-line. Clearance under application includes only vegetation to be impacted which is outside of the existing Maintenance Activity Zone (MAZ) allowed by DIT. Impacted vegetation has been assessed as a 0.8 loss factor to account for impacts to non-frangible vegetation only. Impacted vegetation includes: • 2.15 hectares (ha) of <i>Eucalyptus socialis</i> Mixed Mallee over sclerophyllous shrubs and <i>Austrostipa</i> spp. in varying condition. • 0.23 ha of <i>Eucalyptus phenax</i> +/- <i>Eucalyptus socialis</i> +/- <i>Eucalyptus incrassata</i> Mallee over sclerophyllous • 0.78 ha of <i>Eucalyptus calycogona</i> +/- <i>Eucalyptus socialis</i> +/- <i>Eucalyptus phenax</i> over sclerophyllous shrubs and <i>Austrostipa</i> spp. • 0.62 ha of <i>Eucalyptus incrassata</i> +/- <i>Eucalyptus phenax</i> Mallee over sclerophyllous shrubs (<i>Melaleuca uncinata</i>) and <i>Austrostipa</i> spp. • 0.05 ha of <i>Melaleuca lanceolata</i> Shrubland +/- <i>Eucalyptus socialis</i> • 0.32 ha of Mixed Mallee Open Woodland over <i>Callitris</i> sp., <i>Melaleuca</i> sp. sclerophyllous shrubs +/- <i>Triodia</i> sp. • 0.7 ha of <i>phenax</i> Very Open Mallee
Total proposed clearance – area (ha) and/or number of trees:	4.22 hectares of non-frangible mallee vegetation.
Level of clearance:	Level 4

Overlay (Planning and Design Code):	Native Vegetation Overlay
Map of proposed clearance area:	See Figure 1.
Mitigation Hierarchy:	<u>Avoid</u> • DIT reduced the Project Area extent from starting point of MM10 to MM 43.5, resulting in a reduction of the Project Area extent of 33.5 kilometres on both sides of the road. • Guard fences are proposed to be installed along approximately 9.1 kilometres of roadside which equates to 21% of the current Project Area length. Clearance requirements are reduced to being contained within the existing MAZ where safety barriers are proposed. • Additionally, safety barriers are proposed in locations where State Rare <i>Acacia lineata</i> was identified, to minimise potential impacts to this species. <u>Minimise</u> • Only clearance of non-frangible vegetation proposed. • Vegetation clearance areas are based on mappable edge line of vegetation. Due to the multi-stemmed nature of the mallee vegetation, much of this is likely to be overhanging branches which will require clearance (through pruning) within the 5 m clearance area, leaving the base of the tree alive and able to regenerate. • Minimal impact techniques will be utilised during construction to ensure that damage to off-target vegetation is minimised. This includes, but is not limited to: ○ Utilising existing disturbed or managed areas within MAZ for storage of equipment such as machinery and stockpiles (laydown areas) required during construction; ○ Utilising existing access tracks; ○ Construction contractor working under an approved Vegetation Management Plan including under instruction to minimise impacts to understorey vegetation; ○ Clearly marking areas of vegetation to be retained in the Project Area (such as where threatened species like <i>Acacia lineata</i>) occur. ○ Construction contractor working under an approved Weed, Pest and Disease Management Plan. <u>Mitigate</u> • Frangible vegetation occurring in the understorey will be allowed to regenerate following any disturbance that may occur during construction works.
SEB Offset proposal	SEB payment will be made into the NV Fund of \$91,589.26 (including an administration fee of \$4,755.27).

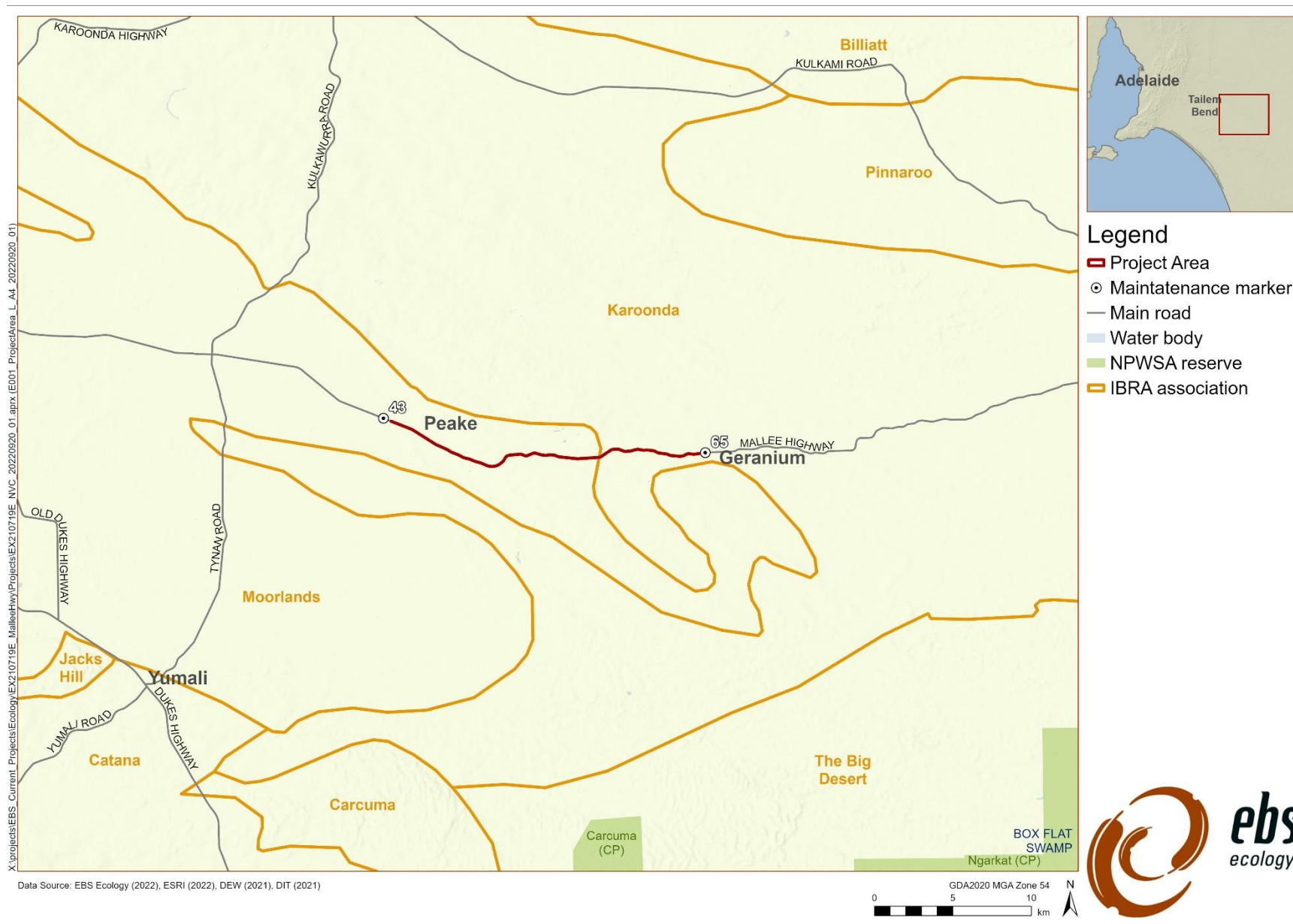


Figure 1. Map of proposed clearance and general location.

2. Purpose of clearance

2.1. Description

EBS Ecology (EBS) was engaged by WSP Australia Pty Ltd (WSP) on behalf of the Department for Infrastructure and Transport (DIT) to undertake a native vegetation clearance assessment for clearance in relation to curve widening and shoulder sealing works along the Mallee Highway as part of a planned safety upgrade program.

The Project Area occurs along the DIT managed Mallee Highway in South Australia, in the road corridor between Maintenance Marker (MM) 43.5 and MM 65.0 (Figure 1). An existing maintenance activity zone (MAZ) occurs within 3.5 metres (m) of the existing edge line. Proposed clearance relates to non-frangible vegetation (i.e., vegetation with mature trunks greater than 10 centimetre [cm] diameter) north and south of the road up to 5 m from the existing edge line, plus additional clearance required for extension of seven existing culverts. The vegetation under application is that which occurs outside of the existing MAZ (i.e., from 3.5 to 5 m, plus culvert extensions).

2.2. Background

A number of surveys (and reports) have been undertaken within the Project Area. In summary:

- A baseline ecological flora and fauna assessment was undertaken on 25-26 October 2021 for proposed curve widening and shoulder sealing works at 57 sites between MM 10.0 and MM 65.0 (EBS Ecology, 2021).
- A secondary ecological assessment was undertaken on 27 June to 1 July 2022 between MM 43.0 and MM 65.0 to assess vegetation occurring within straight sections of the highway. (EBS Ecology 2022a – in review).
- The June 2022 survey included targeted bird surveys, to determine if the nationally Endangered Mallee Bird Community (MBC) of the Murray Darling Depression Bioregion Threatened Ecological Community (TEC) occurred within the Project Area between MM 10.0 and MM 65.0 (EBS Ecology 2022b [letter report] – in review). The MBC was found to occur within the Project Area.
- Based on results of the ecological assessment including a desktop assessment, a targeted survey for *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) listed threatened Orchids *Thelymitra epipactoides* (Metallic Sun-orchid) and *Caladenia tensa* (Greencomb Spider-orchid) was undertaken on 28 September 2022. No EPBC listed threatened species were detected.
- An EPBC Self-Assessment for Matters of National Environmental Significance potentially occurring within the Project Area (including MBC, *T. epipactoides* and *C. tensa*, as well as Malleefowl [*Leipoa ocellata*] and Regent Parrot [*Polytelis anthopeplus ssp. monarchoides*]) found no significant impact was likely (EBS Ecology, 2022c – in review).

2.3. Details of the proposal

DIT works under an existing roadside vegetation management plan (RVMP) under which a maintenance activity zone (MAZ) occurs within 3.5 m from the existing edge-line. Therefore, vegetation clearance under application applies ONLY to vegetation which is proposed to be impacted outside of the 3.5 m MAZ (i.e., the remaining 1.5 m out to 5 m, and any additional clearance required for culvert extensions).

Following provision of design requirements, the following impacts are anticipated (summarised in Table 3):

- Clearance of non-frangible vegetation occurring within five metres of existing road edge-line (0 m) on both sides of the road between MM 43.5 and MM 65.0, except where:
 - existing road safety barriers occur; and
 - new road safety barriers are proposed.
- Clearance for seven culvert extensions including a 2.4 m extension, and additional 2.5 m buffer on all sides (total 5 m buffer).
- Clearance of up to 1 m behind existing and proposed road safety barriers. Where 27 new road safety barriers are proposed, installation is set at a maximum of 2.5 m behind the existing edge-line. As such all clearance associated with safety barriers is within the existing MAZ.

Table 3. Summary of impact areas for each type of infrastructure / clearance area associated with the Project for non-frangible vegetation only, including clearance within the MAZ (not under application).

Infrastructure / Impact area	Total clearance required (hectares)
0 – 3.5 m (MAZ) including barriers and culverts	1.85 ha
3.5 – 5.0 m (RUIA) + culverts; constituting new works under NV clearance application	4.22 ha
0.0 to 5.0 m (total) including culverts and safety barriers.	6.03 ha
Culverts	0.01 ha
Safety Barriers (within MAZ)	0.52 ha

2.4. Approvals required or obtained

Native Vegetation Act 1991 (NV Act)

This report is supplied in support of the application and fulfils the requirements of the NV Act to clear native vegetation.

Planning, Development and Infrastructure Act 2016 (PDI Act)

Not applicable.

Water Resources Act 1997

No waterways are being impacted as part of this development and therefore it is unlikely that a water licence will be required.

Environment Protection and Biodiversity Conservation Act 1999 (EPBC)

An EPBC Self-assessment (EBS Ecology, 2022c – in review) has been undertaken for Matters of National Environmental Significance (MNES) identified as occurring or potentially occurring within the Project Area. This includes the Endangered Mallee Bird Community of the Murray Darling Depression Bioregion, Vulnerable Malleefowl (*Leipoa ocellata*), Vulnerable Eastern Regent Parrot (*Polytelis anthopeplus* ssp. *monarchoides*), Endangered Greencomb Spider-Orchid (*Caladenia tensa*) and the Endangered Metallic Sun Orchid (*Thelymitra epipactoides*). The self-assessment found that no significant impacts to these MNES were likely, and a Commonwealth Referral is therefore not required.

National Parks and Wildlife Act 1972 (NPW Act)

All flora and fauna surveys conducted as part of the native vegetation clearance application were undertaken by EBS Ecology under Scientific Research Licence K25613-20.

Landscapes South Australia Act 2019 (LSA Act)

All landowners have a responsibility to promote sustainable management of the State's landscape, which includes minimising occurrence, transport and spread of weeds including those listed as Declared under the LSA Act. Standard procedures, such as those outlined in a Construction Environmental Management Plan (CEMP) should be in place to prevent the encroachment of weeds and other potential environmental impacts.

No waterways are being impacted as part of this development and therefore it is unlikely that a Water Affecting Activities Permit will be required.

Aboriginal Heritage Act 1988

Approval will be required if any items of cultural significance are uncovered during construction works. A 'Stop Work' procedure should be in place in the event that any items of this nature are located. All DIT projects practice under Attachment 2A – Aboriginal Objects, Sites and Remains Discovery Procedure (DIT, 2021).

2.5. Native Vegetation Regulation

Approval is sought under the Native Vegetation Regulations under:

- Part 3 Division 5, Regulation 12, Clause 32 – Works on Behalf of the Commissioner of Highways.

Additional clearance is permitted (without conditions) under Part 3 Division 2, Regulation 8, Clause 2 – Maintenance of Infrastructure.

Regulation 8 (2) allows clearance of vegetation incidental to the repair or maintenance of infrastructure and must comply with the following requirements:

- Clearance can occur in the vicinity of that which was previously lawfully cleared in relation to the construction, repair or maintenance of the infrastructure; and
- Clearance must only be of plants or parts of plants that have grown or regrown since the previous lawful clearance, and / or
- Clearance is undertaken in accordance with an NVC-approved Standard Operating Procedure (SOP).

DIT have advised that their existing approved maintenance zone includes 3.5 metres (m) from the edge line of the existing road. All other clearance outside of this existing maintenance zone is applied for under Regulation 12 (32), which allows clearance of vegetation incidental to new work being undertaken by or on behalf of the Commissioner of Highways including roads, ports and infrastructure.

2.6. Development Application information (if applicable)

The proposed works do not constitute development for the purposes of the Planning, Development and Infrastructure Act 2016. A Development Application is therefore not required.

3. Method

3.1. Flora assessment

The flora assessment was undertaken by NVC Accredited Consultants J. Carpenter, E. Tremain, C. Gibson and EBS Technical Officer P. Drummond on the 25 – 26 October and again by NVC Accredited Consultants J. Skewes and H. Merigot on the 22 June to 1 July 2022 in accordance with the Bushland Assessment Method (BAM) (NVC, 2020a). A full list of species recorded between MM 10.0 AND MM 65.0 during both field surveys is presented in Appendix 1. Flora Species List (MM 10.0 to MM 65.0).

3.1.1. Bushland Assessment Method

The BAM is derived from the Nature Conservation Society of South Australia's Bushland Condition Monitoring methodology (Croft *et al.* 2007, 2008a, 2008b, 2009; Milne and Croft 2012; Milne and McCallum 2012). The BAM used to assess areas of native vegetation requiring clearance and calculate the SEB requirements.

Details of site selection/stratification and assessment protocols, and the biodiversity value components assessed and the factors that influence these components are outlined in the *Bushland Assessment Manual* (NVC 2020a).

The Conservation Significance Scores were calculated from direct observations of flora and direct and historical observations of fauna species of conservation significance. All fauna identified as known to occur in the PMST, and fauna with BDBSA records since 1995 and with a spatial reliability of less than 1 kilometre (km), within 5 km of the Project Area, were included in the BAM scoresheets. Species determined as unlikely to occur within the Project Area will be removed by the Native Vegetation Branch if the finding is supported. Marine and/or wetland species were omitted from the scoresheets given the Project Area is terrestrial.

BAMs were not undertaken at every curve / straight within the Project Area, instead they were undertaken in areas deemed to be representative of the vegetation condition gradients of each association. In calculating Significant Environmental Benefit (SEB) scores / costs, representative BAM scores were averaged, calculated on a per-hectare basis and then multiplied by the number of hectares being impacted. As such, a flora species list for the Project Area includes species detected in BAM sites between MM 10. 0 and MM 65.0 as part of the October 2021 (curves) and June 2022 (straights) field surveys.

3.2. Fauna assessment

A desktop assessment was undertaken to determine the potential for any threatened fauna species, and Threatened Ecological Communities (TECs) (both Commonwealth and State listed) to occur within the Project Area. This was achieved by undertaking database searches using a 5 km buffer of the Project Area (Search Area).

3.2.1. PMST report

An updated Protected Matters Search Tool (PMST) report was generated on 23 August 2022 to identify nationally threatened flora and fauna, migratory fauna and TECs under the EPBC Act relevant to the Project Area (DCCEEW, 2022). Only species and TECs identified in the PMST report that are listed as likely or known to occur within the Search Area were assessed for their likelihood of occurrence within the Project Area.

3.2.2. BDBSA data extract

A data extract from the Biological Database of South Australia (BDBSA Recordset number: DEWNRBDBSA220902-1), was obtained to identify flora and fauna species that have been recorded within 5 km of the Project Area (data extracted 02/09/2022; DEW 2022). The BDBSA is comprised of an integrated collection of species records from the South Australian Museum, conservation organisations, private consultancies, Birds SA, Birdlife Australia and the Australasian Wader Study Group, which meet the Department for Environment and Water's (DEW) standards for data quality, integrity and maintenance. Only species with records since 1995 and a spatial reliability of less than 1 km were assessed for their likelihood of occurrence.

3.2.3. Field survey

Dedicated bird surveys were carried out at each BAM vegetation survey site in October 2021. The timed area search method was used, where a determined area is searched for a set period of time. In this instance, a 2-hectare (ha) area was searched for a period of 20 minutes.

Opportunistic observations of fauna were recorded throughout the Project Area during the October 2021, June 2022 and September 2022 field surveys. This included the presence of animal signs, such as cats, tracks and other traces. The presence of habitat features that might be important in determining the likelihood of threatened species (for example hollow-bearing trees) was noted.

In June / July 2022 dedicated bird surveys were undertaken at eight sites along the Mallee Highway between MM 10.0 and MM 65.0 and in connected publicly accessible patches of vegetation to confirm the observations from the database search are current. Two sites were within the current Project Area between MM 43.5 and MM 65.0. At 8 sites a 2-ha area was searched for a period of 20 minutes over three mornings (between 7 am and 12 pm). During these surveys, all bird species observed, and their abundance was recorded.

On 28 September EBS Ecology undertook targeted orchid surveys, to search for these two species, along the length of the Project Area (MM 43.5 to MM 65.0). The survey utilised two ecologists to walk along the edge of suitable vegetation, searching a minimum of 5 m from the road edge-line (painted line) within the proposed impact area. Wider searches were also undertaken at each of the seven proposed culvert upgrade locations to account for the construction buffer. A full list of species recorded during the 2021 and 2022 field surveys between MM 10.0 and MM 65.0 is presented in Appendix 2. Fauna Species List (MM 10.0 to MM 65.0).

A species list for all species detected between MM 10.0 and MM 65.0 across the three field surveys, indicating which species were observed in the Project Area between MM 43.5 and MM 65.0, is presented in Appendix 2. Fauna Species List (MM 10.0 to MM 65.0).

No fauna trapping was undertaken within the Project Area.

3.2.4. Likelihood of occurrence

The criteria for the likelihood of occurrence of threatened species within the Project Area are described in Table 4.

Table 4. Criteria for the likelihood of occurrence of threatened species within the Project Area.

Likelihood	Criteria
Highly Likely/Known	Recorded in the last 10 years, the species does not have highly specific niche requirements, the habitat is present and falls within the known range of the species distribution or; The species was recorded as part of field surveys.
Likely	Recorded within the previous 20 years, the area falls within the known distribution of the species and the area provides habitat or feeding resources for the species.
Possible	Recorded within the previous 20 years, the area falls inside the known distribution of the species, but the area provides limited habitat or feeding resources for the species. Recorded within 20 -40 years, survey effort is considered adequate, habitat and feeding resources present, and species of similar habitat needs have been recorded in the area.
Unlikely	Recorded within the previous 20 years, but the area provides no habitat or feeding resources for the species, including perching, roosting or nesting opportunities, corridor for movement or shelter. Recorded within 20 -40 years; however, suitable habitat does not occur, and species of similar habitat requirements have not been recorded in the area. No records despite adequate survey effort.

4. Assessment outcomes

4.1. Vegetation assessment

4.1.1. General description of the vegetation, the site and matters of significance

The Project Area occurs in the Murray Mallee subregion of the Murray-Darling Depression Bioregion. At a local scale the IBRA subregions are further categorised by Environmental Associations, with the eastern and western halves of the Project Area falling in the Karoonda and Moorlands associations respectively. Both Environmental Associations have similar geology, soils and vegetation (Appendix 3. IBRA summaries). Situated on undulating plains, they are dominated by sands and calcretes and characterised by Mallee vegetation with differing *Eucalyptus* spp. dominance. The Project Area falls within the Southern Mallee Local Government Area (LGA) to the east, and Coorong LGA to the west. It is situated within the Murraylands and Riverland Landscape Management Region.

The Project Area is entirely within the area used as a road reserve for the Mallee Highway. The surrounding landscape is utilised for a range of dryland agricultural uses, including grazing of introduced and native pasture and dryland cropping. There are no watercourses or wetlands in the Project Area.

While the road reserve is vegetated with remnant native vegetation, surrounding agricultural land has been extensively cleared historically. A large intact corridor of remnant vegetation occurs in association with the railway line which runs parallel to the Mallee Highway for much of its length, deviating east of the town of Peake (at approximately MM 52), where it runs parallel to, but several hundred meters away from the Project Area. Several larger patches of intact bushland (>5 ha in size) occur along the length of the Project Area on private land, including a number of Heritage Agreement (HA) Areas west of the Project Area which are offset from the road, south-west of Sherlock (HA 797) and west of Peake (HA 780, HA 672, HA 838). Cumulatively, these areas provide a significant vegetated corridor through the landscape.

Vegetation in the Project Area consisted of Grassland to Open Mallee and Mallee. Grassland areas were generally dominated by *Austrostipa* sp. (Spear-grass), *Enneapogon nigricans* (Bottle-washers) and exotic grasses such as *Avena barbata* (Bearded Oat) and *Ehrharta calycina* (Perennial Veldt Grass).

Mallee vegetation was characterised by an understorey of sparse sclerophyllous shrubs and native and exotic tussock grasses, with overstorey *Eucalyptus* spp. varying depending on soil and landscape position. Mallee with a hummock grass understorey (*Triodia* sp.) was limited in extent.

Vegetation condition was typical of remnant vegetation occurring as long, linear strips. Condition was poor to moderate, with a high impact from grassy and herbaceous weed species. Weeds were prominent at most sites, particularly in grasslands, and disturbance created by road maintenance activities was widespread. However, there was little evidence of grazing impacts.

Eight Vegetation Associations (VAs) were recognised in the Project Area:

- **VA3:** *Eucalyptus socialis* Mixed Mallee over sclerophyllous shrubs and *Austrostipa* spp.
- **VA4:** *Eucalyptus phenax* +/- *Eucalyptus socialis* +/- *Eucalyptus incrassata* Mallee over sclerophyllous shrubs and *Austrostipa* spp.
- **VA5:** *Eucalyptus calycogona* +/- *Eucalyptus socialis* +/- *Eucalyptus phenax* over sclerophyllous shrubs and *Austrostipa* spp.
- **VA7:** *Eucalyptus incrassata* Mallee over sclerophyllous shrubs and *Austrostipa* spp.
- **VA8:** *Austrostipa* spp. / *Rytidosperma* spp. / *Enneapogon nigricans* / *Avena barbata* Grassland.
- **VA9:** *Melaleuca lanceolata* Shrubland +/- *Eucalyptus socialis*.
- **VA10:** Mixed Mallee Open Woodland over *Callitris verrucosa*, *Melaleuca* sp., sclerophyllous shrubs +/- *Triodia irritans*.
- **VA11:** *Eucalyptus phenax* Very Open Mallee.

Vegetation occurred on the border of two different IBRA Associations – Moorlands in the west and Karoonda in the east. Remnancy figures for these two IBRA Associations are very similar, and there was no difference in BAM scores or SEB Offsets between the two IBRAs and as such, all scoresheets were assessed under the Moorlands IBRA. Where multiple sites of the same VA were surveyed using BAM methodology, scores were calculated for a 1-hectare clearance area and then averaged to determine the clearance summary scores for each VA, considering varying vegetation conditions across the Project Area. All BAM scoresheets used are attached to this report. The eight impacted vegetation associations in the Project Area are detailed in Table 6 to Table 13.

Impacts to each vegetation association are for infrastructure components are presented in Table 5 and illustrated in Maps 1 to 10 in section 4.1.3.

A list of all flora species observed in BAM sites is presented in Appendix 1. Flora Species List (MM 10.0 to MM 65.0). As BAM survey site scores were averaged across two surveys, the flora species list represents all flora species detected between the October 2021 (curves between MM 10.0 and MM 65.0) and June 2022 (MM 43.5 and MM 65.0) field surveys. [Site map](#) showing areas of proposed impact

Table 5. Summary of clearance in each VA for infrastructure components.

VA	Vegetation Association	Infrastructure Component	Impact Area (ha)	Total (ha)
VA3	<i>Eucalyptus socialis</i> Mixed Mallee over sclerophyllous shrubs and <i>Austrostipa</i> spp.	RUIA (3.5-5 m)	2.1438	2.1478
		Culvert MM 47.82 (north)	0.0020	
		Culvert MM50.40 (north)	0.0020	

VA	Vegetation Association	Infrastructure Component	Impact Area (ha)	Total (ha)
VA4	<i>Eucalyptus phenax</i> +/- <i>Eucalyptus socialis</i> +/- <i>Eucalyptus incrassata</i> Mallee over sclerophyllous shrubs and <i>Austrostipa</i> spp.	RUIA (3.5-5 m)	0.2267	0.2267
VA5	<i>Eucalyptus calycogona</i> +/- <i>Eucalyptus socialis</i> +/- <i>Eucalyptus phenax</i> over sclerophyllous shrubs and <i>Austrostipa</i> spp.	RUIA (3.5-5 m) Culvert MM 63.11 (north)	0.7828 0.0020	0.7848
VA7	<i>Eucalyptus incrassata</i> Mallee over sclerophyllous shrubs and <i>Austrostipa</i> spp.	RUIA (3.5-5 m) Culvert MM 46.00 (south) Culvert MM 48.75 (north)	0.6136 0.002 0.001	0.6166
VA8	<i>Austrostipa</i> spp. / <i>Rytidosperma</i> spp. / <i>Enneapogon nigricans</i> / <i>Avena barbata</i> Grassland	RUIA (3.5-5 m) Culvert MM 56.90 (north)	0.3758 (NA) 0.0020 (NA)	NA (frangible)
VA9	<i>Melaleuca lanceolata</i> Shrubland +/- <i>Eucalyptus socialis</i>	RUIA (3.5-5 m)	0.0511	0.0511
VA10	Mixed Mallee Open Woodland over <i>Callitris verrucosa</i> , <i>Melaleuca</i> sp., sclerophyllous shrubs +/- <i>Triodia irritans</i>	RUIA (3.5-5 m)	0.3234	0.3234
VA11	<i>Eucalyptus phenax</i> Very Open Mallee	RUIA (3.5-5 m) Culvert MM 45.29 (south)	0.0660 0.0020	0.0680
NA	Exotic / Amenity / Cleared	RUIA (3.5-5 m)	0.1371	0.1371

4.1.2. Details of the vegetation associates/scattered trees proposed to be impacted

Table 6. Summary of VA3.

Vegetation Association	VA3: <i>Eucalyptus socialis</i> Mixed Mallee over sclerophyllous shrubs and <i>Austrostipa</i> spp.
	
	
Figure 2. VA3 looking west along roadside.	
Figure 3. VA3: Straight 6 looking west on the south side of the road.	
General description	VA3 was the most widespread across the Project Area. Dominant overstorey species included a mix of mallee eucalypts such as <i>Eucalyptus socialis</i>, <i>Eucalyptus phenax</i>, <i>Eucalyptus dumosa</i>, <i>Eucalyptus yalatensis</i> and <i>Eucalyptus incrassata</i>. Midstorey ranged from sparse to mid-dense and contained a range of sclerophyllous shrub species including <i>Acacia pycnantha</i>, <i>Acacia rigens</i>, <i>Acacia sclerophylla</i>, <i>Melaleuca uncinata</i>, <i>Melaleuca lanceolata</i>, <i>Beyeria opaca</i>, <i>Rhagodia candolleana</i>, <i>Enchylaena tomentosa</i>, <i>Eremophila crassifolia</i> and <i>Dodonaea hexandra</i>. Understorey comprised <i>Austrostipa</i> spp., <i>Dianella revoluta</i>, <i>Sclerolaena obliquicuspis</i> and <i>Carpobrotus rossii</i>. BAM Sites within this VA included: A3a, A3b, A3c, A3d, A3e, A3f
Threatened species or community	This Vegetation Association was found to comprise the EPBC listed Endangered Mallee Bird Community of the Murray Darling Depression Bioregion. One State Rare plant species was observed within this VA – <i>Acacia lineata</i>.

	One State Rare fauna species was recorded within this VA – White-winged Chough (<i>Corcorax melanorhamphos</i>). A desktop assessment found several other species which may occur within this VA: <u>Known</u> <i>Corcorax melanorhamphos</i> (White-winged Chough) (NPW Act: Rare) <i>Lichenostomus cratitius occidentalis</i> (Purple-gaped Honeyeater) (NPW Act: Rare) <i>Zanda funerea whiteae</i> (Yellow-tailed Black Cockatoo) (NPW Act: Rare) <u>Likely</u> <i>Hieraaetus morphnoides</i> (Little Eagle) (NPW Act: Vulnerable) <i>Hylacola cauta cauta</i> (Shy Heathwren) (NPW Act: Rare) <u>Possible</u> <i>Leipoa ocellata</i> (Malleefowl) (EPBC Act: Vulnerable)				
Landscape context score	1.12	Vegetation Condition Score	38.65	Conservation significance score	1.50
Unit biodiversity Score	64.93	Area (ha)	2.15	Total biodiversity Score	139.46

Table 7. Summary of VA4

Vegetation Association	VA4: <i>Eucalyptus phenax</i> +/- <i>Eucalyptus socialis</i> +/- <i>Eucalyptus incrassata</i> Mallee over sclerophyllous shrubs and <i>Austrostipa</i> spp.
	
Figure 4. VA4 (Site A4b) (at curve 48).	
General description	VA4 occurred across Moorlands and Karoonda IBRA. Two BAM sites (A4a and B4a were surveyed within this area). Overstorey dominated by <i>Eucalyptus phenax</i>, <i>Eucalyptus socialis</i>, <i>Eucalyptus incrassata</i> Midstorey mixed, including <i>Melaleuca acuminata</i>, <i>Melaleuca lanceolata</i>, <i>Melaleuca uncinata</i>, <i>Maireana brevifolia</i>, <i>Rhagodia candolleana</i>, <i>Halgania cyanea</i>, <i>Westringia rigida</i>, <i>Enchylaena tomentosa</i>, <i>Correa glabra</i> var. <i>turnbullii</i> Grassy understorey of <i>Austrostipa scabra</i>, <i>Austrostipa elegantissima</i>, <i>Enneapogon nigricans</i>. Weeds included <i>Ehrharta calycina</i> (Perennial Veldtgrass), <i>Avena barbata</i> (Oat Grass), <i>Lagurus ovatus</i> (Pussytails), <i>Mesembryanthemum crystallinum</i> (Iceplant), <i>Salvia verbenaca</i> (Sage), <i>Brassica</i> sp., <i>Asparagus asparagoides</i> (Bridal Creeper), <i>Scabiosa atropurpurea</i> (Pincusion). BAM Sites within this VA included: A4a and A4b.
Threatened species or community	This Vegetation Association was found to comprise the EPBC listed Endangered Mallee Bird Community of the Murray Darling Depression Bioregion. One State Rare fauna species was recorded within this VA – White-winged Chough (<i>Corcorax melanorhamphos</i>). A desktop assessment found several species as having potential to occur, including: Known <i>Corcorax melanorhamphos</i> (White-winged Chough) (NPW Act: Rare) <i>Lichenostomus cratitius occidentalis</i> (Purple-gaped Honeyeater) (NPW Act: Rare) <i>Zanda funerea whiteae</i> (Yellow-tailed Black Cockatoo) (NPW Act: Rare)

	Likely <i>Hieraetus morphnoides</i> (Little Eagle) (NPW Act: Vulnerable) <i>Hylacola cauta cauta</i> (Shy Heathwren) (NPW Act: Rare) Possible <i>Leipoa ocellata</i> (Malleefowl) (EPBC Act: Vulnerable)				
Landscape context score	1.12	Vegetation Condition Score	31.14	Conservation significance score	1.50
Unit biodiversity Score	52.31	Area (ha)	0.23	Total biodiversity Score	11.86

Table 8. Summary of VA5

Vegetation Association	VA5: <i>Eucalyptus calycogona</i> +/- <i>Eucalyptus socialis</i> +/- <i>Eucalyptus phenax</i> over sclerophyllous shrubs and <i>Austrostipa</i> spp.
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Figure 5. VA5 (curve 43A).

General description	Dominant overstorey of <i>Eucalyptus calycogona</i>, <i>Eucalyptus socialis</i>, <i>Eucalyptus phenax</i>. Midstorey of <i>Melaleuca acuminata</i>, <i>Rhagodia candolleana</i>, <i>Enchylaena tomentosa</i>. Grassy understorey of <i>Austrostipa</i> sp., <i>Rytidosperma</i> sp., <i>Enneapogon nigricans</i>, <i>Dianella revoluta</i>. BAM Sites within this VA included: A5a, A5b and A5c.
Threatened species or community	This Vegetation Association was found to comprise the EPBC listed Endangered Mallee Bird Community of the Murray Darling Depression Bioregion. No national or State listed threatened flora or fauna were observed at this site, however a desktop assessment found several species as having potential to occur, including: Known

	<i>Corcorax melanorhamphos</i> (White-winged Cough) (NPW Act: Rare) <i>Lichenostomus cratitius occidentalis</i> (Purple-gaped Honeyeater) (NPW Act: Rare) <i>Zanda funerea whiteae</i> (Yellow-tailed Black Cockatoo) (NPW Act: Rare) Likely <i>Hieraaetus morphnoides</i> (Little Eagle) (NPW Act: Vulnerable) <i>Hylacola cauta cauta</i> (Shy Heathwren) (NPW Act: Rare) Possible <i>Leipoa ocellata</i> (Malleefowl) (EPBC Act: Vulnerable)				
Landscape context score	1.12	Vegetation Condition Score	45.03	Conservation significance score	1.50
Unit biodiversity Score	76.48	Area (ha)	0.78	Total biodiversity Score	60.02

Table 9. Summary of VA7

Vegetation Association	VA7: <i>Eucalyptus incrassata</i> Mallee over sclerophyllous shrubs and <i>Austrostipa</i> spp.
	
Figure 6. VA7 at straight 17.	
General description	Overstorey of <i>Eucalyptus incrassata</i>, <i>Eucalyptus phenax</i>. Midstorey of <i>Melaleuca acuminata</i>, <i>Melaleuca uncinata</i>, <i>Enchylaena tomentosa</i>, <i>Acacia rigens</i>, <i>Acacia spinescens</i>, <i>Rhagodia candolleana</i>, <i>Rhagodia parabolica</i>, <i>Dodonaea viscosa</i>. Mostly grassy understorey of <i>Osteocarpum dipterocarpum</i>, <i>Austrostipa elegantissima</i>, <i>Rytidosperma</i> sp., <i>Enneapogon nigricans</i>, <i>Carpobrotus rossii</i>. Weeds included <i>Asparagus asparagoides</i> (Bridal Creeper, Declared), <i>Scabiosa atropurpurea</i> (Pincushion), <i>Avena barbata</i> (Oat Grass), <i>Salvia verbenaca</i> (Wild Sage), <i>Lycium ferocissimum</i> (African Boxthorn), <i>Pinus halepensis</i> (Radiata Pine), <i>Ehrharta calycina</i> (Perennial Veldtgrass).

	BAM Sites within this VA included: A7a, A7b and A7c.				
Threatened species or community	This Vegetation Association was found to comprise the EPBC listed Endangered Mallee Bird Community of the Murray Darling Depression Bioregion. No national or State listed threatened flora or fauna were observed at this site, however a desktop assessment found several species as having potential to occur, including: <u>Known</u> <i>Corcorax melanorhamphos</i> (White-winged Chough) (NPW Act: Rare) <i>Lichenostomus cratitius occidentalis</i> (Purple-gaped Honeyeater) (NPW Act: Rare) <i>Zanda funerea whiteae</i> (Yellow-tailed Black Cockatoo) (NPW Act: Rare) <u>Likely</u> <i>Hieraaetus morphnoides</i> (Little Eagle) (NPW Act: Vulnerable) <i>Hylacola cauta cauta</i> (Shy Heathwren) (NPW Act: Rare) <u>Possible</u> <i>Leipoa ocellata</i> (Malleefowl) (EPBC Act: Vulnerable)				
Landscape context score	1.12	Vegetation Condition Score	34.76	Conservation significance score	1.50
Unit biodiversity Score	58.40	Area (ha)	0.62	Total biodiversity Score	36.01

Table 10. Summary of VA8

Vegetation Association	VA8: <i>Austrostipa</i> spp. / <i>Rytidosperma</i> spp. / <i>Enneapogon nigricans</i> / <i>Avena barbata</i> Grassland.
	
Figure 7. VA 8 at straight 10.	
General description	Scattered emergent mallee tree species occurred throughout open grassland areas varying in condition to poor to moderate condition with varying levels of weed invasion. Other scattered shrubs included <i>Acacia pycnantha</i> and <i>Enchylaena tomentosa</i>. Dominant grass species varied but included <i>Austrostipa scabra</i>, <i>Austrostipa</i> sp., <i>Rytidosperma</i> sp., <i>Vittadinia gracilis</i>, <i>Ptilotus spathulatus</i>. Weeds were present throughout, dominated by <i>Avena barbata</i>, <i>Bromus diandrus</i>, <i>Bromus rubens</i>, <i>Asphodelus fistulosus</i>, <i>Salvia verbenaca</i>, <i>Gazania</i> sp., <i>Scabiosa atropurpurea</i>, <i>Lagurus ovatus</i> and <i>Reichardia tingitana</i>. One BAM site only.
Threatened species or community	This Vegetation Association was found to comprise the EPBC listed Endangered Mallee Bird Community of the Murray Darling Depression Bioregion. No national or State listed threatened flora or fauna were observed at this site, however a desktop assessment found several species as having potential to occur, including: <u>Known</u> <i>Corcorax melanorhamphos</i> (White-winged Chough) (NPW Act: Rare) <i>Lichenostomus cratitius occidentalis</i> (Purple-gaped Honeyeater) (NPW Act: Rare) <i>Zanda funerea whiteae</i> (Yellow-tailed Black Cockatoo) (NPW Act: Rare) <u>Likely</u> <i>Hieraetus morphnoides</i> (Little Eagle) (NPW Act: Vulnerable) <i>Hylacola cauta cauta</i> (Shy Heathwren) (NPW Act: Rare) <u>Possible</u> <i>Leipoa ocellata</i> (Malleefowl) (EPBC Act: Vulnerable)

Landscape context score	1.12	Vegetation Condition Score	5.25	Conservation significance score	1.00
Unit biodiversity Score	6.47	Area (ha)	0.38 (non-frangible, not impacted)	Total biodiversity Score	NA

Table 11. Summary of VA9

Vegetation Association	VA9: <i>Melaleuca lanceolata</i> Shrubland +/- <i>Eucalyptus socialis</i> .	
		
Figure 8. VA9 looking east. Lat: 35.38, Lon: 140.07.		
General description	Dense patch of shrubland close to the town of Jabuk, merging from the roadside onto private land, where revegetation has taken place. The upperstorey was dominated by <i>Melaleuca lanceolata</i> and also included <i>Melaleuca uncinata</i>, <i>Melaleuca acuminata</i> and <i>Eucalyptus socialis</i>. The midstorey was low and shrubby, containing <i>Acacia brachybotrya</i>, <i>Exocarpos aphylla</i>, and <i>Dampiera rosmarinifolia</i>. Understorey was patchy, but comprised a mix of <i>Enchylaena tomentosa</i>, <i>Rhagodia candolleana</i>, <i>Austrostipa</i> sp., <i>Rytidosperma</i> sp., <i>Goodenia</i> sp., <i>Carpobrotus rossii</i>. Weeds were sparsely present, more dominant on the roadside edge, and included <i>Asphodelus fistulosus</i>, <i>Asparagus asparagoides</i>, <i>Erodium</i> sp., <i>Romulea rosea</i> var. <i>australis</i> and <i>Sonchus</i> sp. One BAM site only.	
Threatened species or community	No national or State listed threatened flora or fauna or TECs were observed at this site, however a desktop assessment found several species as having potential to occur, including: <u>Known</u> <i>Corcorax melanorhamphos</i> (White-winged Chough) (NPW Act: Rare) <i>Lichenostomus cratitius occidentalis</i> (Purple-gaped Honeyeater) (NPW Act: Rare) <i>Zanda funerea whiteae</i> (Yellow-tailed Black Cockatoo) (NPW Act: Rare)	

	Likely <i>Hieraetus morphnoides</i> (Little Eagle) (NPW Act: Vulnerable) <i>Hylacola cauta cauta</i> (Shy Heathwren) (NPW Act: Rare) Possible <i>Leipoa ocellata</i> (Malleefowl) (EPBC Act: Vulnerable)				
Landscape context score	1.12	Vegetation Condition Score	52.63	Conservation significance score	1.00
Unit biodiversity Score	64.84	Area (ha)	0.05	Total biodiversity Score	3.31

Table 12. Summary of VA10

Vegetation Association	VA10: Mixed Mallee Open Woodland over <i>Callitris verrucosa</i> , <i>Melaleuca</i> sp., sclerophyllous shrubs +/- <i>Triodia irritans</i> .	
		
Figure 9. VA10 looking west. Lat: 35.36; Lon:139.94.		
General description	Overstorey dominated by <i>Callitris verrucosa</i> with mixed, <i>Eucalyptus phenax</i>, <i>Eucalyptus socialis</i>, <i>Melaleuca acuminata</i>, <i>Melaleuca lanceolata</i>, <i>Eucalyptus porosa</i>, <i>Eucalyptus leptophylla</i>. Midstorey of <i>Correa glabra</i>, <i>Acacia brachybotrya</i>, <i>Santalum acuminatum</i>, <i>Exocarpos sparteus</i> Understorey of <i>Enchylaena tomentosa</i>, <i>Chenopodium desertorum</i>, <i>Austrostipa</i> sp., <i>Rytidosperma</i> sp., <i>Triodia irritans</i>, <i>Enneapogon nigricans</i>, <i>Dianella revoluta</i> and <i>Ptilotus obovatus</i>. Weeds included <i>Asparagus asparagoides</i> (Bridal Creeper, Declared), <i>Romulea rosea</i> var. <i>australis</i> (Onionweed), <i>Scabiosa atropurpurea</i> (Pincushion). <i>Lagurus ovata</i> (Pussytails). Sparsely present Declared woody weeds <i>Shinus molle</i> (Pepper Tree) and <i>Olea europaeus</i> (Olive). Undulating sandy soil. One BAM site only.	

Threatened species or community	This Vegetation Association was found to comprise the EPBC listed Endangered Mallee Bird Community of the Murray Darling Depression Bioregion. No national or State listed threatened flora or fauna were observed at this site, however a desktop assessment found several species as having potential to occur, including: <u>Known</u> <i>Corcorax melanorhamphos</i> (White-winged Chough) (NPW Act: Rare) <i>Lichenostomus cratitius occidentalis</i> (Purple-gaped Honeyeater) (NPW Act: Rare) <i>Zanda funerea whiteae</i> (Yellow-tailed Black Cockatoo) (NPW Act: Rare) <u>Likely</u> <i>Hieraaetus morphnoides</i> (Little Eagle) (NPW Act: Vulnerable) <i>Hylacola cauta cauta</i> (Shy Heathwren) (NPW Act: Rare) <u>Possible</u> <i>Leipoa ocellata</i> (Malleefowl) (EPBC Act: Vulnerable)				
Landscape context score	1.12	Vegetation Condition Score	55.28	Conservation significance score	1.50
Unit biodiversity Score	92.86	Area (ha)	0.32	Total biodiversity Score	30.03

Table 13. Summary of VA11

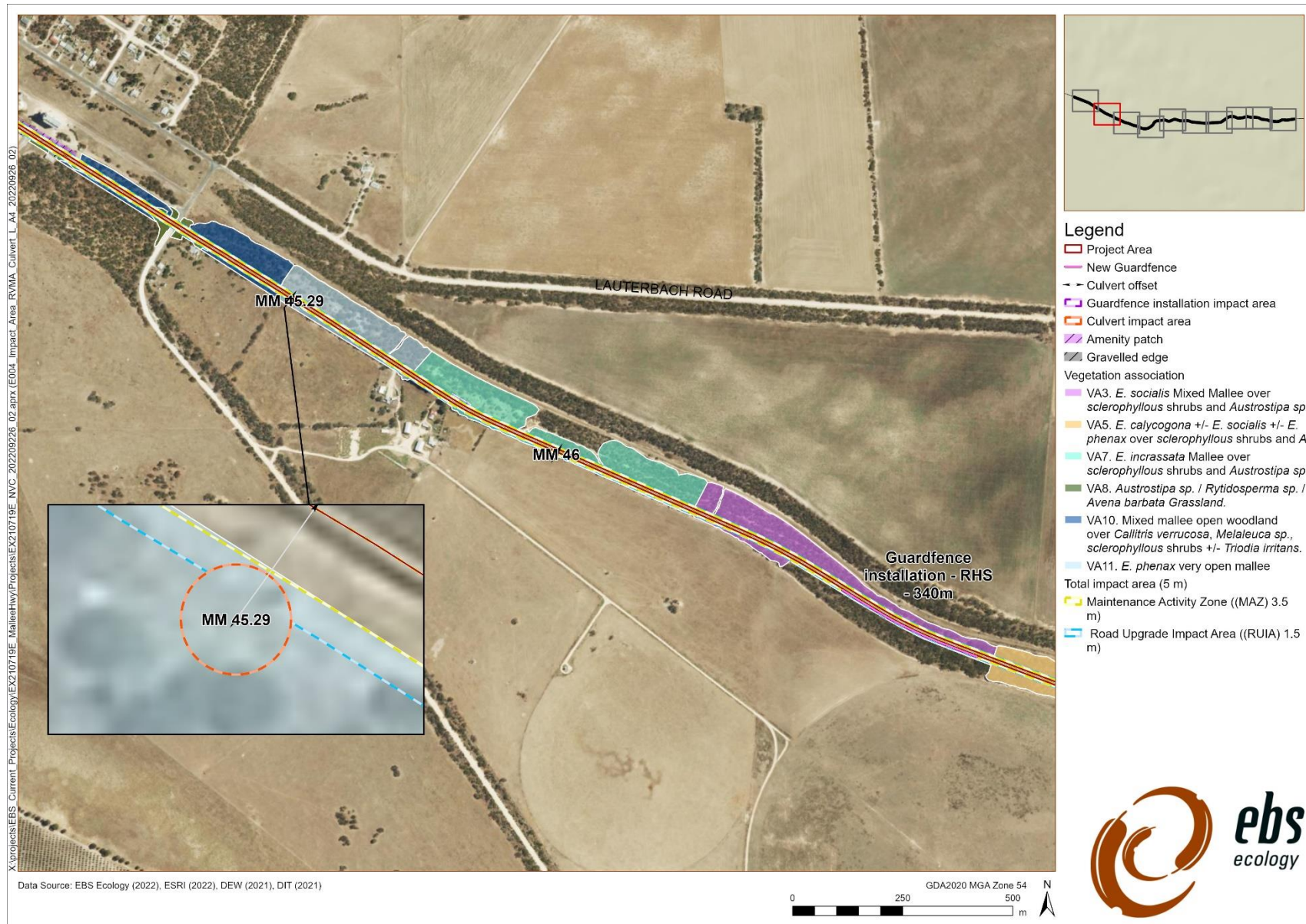
Vegetation Association	VA11: <i>Eucalyptus phenax</i> Very Open Mallee	
		
Figure 10. VA 11 looking east Lat: 35.37° S; Lon: 139.96		
General description	Overstorey of <i>Eucalyptus phenax</i> and <i>Eucalyptus dumosa</i> Midstorey of <i>Acacia pycnantha</i> and <i>Correa glabra</i> Understorey of <i>Enchylaena tomentosa</i>, <i>Austrostipa</i> sp., <i>Westringia rigida</i>, <i>Beyeria opaca</i>, <i>Dianella revoluta</i> and <i>Lasiopetalum behrii</i>. Weeds included <i>Asphodelus fistulosus</i> (Onion weed) <i>Asparagus asparagoides</i> (Bridal Creeper, Declared). <i>Scabiosa atropurpurea</i> (Pincushion).	

	Gravelly limestone soil surface with abundant leaf litter. Mallee typically 6-10m in height. One BAM site only.				
Threatened species or community	This Vegetation Association was found to comprise the EPBC listed Endangered Mallee Bird Community of the Murray Darling Depression Bioregion. No national or State listed threatened flora or fauna were observed at this site, however a desktop assessment found several species as having potential to occur, including: <u>Known</u> <i>Corcorax melanorhamphos</i> (White-winged Chough) (NPW Act: Rare) <i>Lichenostomus cratitius occidentalis</i> (Purple-gaped Honeyeater) (NPW Act: Rare) <i>Zanda funerea whiteae</i> (Yellow-tailed Black Cockatoo) (NPW Act: Rare) <u>Likely</u> <i>Hieraaetus morphnoides</i> (Little Eagle) (NPW Act: Vulnerable) <i>Hylacola cauta cauta</i> (Shy Heathwren) (NPW Act: Rare) <u>Possible</u> <i>Leipoa ocellata</i> (Malleefowl) (EPBC Act: Vulnerable)				
Landscape context score	1.12	Vegetation Condition Score	44.85	Conservation significance score	1.50
Unit biodiversity Score	75.35	Area (ha)	0.07	Total biodiversity Score	5.12

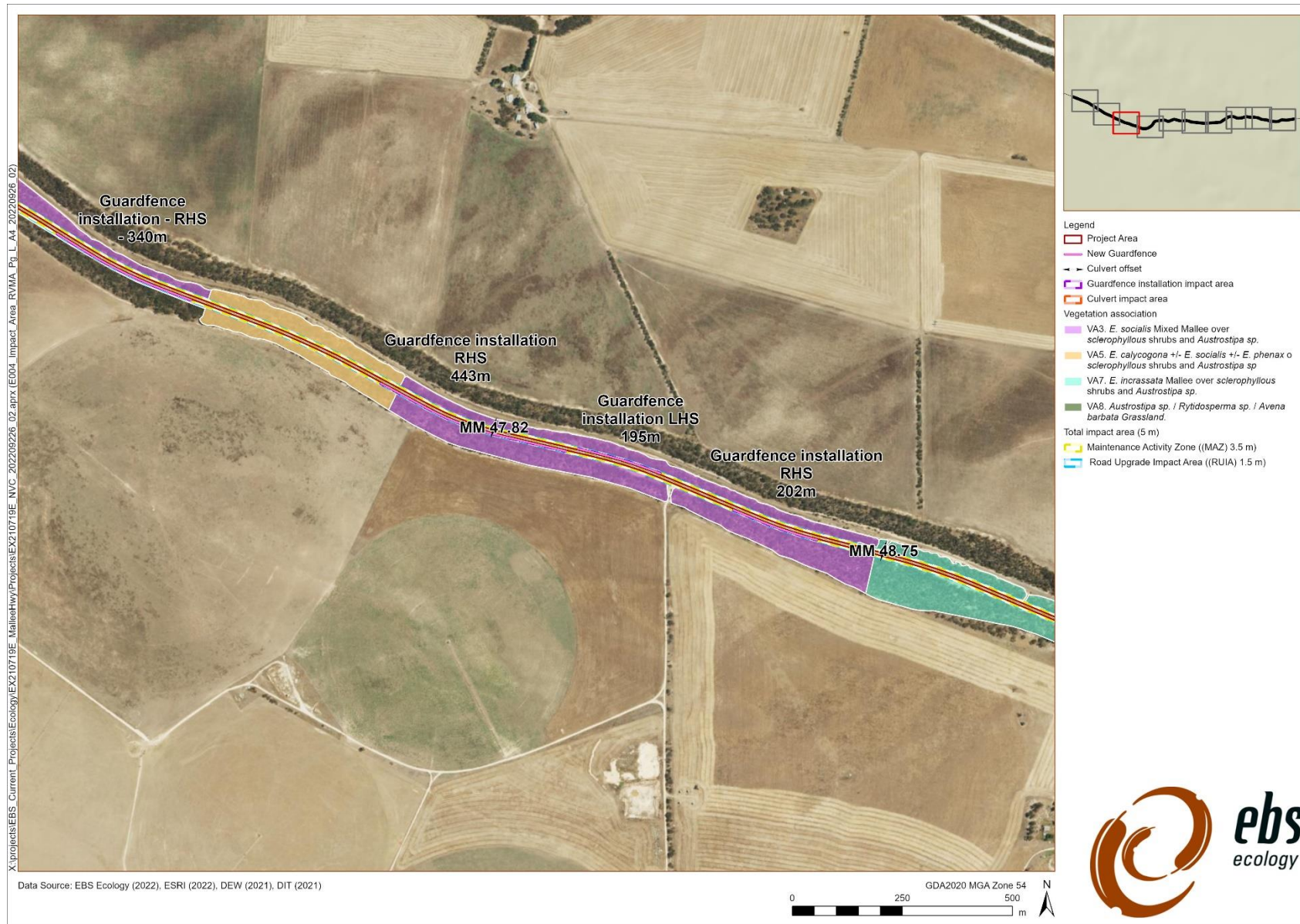
4.1.3. Site map showing areas of proposed impact



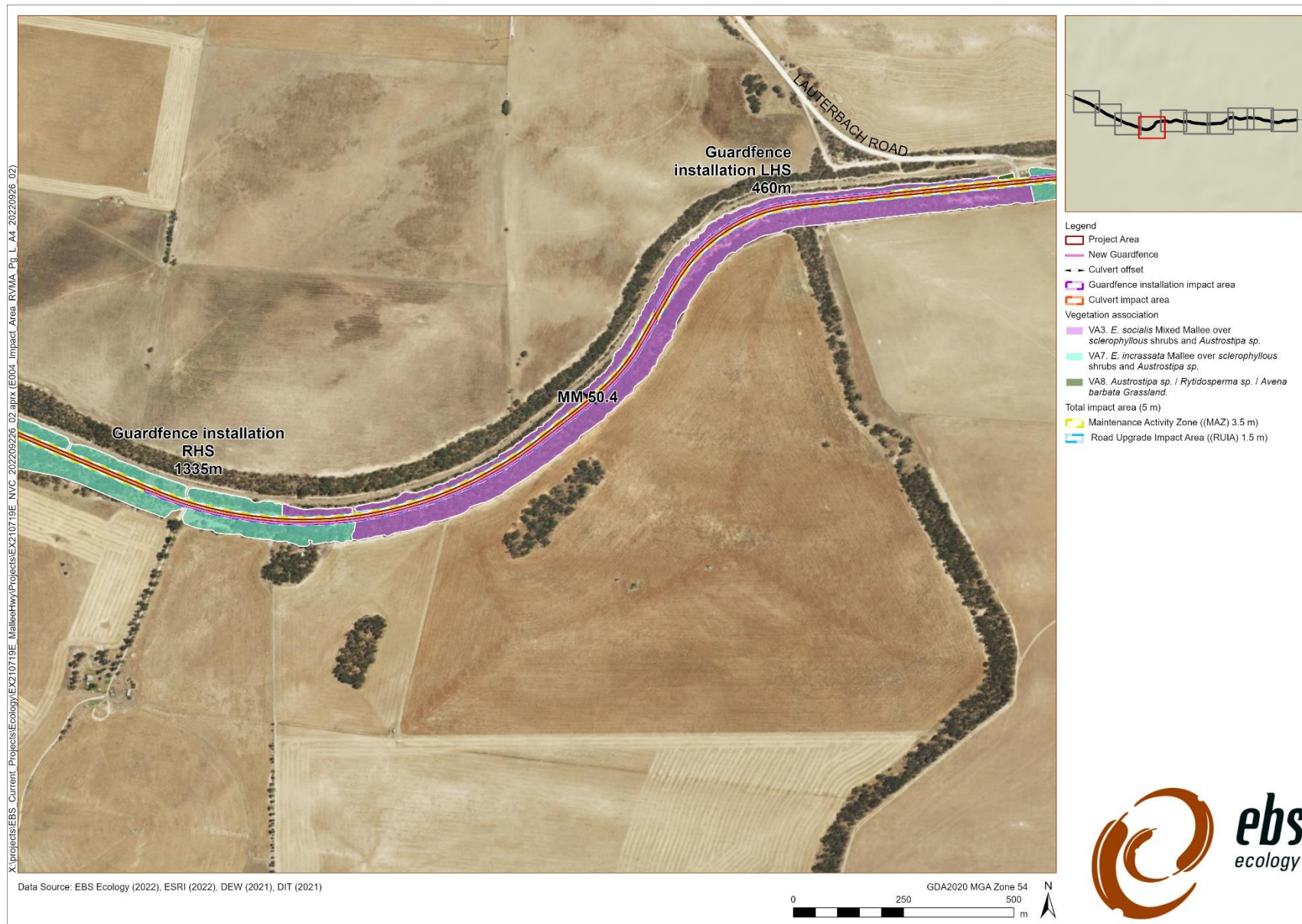
Map 1. Project impact area Map 1 of 10.



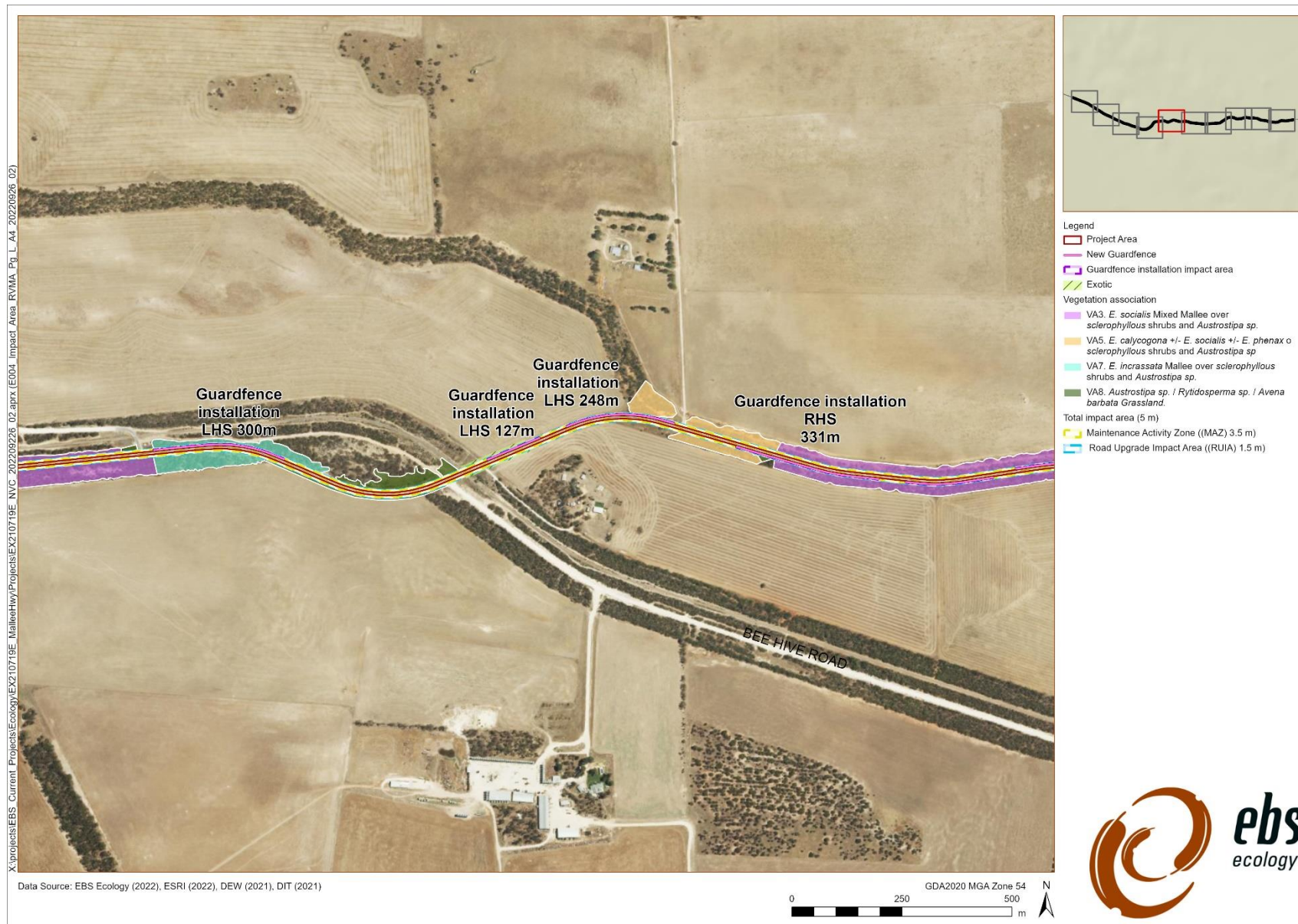
Map 2. Project impact area Map 2 of 10.



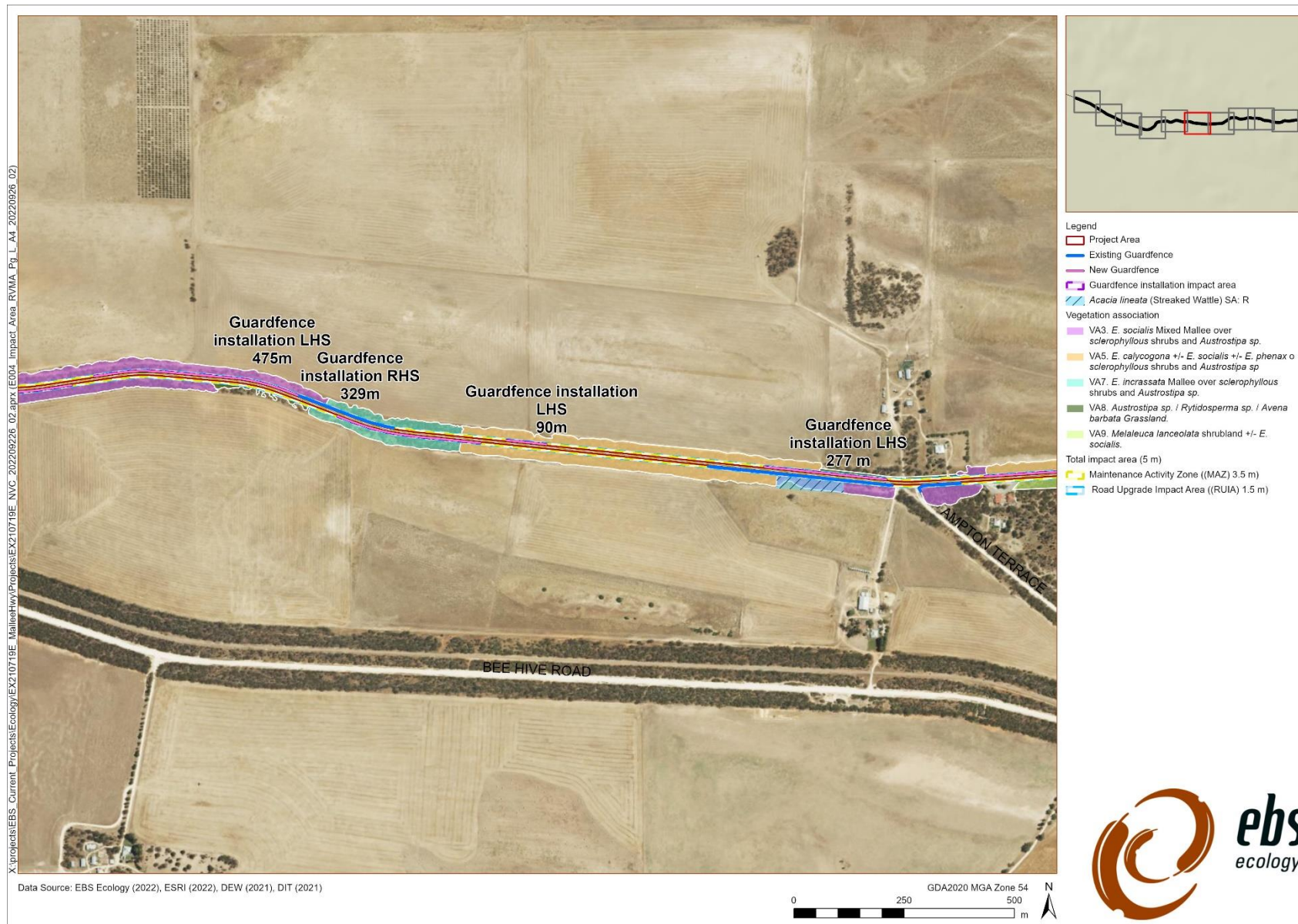
Map 3. Project impact area Map 3 of 10.



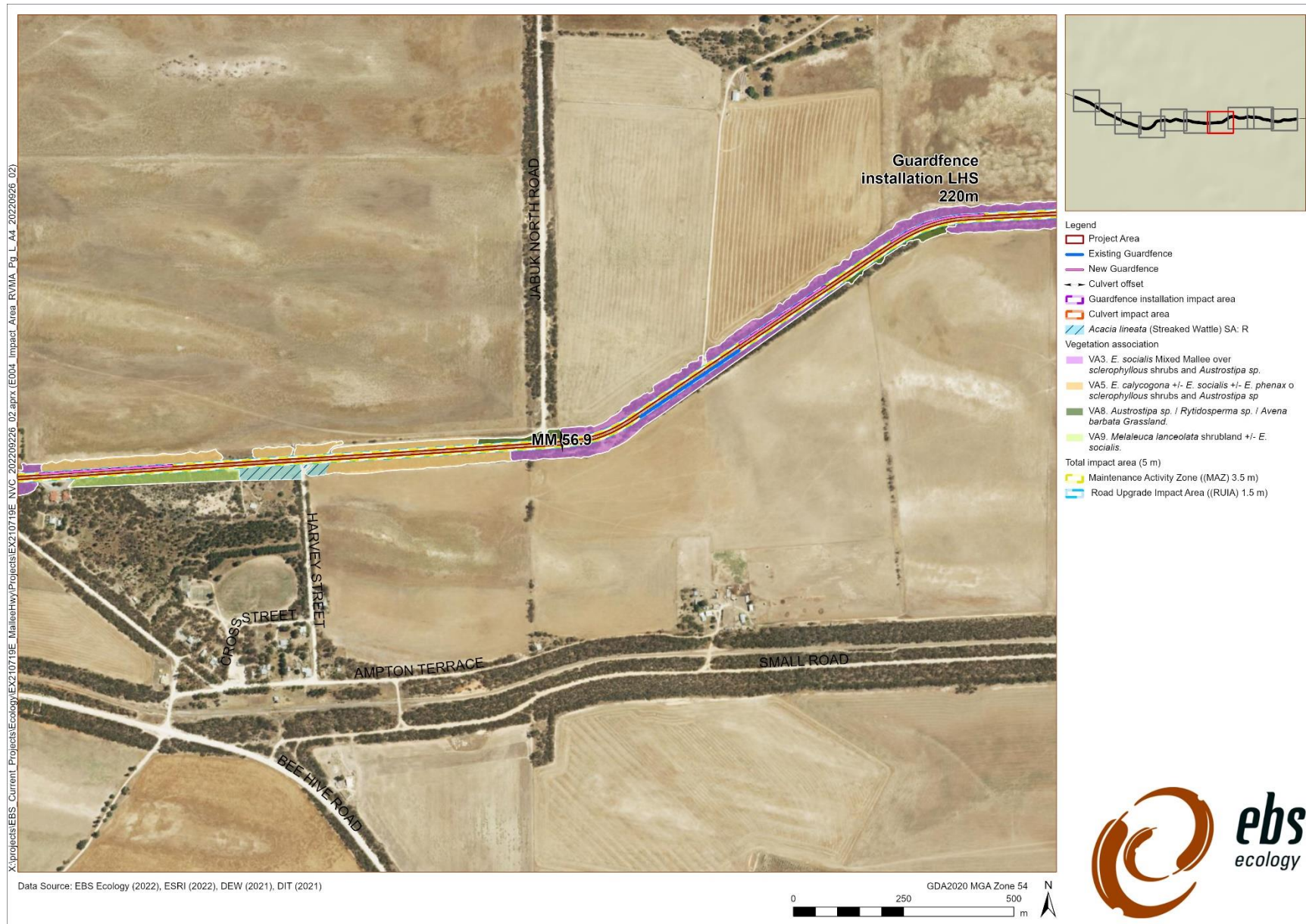
Map 4. Project impact area Map 4 of 10.



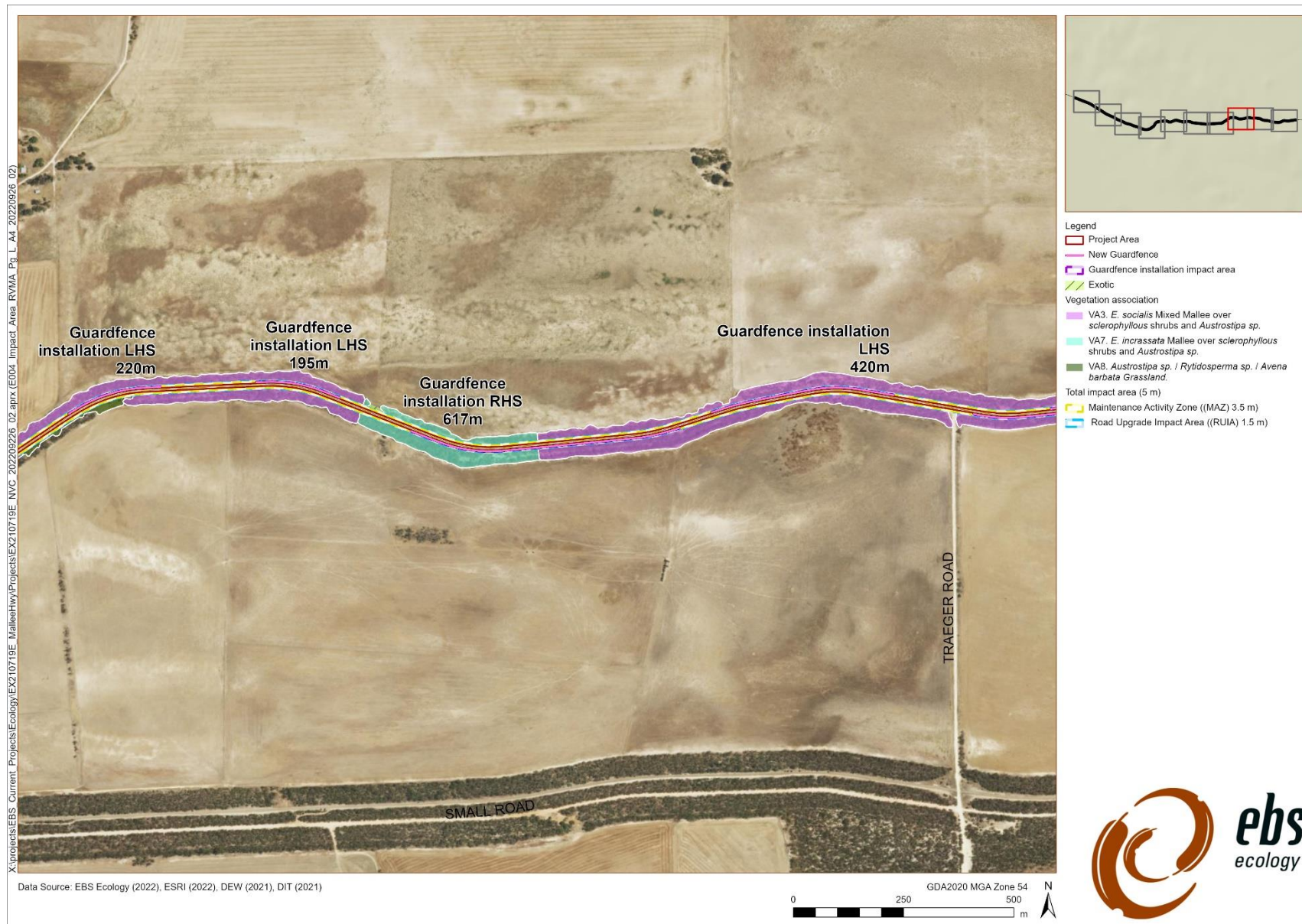
Map 5. Project impact area Map 5 of 10.



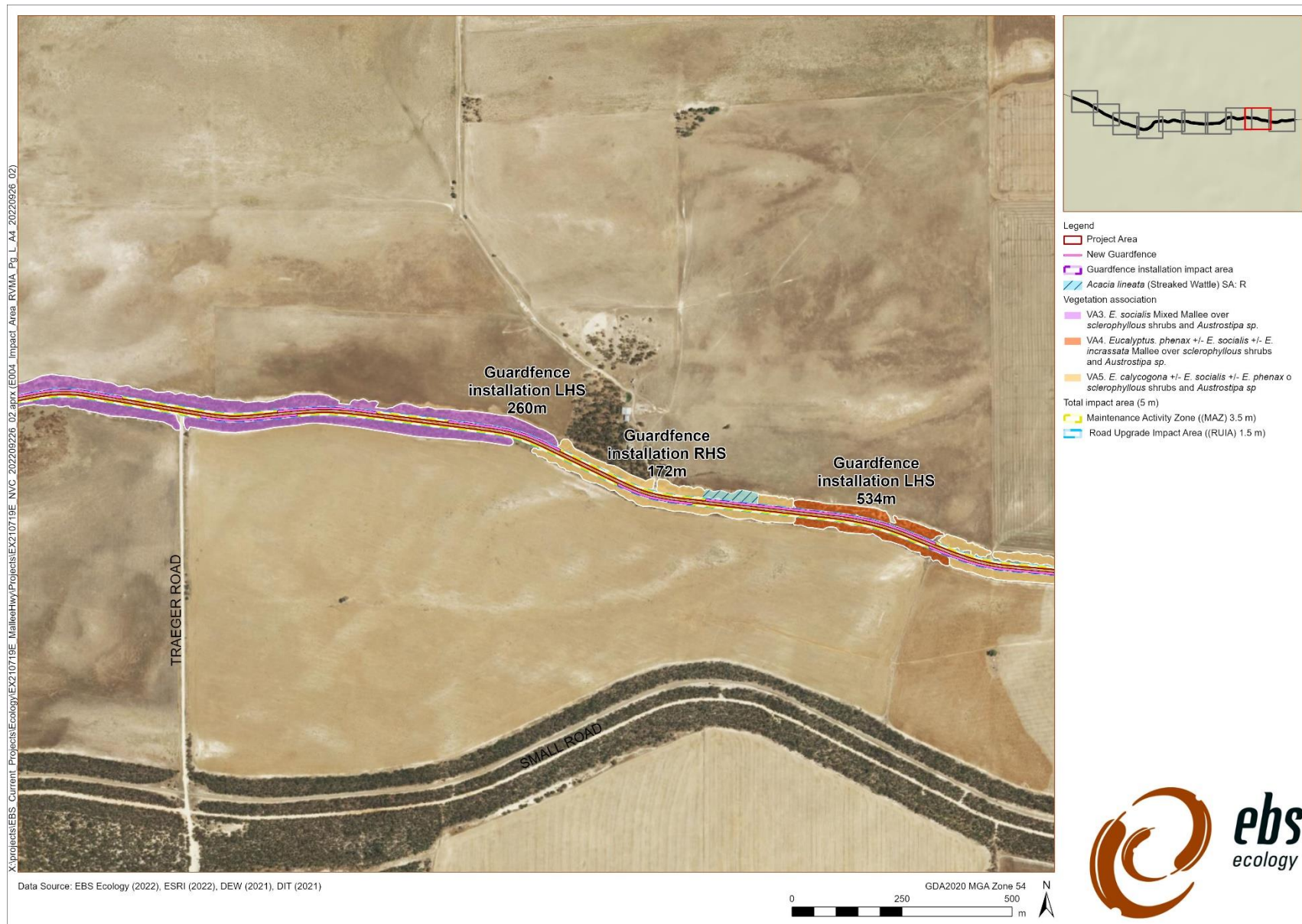
Map 6. Project impact area Map 6 of 10.



Map 7. Project impact area Map 7 of 10.



Map 8. Project impact area Map 8 of 10.



Map 9. Project impact area Map 9 of 10.



Map 10. Project impact area Map 10 of 10.

4.1.4. Photo log

Photos below (Figure 11 and Figure 12) show the condition of vegetation occurring within the immediate roadside vegetation, with historical clearance area evidently extending out from between 3.5 m to around 10 m in some places. A higher weed load was apparent in the existing MAZ, particularly where batter slopes occurred, and disturbance around existing culverts extended into the surrounding vegetation.



Figure 11. Weeds occurring in previous disturbance area, especially on batter slopes, with native vegetation set back from the road edge line.



Figure 12. Disturbance from existing culverts, looking from road edge into vegetation.

4.2. Threatened species assessment

Three EPBC Act listed TEC were identified by the PMST, of which one was found to occur within the Project Area, summarised in Table 14.

Table 14. Threatened Ecological Communities identified as possibly occurring within the Project Area.

Threatened Ecological Community	Status	PMST Type of Occurrence	Confirmed occurrence
Plains Mallee Box Woodlands of the Murray Darling Depression, Riverina and Naracoorte Coastal Plain Bioregions.	Critically Endangered	Community likely to occur	Does not occur in Project impact area, but was observed within the broader road reserve / rail corridor and in area considered within the initial scope of the road upgrades (i.e., between MM 10.0 and MM 43.5)
Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions.	Endangered	Community may occur	A field assessment confirmed that this TEC does not occur in the Project Area.
Mallee Birds Community of the Murray Darling Depression Bioregion	Endangered	Community likely to occur	A desktop and field survey confirmed that this community occurs in Project Area in all vegetation identified as Mallee.

A PMST search found eight EPBC listed threatened plant species were identified as possibly occurring within 5 km of the Project Area. Based on field survey results as well as proximity of and time since previous records (BDBSA Recordset number: DEWNRBDBSA220902-1), two of these species were considered to potentially occur:

- *Thelymitra epipactoides* (Metallic Sun-orchid); (EPBC Act: Endangered) and
- *Caladenia tensa* (Greencomb Spider-orchid) (EPBC Act: Endangered).

Thirteen EPBC listed threatened fauna species were identified as possibly occurring within the Project Area. Based on proximity of and time since the most recent record (BDBSA Recordset number: DEWNRBDBSA220902-1) combined with suitability of habitat in the Project Area, two of these species were determined as potentially occurring within the Project Area:

- Malleefowl (*Leipoa ocellata*) (EPBC Act: Vulnerable); and
- Regent Parrot (*Polytelis anthopeplus monarchoides*) (EPBC Act: Vulnerable).

Ten EPBC listed migratory fauna species were identified as possibly occurring within 5 km of the Project Area. All of these species were associated with wetland or marine environments and are likely to occur within the Coorong and Lakes Alexandrina and Albert Wetland situated ~10 km to the south. However, the Project Area is not within any wetland area and contains no watercourses that flow into the important wetland or otherwise.

The BDBSA search found two threatened flora species with records within 5 km of the Project Area including one EPBC listed species *Thelymitra epipactoides* (Metallic Sun-orchid). One additional State Rare flora species was detected throughout the Project Area during the field assessment, *Acacia lineata*.

A BDBSA search (BDBSA Recordset number: DEWNRBDBSA220902-1) found five listed threatened fauna species with records in the Project Area including one EPBC listed species, the Regent Parrot (*Polytelis anthopeplus monarchoides*). Three of these species were observed within the Project Area during the field survey, Yellow-tailed Black Cockatoo (*Zanda funerea whiteae*), White-winged Chough (*Corcorax melanorhamphos*) and Purple-gaped Honeyeater (*Lichenostomus cratitius occidentalis*). Two other species were observed outside of the Project Area within areas of intact bushland such as Heritage Agreements during the field survey, Shy Heathwren (*Hylacola cauta cauta*) and Malleefowl (*Leipoa ocellata*).

Table 15 presents species observed on site or recorded within 5 km of the application area since 1995 (<1 km reliability), or the vegetation is considered to provide suitable habitat and the PMST found them likely or known to occur. A full list of all species, including migratory species, assessed as part of this Project is presented in Appendix 4. Likelihood assessment of threatened species.

Table 15. Likelihood of occurrence of threatened species identified in the desktop assessment. The data source and threat levels are described in the table footer.

Species (common name)	EPBC Act	NPW Act	Data source	Date of last record	Species known habitat preferences	Likelihood of use for habitat – Comments
FLORA						
<i>Acacia lineata</i> (Streaked Wattle)		R	1, 4	2022	Typically grows in mallee habitats (Maslin, 2018)	Known- this species was observed and marked throughout the length of the Project Area during the field surveys (indicated in Section 4.1.3 on Map 1 to Map 10).

Species (common name)	EPBC Act	NPW Act	Data source	Date of last record	Species known habitat preferences	Likelihood of use for habitat – Comments
<i>Caladenia tensa</i> (Greencomb Spider-orchid)	EN		5	NA	Dry woodland and mallee in sandy loam soils (Seeds of SA, 2022). A single record occurs approximately 8.5 kilometres to the southeast of the Project Area near Parrakie, from 2005.	Unlikely – potentially suitable habitat in Project Area, however there are no recent records within 5 km of the Project Area. A targeted field survey undertaken on 28 September 2022 did not locate this species within the Project Area.
<i>Eucalyptus dalrympleana</i> ssp. <i>dalrympleana</i> (Candlebark Gum)		R	1	1998	In South Australia, the species occurs naturally only in the southern Mount Lofty Ranges.	Unlikely- The Project Area is outside the natural distribution of the species. The single historical record is most likely a planted specimen and was not observed during the field survey.
<i>Thelymitra epipactoides</i> (Metallic Sun-orchid)	EN	E	1, 5	NA	<i>Thelymitra epipactoides</i> occurs in a variety of habitats including grasslands, heathlands, heathy and shrubby woodlands and open forest (Duncan and Coates, 2010).	Unlikely – habitat is broadly suitable with one record occurring 5.5 km to the south of the Project Area. The majority of known records in the SA Murray Darling Basin occur nearby Murray Bridge, Tailm Bend, Coonalpyn and Meningie. A targeted field survey undertaken on 28 September 2022 did not locate this species within the Project Area.
FAUNA						
<i>Corcorax melanorhamphos</i> (White-winged Chough)		R	1, 4	2022	Open forests and woodlands. They tend to prefer the wetter areas, with lots of leaf-litter, for feeding, and available mud for nest building.	Known – the species was recorded frequently throughout the survey.
<i>Falco hypoleucos</i> (Grey Falcon)	VU	R	5	NA	Occurs in arid and semi-arid Australia including the Murray-Darling Basin, Eyre Basin and central Australia and WA. Frequents timbered lowland plains, with acacia shrublands and tree-lined watercourses (TSSC, 2020).	Unlikely – no nearby records and no preferred habitat in Project Area.
<i>Hieraetus morphnoides</i> (Little Eagle)		V	4	2022	Woodland and forested lands and open country.	Likely – Habitat is broadly suitable and there are historical records of the species between 20 and 40 years old near the Project Area. This species was identified west of the Project Area during the field survey.

Species (common name)	EPBC Act	NPW Act	Data source	Date of last record	Species known habitat preferences	Likelihood of use for habitat – Comments
<i>Hylacola cauta cauta</i> (Shy Heathwren)		R	1	2012	Prefers dense shrubby or heath understorey in mallee woodland, mallee shrubland or mallee heath in coastal and semi-arid regions, often where spinifex (<i>Triodia</i>) occurs and with dense shrubs such as Banksia, Hakea and Grevillea, also tea-tree (<i>Leptospermum</i>) and cypress pine (<i>Callitris</i>) (Gregory, 2020).	Likely- there are small areas of potential habitat in the Project Area and nearby historical records between 10 and 20 years old. This species was detected on targeted field surveys in suitable habitat near the town of Sherlock (west of the Project Area).
<i>Leipoa ocellata</i> (Malleefowl)	VU	V	1	1991	Shrublands and low woodlands dominated by mallee and associated habitats such as Broombush (<i>Melaleuca uncinata</i>) and Scrub Pine (<i>Callitris verrucosa</i>). Requires a sandy substrate and an abundance of leaf litter for the construction of incubation nest (Benshemesh, 2007).	Possible – multiple records from heritage agreement areas to the NNE of Peake. Also observed during field survey in HA NNE of Peake. All records are > 5 km from the Project Area except one record of an active mound from 1991, situated 3.1 km NNE of Peake.
<i>Litoria raniformis</i> (Growling Grass Frog)	VU	E	1		Watercourses and wetlands.	Unlikely – no aquatic habitat in Project Area.
<i>Lichenostomus cratitius occidentalis</i> (Purple-gaped Honeyeater)		R	1, 4	2022	Mallee habitats, open woodland and heath.	Known -there is suitable habitat in the Project Area, with historical records between 10 and 20 years old within 5 km. This species was observed within the Project Area during the field survey.
<i>Polytelis anthopeplus monarchoides</i> (Regent Parrot (eastern))	VU	V			River Red Gum (<i>Eucalyptus camaldulensis</i>) floodplain woodland with abundance of nesting hollows.	Unlikely – Project Area not within known or suspected breeding area of species, and outside of area where the species is likely to occur based on the National Recovery Plan for the Regent Parrot (eastern subspecies). May occur as rare migrant and impact is therefore considered to be insignificant (Baker-Gabb and Hurley, 2011).
<i>Zanda funerea whiteae</i> (Yellow-tailed Black Cockatoo)		V	1, 4	2021	Eucalypt woodland, heathlands, subalpine areas, pine plantations and occasionally in urban areas. The species was observed just east of the Project Area in planted <i>Pinus halepensis</i> trees.	Known – observed during the field survey and pers. Comms with residents at Jabuk confirmed their presence.

Source; 1- BDBSA, 2 – AoLA, 3 – NatureMaps 4 – Recorded in the field, 5 – PMST, 6 – others

NPW Act; E= Endangered, V = Vulnerable, R= Rare ; EPBC Act; Ex = Extinct, CR = Critically endangered, EN = Endangered; VU = Vulnerable

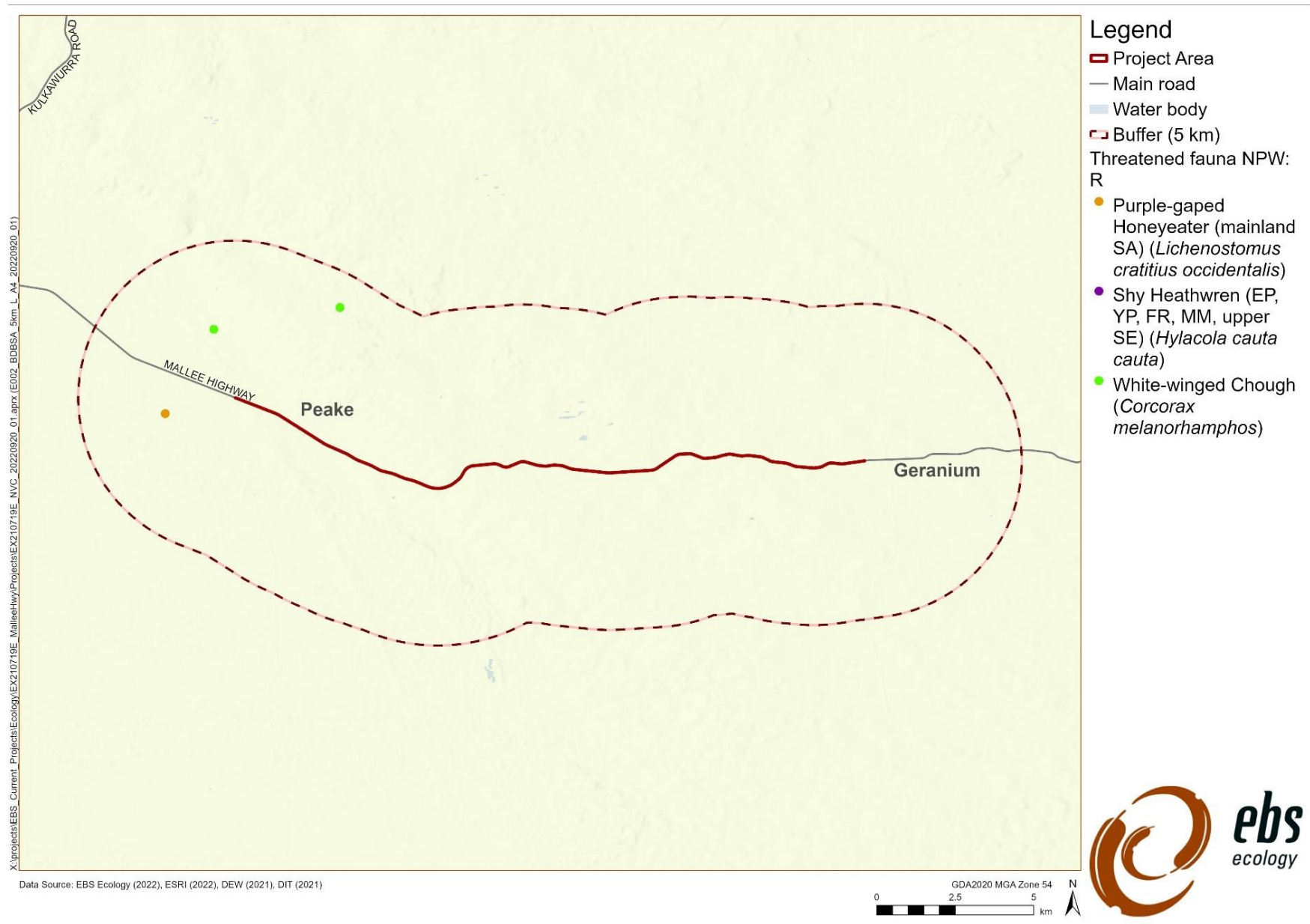


Figure 13. Threatened fauna records within 5 km of the Project Area (BDBSA Recordset number DEWNRBDBSA220902-1).

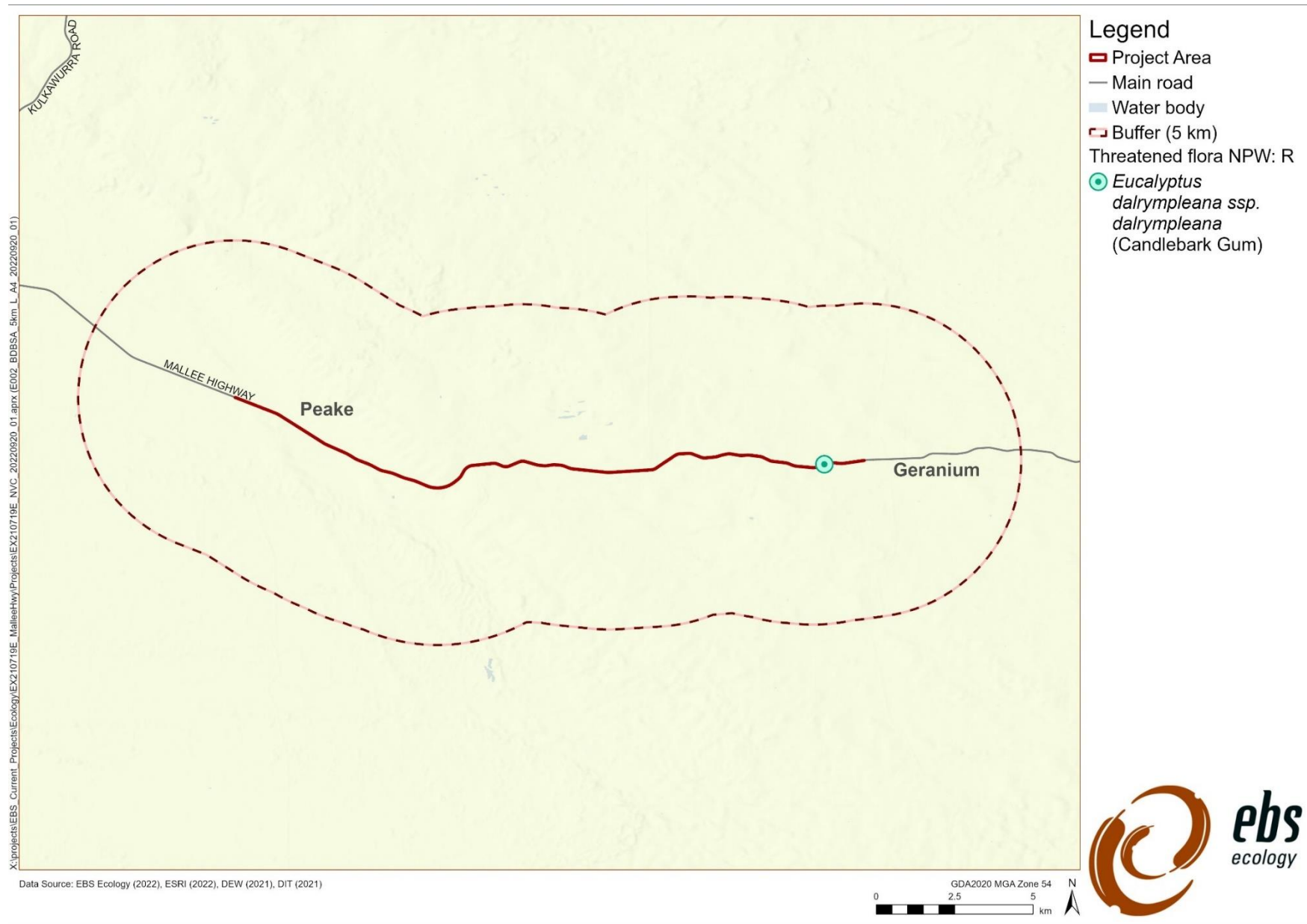


Figure 14. Threatened flora species with records within 5 km of the Project Area since 1995.

4.3. Cumulative impacts

When exercising a power or making a decision under Division 5 of the Native Vegetation Regulations 2017, the NVC must consider the potential cumulative impact, both direct and indirect, that is reasonably likely to result from a proposed clearance activity.

Direct impacts

The Project will result in clearance of up to 4.22 ha of non-frangible native vegetation, with impacts likely to include:

- Clearance of non-frangible vegetation rooted within the 3.5-5 m road upgrade impact area.
- Pruning of overhanging non-frangible vegetation within the 3.5-5 m road upgrade impact area.
- Clearance of non-frangible vegetation within the existing MAZ (0-3.5m).

Indirect impacts

- Possible increase in weed cover in Project Area from disturbance to ground layer and / or from increased light penetration into vegetation edges as a result of clearing.
- Temporary disturbance to fauna species utilising vegetation within the Project Area during construction works.
- Runoff and erosion impacts associated with culvert extensions, incorporated into a 2.5 m clearance buffer around all culverts.

4.4. Addressing the Mitigation Hierarchy

When exercising a power or making a decision under Division 5 of the Native Vegetation Regulations 2017, the NVC must have regard to the mitigation hierarchy. The NVC will also consider, with the aim to minimize, impacts on biological diversity, soil, water and other natural resources, threatened species or ecological communities under the EPBC Act or listed species under the NP&W Act.

a) Avoidance – outline measures taken to avoid clearance of native vegetation

Following provision of the Ecological Flora and Fauna Report (EBS Ecology, 2021) DIT reduced the Project Area extent from starting point of MM 10.0 to MM 43.5, resulting in a reduction of the Project Area extent of 33.5 km on both sides of the road.

b) Minimization – if clearance cannot be avoided, outline measures taken to minimize the extent, duration and intensity of impacts of the clearance on biodiversity to the fullest possible extent (whether the impact is direct, indirect or cumulative).

Only clearance of non-frangible vegetation is considered, as there will be no impacts to frangible vegetation, such as VA 8 *Austrostipa* spp., *Rytidosperma* spp. and *Avena barbata* Grassland. Impacts to understorey vegetation may occur as a result of works to remove / prune frangible vegetation, however, minimisation techniques will be utilised during construction, limiting the extent of damage, and all non-frangible vegetation will be allowed to regenerate.

Following provision of the updated Ecological Flora and Fauna Report (EBC Ecology 2022a), DIT proposed installation of guard fences to be installed along approximately 9.1 kilometres of roadside which equates to 21% of the current Project Area length. Clearance requirements are reduced to being contained within the existing MAZ where safety

barriers are proposed. Additionally, safety barriers are proposed in locations where State Rare *Acacia lineata* was identified, to minimise potential impacts to this species.

Vegetation clearance areas are based on mappable edge line of vegetation. Due to the multi-stemmed nature of the mallee vegetation, much of this is likely to be overhanging branches which will require clearance (through pruning) within the 5 m clearance area, leaving the base of the tree alive and able to regenerate.

Minimal impact techniques will be utilised during construction to ensure that damage to off-target vegetation is minimised. This includes, but is not limited to:

- Utilising existing disturbed or managed areas within MAZ for storage of equipment such as machinery and stockpiles (laydown areas) required during construction;
 - Utilising existing access tracks and disturbed areas for driving and parking of vehicles;
 - Construction contractor working under an approved Vegetation Management Plan including under instruction to minimise understorey impacts during construction works;
 - Clearly marking areas of vegetation to be retained in the Project Area (such as where threatened species like *Acacia lineata*) occur.
 - Construction contractor working under an approved Weed, Pest and Disease Management Plan.
- c) Rehabilitation or restoration – outline measures taken to rehabilitate ecosystems that have been degraded, and to restore ecosystems that have been degraded, or destroyed by the impact of clearance that cannot be avoided or further minimized, such as allowing for the re-establishment of the vegetation.**

Frangible vegetation occurring in the understorey will be allowed to regenerate following any disturbance that may occur during construction works.

- d) Offset – any adverse impact on native vegetation that cannot be avoided or further minimized should be offset by the achievement of a significant environmental benefit that outweighs that impact.**

Offset will be achieved by way of payment into the Native Vegetation Fund.

4.5. Principles of Clearance (Schedule 1, Native Vegetation Act 1991)

The Native Vegetation Council will consider Principles 1(b), 1(c) and 1(d) when assigning a level of Risk under Regulation 16 of the Native Vegetation Regulations. The Native Vegetation Council will consider all the Principles of Clearance of the Act as relevant, when considering an application referred under the *Planning, Development and Infrastructure Act 2016*. An assessment against the Principles for a native vegetation clearance application (not related to a Development Application) is presented in Table 16.

Table 16. Assessment against the Principles of Clearance.

Principle of clearance	Relevant information
Principle 1(b) – significance	Three State threatened species were recorded within the Project Area during the field survey. Several other species are considered to possibly occur. These species are listed below: <u>Known</u>

Principle of clearance	Relevant information																																								
as a habitat for wildlife	• <i>Corcorax melanorhamphos</i> (White-winged Chough) (NPW Act: Rare) • <i>Lichenostomus cratitius occidentalis</i> (Purple-gaped Honeyeater) (NPW Act: Rare) • <i>Zanda funerea whiteae</i> (Yellow-tailed Black Cockatoo) (NPW Act: Rare)																																								
	Likely																																								
	• <i>Hieraaetus morphnoides</i> (Little Eagle) (NPW Act: Vulnerable) • <i>Hylacola cauta cauta</i> (Shy Heathwren) (NPW Act: Rare)																																								
	Possible																																								
	• <i>Leipoa ocellata</i> (Malleefowl) (EPBC Act: Vulnerable)																																								
	The majority of vegetation in the Project Impact area, up to 5 m from the edge line, has previously been disturbed through road construction and / or maintenance activities. Vegetation is largely comprised of overhanging mallee spp. Branches with a mixed native and exotic understorey (which will not be impacted). BAM sites included vegetation which was further from the road impact area and therefore is likely to reflect higher fauna habitat scores that what was present in the area to be impacted.																																								
	White-winged Choughs are locally abundant in the Project Area, with multiple sightings made along the roadside throughout the survey periods. Other threatened species with potential to occur in the Project Area are unlikely to utilise the road corridor other than for dispersal. For example, the Shy Heathwren is likely to be restricted to denser vegetation in nearby larger blocks of vegetation. Malleefowl have been sighted in larger areas of vegetation north of Peake, but the Project Area is unlikely to support their lifecycle requirements. As the impact does not further fragment the corridor, it is unlikely to impact dispersal of this species. An EPBC Self-Assessment (EBS Ecology, 2022c – in review) found the project unlikely to have significant impact on this species.																																								
	Assessment against the principles:																																								
	<table><tr><th>VA</th><th>Threatened Fauna Score</th><th>Unit Biodiversity Score</th><th>At Variance</th><th>Seriously at Variance</th></tr><tr><td>A3</td><td>0.1</td><td>64.93</td><td></td><td>Yes</td></tr><tr><td>A4</td><td>0.1</td><td>52.31</td><td></td><td>Yes</td></tr><tr><td>A5</td><td>0.1</td><td>76.48</td><td></td><td>Yes</td></tr><tr><td>A7</td><td>0.1</td><td>58.40</td><td></td><td>Yes</td></tr><tr><td>A9</td><td>0.1</td><td>64.84</td><td></td><td>Yes</td></tr><tr><td>A10</td><td>0.1</td><td>92.86</td><td></td><td>Yes</td></tr><tr><td>A11</td><td>0.1</td><td>75.35</td><td></td><td>Yes</td></tr></table>	VA	Threatened Fauna Score	Unit Biodiversity Score	At Variance	Seriously at Variance	A3	0.1	64.93		Yes	A4	0.1	52.31		Yes	A5	0.1	76.48		Yes	A7	0.1	58.40		Yes	A9	0.1	64.84		Yes	A10	0.1	92.86		Yes	A11	0.1	75.35		Yes
	VA	Threatened Fauna Score	Unit Biodiversity Score	At Variance	Seriously at Variance																																				
A3	0.1	64.93		Yes																																					
A4	0.1	52.31		Yes																																					
A5	0.1	76.48		Yes																																					
A7	0.1	58.40		Yes																																					
A9	0.1	64.84		Yes																																					
A10	0.1	92.86		Yes																																					
A11	0.1	75.35		Yes																																					
Moderating Factors that may be considered by the NVC based on the above information:																																									
<u>Impact Significance</u> Is an impact likely to: • Lead to a long-term decrease in the size of a population, or • Reduce the area of occupancy of the species, or • Fragment an existing population into two or more populations, or • Adversely affect habitat critical to the survival of a species, or • Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or • Result in invasive species that are harmful to a threatened species becoming established in the threatened species habitat, or																																									

Principle of clearance	Relevant information
	- Interfere with the recovery of a species. <u>Non-essential habitat</u> - If the clearance is of non-essential habitat for threatened species and the clearance will have a negligible impact on that species local population over the long term (i.e. next 20 to 50 years), it may be reduced to 'At variance'.
Principle 1(c) – plants of a rare, vulnerable or endangered species	<u>Relevant information</u> One State threatened flora species was detected in the Project Area during the field survey – State Rare <i>Acacia lineata</i> (Streaked Wattle). The occurrence of this species is marked on Map 1 to 10 and has largely been avoided through placement of guard fences. Approximately 0.03 ha of this VA is within the Project Impact Area (not protected by guard fences), however as it is not considered non-frangible vegetation, will not be impacted. DIT should ensure areas which contain <i>A. lineata</i> are clearly marked prior to construction to ensure impacts to this species are minimised during construction works. Other threatened flora species which have potential to occur within the Project Area include species which were found to have records within 5 km of the Project Area since 1995 including: <i>Thelymitra epipactoides</i> (Metallic Sun-orchid); (Endangered) and <i>Caladenia tensa</i> (Greencomb Spider-orchid) (Endangered). A targeted field survey was undertaken in Spring 2022 (September 28, 2022) along the length of the Project Area (i.e., both sides of the road between MM 43.5 and MM65). No individuals of these species were detected, and it is considered unlikely that they occur. <u>Threatened Flora Score(s)</u> Only one BAM site (A5a) was found to contain this species, with a threatened flora score of 0.04. <i>Acacia lineata</i> was also detected and marked opportunistically within VAs: - A3 – <i>E. socialis</i> Mixed Mallee over sclerophyllous shrubs and <i>Austrostipa</i> sp. - A5 – <i>E. calycogona</i>, <i>E. socialis</i>, <i>E. phenax</i> over sclerophyllous shrubs and <i>Austrostipa</i> sp. <u>Assessment against the principles:</u> <u>Seriously at variance:</u> NA <u>At variance:</u> A3, A5 <u>Moderating Factors that may be considered by the NVC based on the above information:</u> <u>Impact Significance</u> Is an impact likely to: - Lead to a long-term decrease in the size of a population, or - Reduce the area of occupancy of the species, or - Fragment an existing population into two or more populations, or - Adversely affect habitat critical to the survival of a species, or - Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or

Principle of clearance	Relevant information
	• Result in invasive species that are harmful to a threatened species becoming established in the threatened species habitat, or • Interfere with the recovery of a species. <u>Number of plants to be cleared</u> If less than 1% of the individual plants are affected within the immediate vicinity (within a 1 km radius) of the proposed clearance, or the affected individuals can be transplanted or replaced easily, the proposed clearance may be tempered to 'At variance'.
Principle 1(d) – the vegetation comprises the whole or part of a plant community that is Rare, Vulnerable or endangered	A desktop assessment and subsequent targeted bird survey found the nationally Endangered Mallee Bird Community of the Murray Darling Depression Bioregion to occur within the Project Area, in all vegetation considered mallee (listed below). An EPBC Self-Assessment (EBS Ecology, 2022c – in review) found the impact to this community to be not significant based on: • Clearance of vegetation for the Project represents a clearance of <0.05% of the 8,379.51 ha of mallee vegetation mapped within 20 km of the Project Area (DEW Native Vegetation Mapping). • The clearance will not result in a reduction in the extent of the MBC as it is within an area central to the mapped MBC. • Clearance will not result in fragmentation of the ecological community and is therefore not likely to impact dispersal opportunities of MBC species which have strongholds in adjoining larger patches of vegetation. The only functionally important species listed for the MBC is Malleefowl, which is not expected to be impacted by the Project, as the Project Area is not suitable to maintain its lifecycle. • Vegetation within the clearance impact area has been historically disturbed and therefore will not modify or destroy abiotic factors, nor result in increased occurrence of invasive species, nor increase the incidence of chemical pollutants into the vegetation. <u>Threatened Community Score</u> A3, A4, A5, A7, A10, A11: 1.4 <u>Assessment against the principles:</u> <u>Seriously at variance</u> A3, A4, A5, A7, A10, A11 <u>Moderating Factors that may be considered by the NVC based on the above information:</u> <u>Impact Significance:</u> Is an impact likely to: • Lead to a long-term decrease in the size of a population, or • Reduce the area of occupancy of the species, or • Fragment an existing population into two or more populations, or • Adversely affect habitat critical to the survival of a species, or • Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or • Result in invasive species that are harmful to a threatened species becoming established in the threatened species habitat, or

Principle of clearance	Relevant information
	Interfere with the recovery of a species. <i>Area of impact:</i> If less than 1% of the area of that vegetation community within the immediate vicinity (within a 1 km radius) of proposed clearance is to be affected, the proposed clearance may be tempered to 'At variance'. <i>Condition of the vegetation:</i> If the vegetation is in a highly degraded state and is unlikely to return to a functional state without significant human intervention, the proposed clearance may be tempered to 'At variance'.

Principles of Clearance (h-m) will be considered by comments provided by the local NRM Board or relevant Minister. The Data Report should contain information on these principles where relevant and where sufficient information or expertise is available.

4.6. Risk assessment

The application is a Level 4 clearance, as summarised in Table 17. The level of clearance has been assessed based on the risk assessment methodology outlined in Table 18. NVC risk assessment table.

Table 17. Summary of the level of risk associated with the application.

Total clearance	No. of trees	0
	Area (ha)	4.22
	Total biodiversity Score	285.81
Seriously at variance with principle 1(b), 1(c) or 1 (d)		1b, 1d
Risk assessment outcome		Level 4

Table 18. NVC risk assessment table.

	Agricultural (EP, GA, H&F, KI, LC, M&R and N&Y Landscape Management Regions plus Port Augusta city Council and the Flinders Ranges Council).		Pastoral (SAAL and AW Landscape Management Regions excluding Port Augusta city Council and the Flinders Ranges Council).		Escalating matters Clearance assessment will be raised to the next level if;
	Patches – clearance	Trees – clearance	Patches – clearance	Trees – clearance	
Level 1	0.05ha or less	5 trees or less	3ha or less	5 trees or less	The site contains a listed species or contains a threatened community under either the NP&W Act or EPBC Act Or Clearance of any trees of the specified circumference.
	And clearance does not involve any trees with a trunk circumference measured at 1m above the ground of (for multi stemmed trees, measure the largest trunk/stem): - 50cm or more for Agricultural zone, or - 30cm or more for the Pastoral zone,				
Level 2	>0.05 ha to 0.5ha	6 – 20 trees	>3ha to 10 ha	6 – 20 trees	Clearance is seriously at variance with Principle of Clearance 1(b), 1(c) or 1(d).
Level 3	Total Biodiversity Score of less than or equal to 250		Total Biodiversity Score of less than or equal to 2500 .		Clearance is seriously at variance with Principle of Clearance 1(b), 1(c) or 1(d).
Level 4	Total Biodiversity Score of greater than 250		Total Biodiversity Score of greater than 2500		

5. Clearance summary

Clearance Area(s) Summary table

Table 19. Clearance Summary Table for Mallee Highway. Average scores for VAs with multiple sites indicated in green and totals based on the actual clearance area in orange.

Block	BAM Sample point	Species Diversity Score	TEC Score	Threatened Plant Score	Threatened Fauna Score	Unit Biodiversity Score	Area (ha)	Total Biodiversity Score (UBS x Area)	Loss Factor	Loadings	Reductions	SEB Points Required	SEB Payment (GST Exclusive)	Admin Fee (GST inclusive)
A	3a	14	1.4	0	0.1	44.7	1	-	0.8			37.55	\$12,689.69	\$697.93
	3b	16	1.4	0	0.1	57.86	1	-	0.8			48.60	\$16,470.25	\$905.86
	3c	18	1.4	0	0.1	72.45	1	-	0.8			60.86	\$21,992.60	\$1,209.59
	3d	21	1.4	0	0.1	74.09	1	-	0.8			62.23	\$23,014.20	\$1,265.78
	3e	22	1.4	0	0.1	81.81	1	-	0.8			68.72	\$25,475.84	\$1,401.17
	3f	18	1.4	0	0.1	58.67	1	-	0.8			49.29	\$18,272.24	\$1,004.97
	VA3 Average	18.17	1.4	0	0.1	64.93	1	64.93	0.8			54.54	\$19,652.47	\$1,080.88
	VA3 Total		1.4	0	0.1	64.93	2.15	139.46	0.8	-	-	117.15	\$42,209.58	\$2,321.52
	4a	16	1.4	0	0.1	46.41	1		0.8			38.98	\$13,650.04	\$750.75
	4b	14	1.4	0	0.1	58.21	1		0.8			48.90	\$18,082.58	\$994.54
	VA4 Average	15	1.4	0	0.1	52.31	1	52.31	0.8			43.94	\$15,866.31	\$872.65

Block	BAM Sample point	Species Diversity Score	TEC Score	Threatened Plant Score	Threatened Fauna Score	Unit Biodiversity Score	Area (ha)	Total Biodiversity Score (UBS x Area)	Loss Factor	Loadings	Reductions	SEB Points Required	SEB Payment (GST Exclusive)	Admin Fee (GST inclusive)
	VA4 Total		1.4	0	0.1	52.31	0.23	11.86	0.8	-	-	9.96	\$3,596.89	\$197.83
	5a	22	1.4	0.04	0.1	97.49	1		0.8			81.90	\$30,208.31	\$1,661.46
	5b	12	1.4	0	0.1	39.1	1		0.8			32.85	\$12,054.13	\$662.98
	5c	20	1.4	0	0.1	92.86	1		0.8			78	\$28,773.00	\$1,582.51
	VA5 Average	18	1.4	0	0.1	76.48	1	76.48	0.8			64.25	\$23,678.48	\$1,302.32
	VA5 Total	-	1.4	0.04	0.1	76.48	0.79	60.02	0.8	-	-	50.42	\$18,582.87	\$1,022.06
	7a	14	1.4	0	0.1	65.44	1		0.8			54.97	\$20,120.76	\$1,106.64
	7b	20	1.4	0	0.1	61.99	1		0.8			52.07	\$19,016.77	\$1,048.40
	7c	14	1.4	0	0.1	47.78	1		0.8			40.13	\$14,690.22	\$807.96
	VA7 Average	16	1.4	0	0.1	58.40	1	58.40	0.8			49.06	\$17,942.58	\$987.67
	VA7 Total	-	1.4	0	0.1	58.40	0.62	36.01	0.8	-	-	30.25	\$11,063.40	\$609.00
	8	6	1	0	0.1	6.47	NA	NA (frangible)	0			0	\$0.00	\$0.00
	9	28	1	0	0.1	64.84	0.05	3.31	0.8			2.78	\$1,021.45	\$56.18
	10	26	1.4	0	0.1	92.86	0.32	30.03	0.8			25.23	\$8,832.84	\$485.81
	11	20	1.4	0	0.1	75.35	0.07	5.12	0.8			4.3	\$1,506.96	\$82.88

Totals summary table

	Total Biodiversity score	Total SEB points required	SEB Payment	Admin Fee	Total Payment
Application	285.81	240.09	\$86,813.99	\$4,755.27	\$91,589.26

Economies of Scale Factor	0.5
Rainfall (mm) (average across Project Area)	379

6. Significant Environmental Benefit

A Significant Environmental Benefit (SEB) is required for approval to clear under Division 5 of the *Native Vegetation Regulations 2017*. The NVC must be satisfied that as a result of the loss of vegetation from the clearance that an SEB will result in a positive impact on the environment that is over and above the negative impact of the clearance.

ACHIEVING AN SEB

Indicate how the SEB will be achieved by ticking the appropriate box and providing the associated information:

- ☐ Establish a new SEB Area on land owned by the proponent.
- ☐ Use SEB Credit that the proponent has established. Provide the SEB Credit Ref. No. _____
- ☐ Apply to have SEB Credit assigned from another person or body. The [application form](#) needs to be submitted with this Data Report.
- ☐ Apply to have an SEB to be delivered by a Third Party. The [application form](#) needs to be submitted with this Data Report.
- ☒ Pay into the Native Vegetation Fund.

PAYMENT SEB

If a proponent proposes to achieve the SEB by paying into the Native Vegetation Fund, summary information must be provided on the amount required to be paid and the manner of payment:

SEB payment will be made into the NV Fund of **\$91,589.26** (including an administration fee of **\$4,755.27**).

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8. Appendices

Appendix 1. Flora Species List (MM 10.0 to MM 65.0)

Scientific Name	Common Name	Status		LSA Act Declared/ WoNS
		EPBC Act	NPW Act	
<i>Acacia argyrophylla</i>	Silver Mulga-bush			
<i>Acacia brachybotrya</i>	Grey Mulga-bush			
<i>Acacia farinosa</i>				
<i>Acacia cupularis</i>	Cup Wattle			
<i>Acacia ligulata</i>	Umbrella Bush			
<i>Acacia lineata</i>	Streaked Wattle		Rare	
<i>Acacia oswaldii</i>	Umbrella Wattle			
<i>Acacia pycnantha</i>	Golden Wattle			
<i>Acacia rigens</i>	Nealie			
<i>Acacia sclerophylla</i> var. <i>sclerophylla</i>	Hard-leaf Wattle			
<i>Acacia</i> sp.				
<i>Acacia spinescens</i>	Spiny Wattle			
<i>Acacia triquetra</i>				
<i>Acacia microcarpa</i>				
<i>Allocasuarina pusilla</i>	Sheoak/Oak-bush			
<i>Asparagus asparagoides</i> *	Bridal Creeper			Declared/ WoNS
<i>Asphodelus fistulosus</i> *	Onion Weed			Declared, Coorong LGA
<i>Atriplex semibaccata</i>	Berry Saltbush			
<i>Atriplex</i> sp.				
<i>Austrostipa elegantissima</i>	Feather Spear-grass			
<i>Austrostipa scabra</i>	Spear-grass			
<i>Austrostipa</i> sp.	Spear-grass			
<i>Avena barbata</i>	Wild Oat			
<i>Beyeria lechenaultii</i>	Pale Turpentine Bush			
<i>Beyeria opaca</i>	Dark Turpentine Bush			
<i>Beyeria</i> sp.	Turpentine Bush			
<i>Billardiera cymosa</i>	Sweet Apple-berry			
<i>Brachyscome ciliaris</i>	Variable Daisy			
<i>Brachyscome</i> sp.	Native Daisy			
<i>Brassica</i> sp.*				
<i>Briza</i> sp.*	Quaking Grass			
<i>Bromus diandrus</i> *	Great Brome			
<i>Bromus</i> sp.*	Brome			
<i>Bursaria spinosa</i>	Bursaria			
<i>Callitris gracilis</i>	Southern Cypress Pine			

Scientific Name	Common Name	Status		LSA Act Declared/ WoNS
		EPBC Act	NPW Act	
<i>Callitris verrucosa</i>	Scrub Cypress Pine			
<i>Calytrix tetragona</i>	Common Fringe-myrtle			
<i>Carpobrotus rossii</i>	Native Pigface			
<i>Carrichtera annua</i> *	Ward's Weed			
<i>Cassytha melantha</i>	Coarse Dodder-laurel			
<i>Cassytha pubescens</i>	Downy Dodder-laurel			
<i>Chondrilla juncea</i> *	Skeleton Weed			Declared
<i>Chrysocephalum apiculatum</i>	Common Everlasting			
<i>Clematis microphylla</i>	Old Man's Beard			
<i>Comesperma volubile</i>	Love Creeper			
<i>Convolvulus sp.</i>	Bindweed			
<i>Correa glabra</i> var. <i>turnbullii</i>	Smooth Correa			
<i>Cryptandra tomentosa</i>	Heath Cryptandra			
<i>Dianella revoluta</i>	Flax-lily			
<i>Dodonaea bursariifolia</i>	Small Hop-bush			
<i>Dodonaea hexandra</i>	Horned Hop-bush			
<i>Dodonaea viscosa</i> ssp.	Sticky Hop-bush			
<i>Ehrharta calycina</i> *	Perennial Veldt Grass			
<i>Enchylaena tomentosa</i>	Ruby saltbush			
<i>Enneapogon nigricans</i>	Black-head grass			
<i>Eremophila crassifolia</i>	Thick-leaf Emubush			
<i>Eucalyptus oleosa</i>	Red Mallee			
<i>Eucalyptus calycogona</i> ssp.	Square-fruit Mallee			
<i>Eucalyptus cyanophylla</i>	Blue-leaf Mallee			
<i>Eucalyptus dumosa</i>	White Mallee			
<i>Eucalyptus gracilis</i>	Yorrell			
<i>Eucalyptus incrassata</i>	Ridge-fruited Mallee			
<i>Eucalyptus leptophylla</i>	Narrow-leaf Red Mallee			
<i>Eucalyptus phenax</i>	White Mallee			
<i>Eucalyptus porosa</i>	Mallee Box			
<i>Eucalyptus socialis</i>	Beaked Red Mallee			
<i>Eucalyptus yalatensis</i>	Yalata Mallee			
<i>Eucalyptus dumosa</i>	White Mallee			
<i>Euphorbia terracina</i>	False Caper			
<i>Eutaxia microphylla</i>	Common Eutaxia			
<i>Exocarpos aphyllus</i>	Leafless Cherry			
<i>Gazania sp.</i> *	Gazania			
<i>Goodenia varia</i>	Sticky Goodenia			
<i>Halgania cyanea</i>	Rough Blue-flower			
<i>Hibbertia virgata</i>	Twiggy Guinea-flower			
<i>Hordeum vulgare</i> *	Barley			

Scientific Name	Common Name	Status		LSA Act Declared/ WoNS
		EPBC Act	NPW Act	
<i>Lactuca serriola</i> *	Prickly Lettuce			
<i>Lagurus ovatus</i>	Hare's Tail Grass			
<i>Lasiopetalum behrii</i>	Pink Velvet-bush			
<i>Lasiopetalum sp.</i>	Velvet-bush			
<i>Lepidosperma sp.</i>	Sword-sedge/Rapier-sedge			
<i>Leptospermum coriaceum</i>	Dune Tea-tree			
<i>Linum marginale</i>	Native Flax			
<i>Lolium sp.*</i>	Ryegrass			
<i>Lomandra effusa</i>	Scented Mat-rush			
<i>Lomandra micrantha</i>	Small-flower Mat-rush			
<i>Lycium ferocissimum</i> *	African Boxthorn			Declared/ WoNS
<i>Maireana brevifolia</i>	Short-leaf Bluebush			
<i>Marrubium vulgare</i> *	Horehound			Declared
<i>Melaleuca acuminata</i> ssp. <i>acuminata</i>	Mallee Honey-myrtle			
<i>Melaleuca lanceolata</i>	Dryland Tea-tree			
<i>Melaleuca uncinata</i>	Broombush			
<i>Mesembryanthemum crystallinum</i> *	Common Iceplant			
<i>Myoporum platycarpum</i>	False Sandalwood			
<i>Opuntia sp.*</i>	Prickly Pear			Declared/ WoNS
<i>Osteocarpum salsuginosum</i>	Bonefruit			
<i>Pimelea sp.</i>	Riceflower			
<i>Pinus halepensis</i> *	Aleppo Pine			
<i>Piptatherum miliaceum</i> *	Rice millet			
<i>Pittosporum angustifolium</i>	Native Apricot			
<i>Podolepis rugata</i>	Pleated Copper-wire Daisy			
<i>Podolepis sp.</i>	Copper-wire Daisy			
<i>Ptilotus seminudus</i>	Rabbit-tails			
<i>Ptilotus spathulatus</i>	Pussy-tails			
<i>Reichardia tingitana</i> *	False Sowthistle			
<i>Rhagodia candolleana</i>	Sea-berry Saltbush			
<i>Rhagodia parabolica</i>	Mealy Saltbush			
<i>Rytidosperma sp.</i>	Wallaby-grass			
<i>Salvia verbenaca</i> *	Wild Sage			
<i>Scabiosa atropurpurea</i> *	Pincushion			
<i>Sclerolaena bicuspidis</i>	Two-spine Bindyi			
<i>Sclerolaena obliquicuspis</i>	Oblique-spined Bindyi			
<i>Senecio pinnatifolius</i>	Variable Groundsel			
<i>Senna artemisioides</i>	Desert Senna			
<i>Solanum sp.</i>	Nightshade			
<i>Spyridium sp.</i>	Spyridium			

Scientific Name	Common Name	Status		LSA Act Declared/ WoNS
		EPBC Act	NPW Act	
<i>Triodia scariosa</i>	Spinifex			
<i>Triticum aestivum</i> *	wheat			
<i>Vittadinia cuneata</i>	Fuzzy New Holland Daisy			
<i>Vittadinia gracilis</i>	Woolly New Holland Daisy			
<i>Vittadinia sp.</i>				
<i>Vulpia sp.</i> *	Fescue			
<i>Westringia eremicola</i>	Slender Westringia			
<i>Westringia rigida</i>	Stiff Westringia			

Appendix 2. Fauna Species List (MM 10.0 to MM 65.0)

Scientific Name	Common Name	Status		Survey Period			MM 43.5 – MM 65.0 (Project Area)
		EPBC Act	NPW Act	October 2021 Survey	June/July 2022 Survey	September 2022 Survey	
<i>Acanthagenys rufogularis</i>	Spiny-cheeked Honeyeater			✓	✓		✓
<i>Acanthiza apicalis</i>	Inland Thornbill				✓		
<i>Acanthiza chrysorrhoa</i>	Yellow-rumped Thornbill			✓	✓		✓
<i>Acanthiza nana</i>	Yellow Thornbill			✓			
<i>Acanthiza reguloides</i>	Buff-rumped Thornbill				✓		✓
<i>Accipiter fasciatus</i>	Brown Goshawk			✓	✓		
<i>Anthochaera carunculata</i>	Red Wattlebird			✓	✓		✓
<i>Artamus cyanopterus</i>	Dusky Woodswallow				✓		
<i>Chalcites basal</i>	Horsfield's Bronze-Cuckoo			✓			
<i>Cincloramphus cruralis</i>	Brown Songlark			✓			
<i>Colluricincla harmonica</i>	Grey Shrike-thrush			✓	✓		✓
<i>Corcorax melanorhamphos</i>	White-winged Chough		Rare	✓	✓	✓	✓
<i>Corvus coronoides</i>	Australian Raven				✓	✓	✓
<i>Corvus mellori</i>	Little Raven			✓			
<i>Cracticus torquatus leucopterus</i>	Grey Butcherbird			✓	✓		✓
<i>Drymodes brunneopygia</i>	Southern Scrub Robin				✓		
<i>Eolophus roseicapilla</i>	Galah			✓	✓		✓
<i>Falco cenchroides</i>	Nankeen Kestrel			✓			
<i>Falco longipennis</i>	Australian Hobby					✓	✓
<i>Gavicalis virescens</i>	Singing Honeyeater			✓	✓		✓
<i>Geopelia placida</i>	Peaceful Dove			✓	✓		
<i>Grallina cyanoleuca</i>	Magpie Lark				✓		✓
<i>Gymnorhina tibicen</i>	Australian Magpie			✓	✓		✓
<i>Hirundo neoxena</i>	Welcome swallow				✓		
<i>Lichenostomus cratitius</i>	Purple-gaped Honeyeater		Rare		✓		✓
<i>Lichenostomus leucotis</i>	White-eared Honeyeater				✓		✓
<i>Malurus cyaneus</i>	Superb Fairy-wren			✓	✓		✓
<i>Malurus splendens</i>	Splendid Fairy-wren				✓		✓
<i>Manorina flavigula</i>	Yellow-throated Miner			✓			
<i>Manorina melanocephala</i>	Noisy Miner				✓		
<i>Melithreptus brevirostris</i>	Brown-headed Honeyeater					✓	✓
<i>Merops ornatus</i>	Rainbow Bee-eater			✓			

Scientific Name	Common Name	Status		Survey Period			MM 43.5 – MM 65.0 (Project Area)
		EPBC Act	NPW Act	October 2021 Survey	June/July 2022 Survey	September 2022 Survey	
<i>Milvus migrans</i>	Black Kite			✓			
<i>Myiagra inquieta</i>	Restless Flycatcher		Rare	✓			
<i>Northiella haematogaster</i>	Blue Bonnet			✓			
<i>Nymphicus hollandicus</i>	Cockatiel			✓			
<i>Ocyphaps lophotes</i>	Crested Pigeon			✓	✓		✓
<i>Pachycephala pectoralis</i>	Golden Whistler				✓		✓
<i>Pardalotus punctatus</i>	Spotted Pardalote			✓	✓	✓	✓
<i>Pardalotus striatus</i>	Striated Pardalote			✓			
<i>Passer domesticus</i> *	House Sparrow			✓	✓		✓
<i>Phaps chalcoptera</i>	Common Bronzewing				✓		✓
<i>Pomatostomus superciliosus</i>	White-browed Babbler			✓			
<i>Psephotus haematonotus</i>	Red-rumped Parrot			✓			
<i>Psephotus varius</i>	Mulga Parrot				✓		✓
<i>Rhipidura albiscapa</i>	Grey Fantail				✓		✓
<i>Rhipidura leucophrys</i>	Willy Wagtail			✓	✓		
<i>Smicronis brevirostris</i>	Weebill			✓	✓		✓
<i>Strepera versicolor</i>	Grey Currawong			✓	✓		✓
<i>Sturnus vulgaris</i> *	Common Starling			✓	✓		✓
<i>Tiliqua rugosa</i>	Sleepy Lizard / Shingleback Lizard			✓			
<i>Vanellus miles</i>	Masked lapwing				✓		
<i>Zanda funerea whiteae</i>	Yellow-tailed Black Cockatoo		Vuln.	✓			
<i>Zosterops lateralis</i>	Silvereye				✓		✓

Appendix 3. IBRA summaries

Murray Darling Depression IBRA bioregion

An extensive gently undulating sand and clay plain of Tertiary and Quaternary age frequently overlain by aeolian dunes. Vegetation consists of semi-arid woodlands of Black Oak / Belah, Bullock Bush/ Rosewood and Acacia spp., mallee shrublands and heathlands and savanna woodlands.

Murray Mallee IBRA subregion

Extensive calcreted plains overlain by a series of sand dunes. The calcreted ridges which form the undulating plain have a distinct west-north-westerly trend. The soils are shallow reddish sands on the plains and deep yellowish sands on the dunes. Fans bordering the Mt Lofty Ranges with low isolated hills rising above them have red duplex soils and calcareous earths subject to sheet erosion. Mallee is the dominant vegetation of the subregion. Its species composition reflects the diminishing coastal influence towards the north, especially in the understorey: Broombush (*M. uncinata*) gives way here to saltbush and bluebush (*Atriplex* and *Maireana* spp.) and hummock grass (*Triodia irritans*). Blue gum (*E. leucoxylon*) and Peppermint Box (*E. odorata*) are characteristic species in the west of the region. Although tracts of mallee still occur, most of the original vegetation has been cleared for agriculture.

Remnant vegetation	Approximately 21% (444,401 ha) of the subregion is mapped as remnant native vegetation, of which 17% (76,180 ha) is formally conserved
Landform	Very gently undulating, to flat aeolian sand covered depositional plain of the central-southern Murray Basin.
Geology	East-west linear dunes, regularly spaced with cusp-like crests which are consistently steeper on the southern side. Up to four buried paleosols within the dune. Dunes composed of pale to dark reddish-brown calcareous sand with some clay fraction
Soil	Brown calcareous earths and highly calcareous brown loamy earths, Hard setting loamy soils with red clayey subsoils, Cracking clays.
Vegetation	Mallee heath and shrublands.
Conservation significance	101 species of threatened fauna, 136 species of threatened flora. 9 wetlands of national significance.

Karoonda IBRA environmental association

Remnant vegetation	Approximately 6% (26,748 ha) of the association is mapped as remnant native vegetation, of which 25% (6,725 ha) is formally conserved
Landform	Undulating consolidated plain with low dunes and frequent outcrops of calcrete.
Geology	Sand and calcrete.
Soil	Brown calcareous earths, red weakly structured sandy soils and bleached sands.
Vegetation	Open scrub of beaked red mallee, white mallee and yorrell.
Conservation significance	36 species of threatened fauna, 30 species of threatened flora. 3 wetlands of national significance.

Moorlands IBRA environmental association

Remnant vegetation	Approximately 5% (7,730 ha) of the association is mapped as remnant native vegetation, of which 26% (2,021 ha) is formally conserved
Landform	Undulating plain on calcreted sands with outcrops of calcrete and isolated dunes.
Geology	Calcrete and sand.
Soil	Brown calcareous earths, red weakly structured sandy soils and bleached sands.
Vegetation	Open scrub of beaked red mallee, white mallee and yorrell.

Conservation significance	30 species of threatened fauna, 17 species of threatened flora. 0 wetlands of national significance.
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Appendix 4. Likelihood assessment of threatened species

Status: EPBC Act, CR: Critically Endangered, EN: Endangered, VU: Vulnerable, Mi: Migratory. NPW Act, E: Endangered, V: Vulnerable, R: Rare.

Source of record, 1: Protected Matters Search Tool report, 2: Biological Database of South Australia extract (Accessed via NatureMaps), 3: Recorded during the field survey.

Scientific Name	Common Name	Status		Source of Record	Year of Most Recent Record	Habitat	Likelihood of Occurrence
		EPBC Act	NPW Act				
FLORA							
<i>Acacia lineata</i>	Streaked Wattle		R	2, 3	2021	Usually grows in Mallee habitats (Maslin, 2018).	Highly likely -The species was recorded during the survey in mallee vegetation associations.
<i>Caladenia colorata</i>	Coloured Spider-orchid	EN	E	1		This species grows in woodland dominated by South Australian Blue Gum (<i>Eucalyptus leucoxylon</i>), Pink Gum (<i>E. fasciculosa</i>), Drooping Sheoak (<i>Allocasuarina stricta</i>) (Department of Agriculture, Water and the Environment, 2021a).	Unlikely -There are no records of the species from within 5 km of the Project Area. Associated vegetation types known as habitat do not occur in the Project Area.
<i>Caladenia tensa</i>	Greencomb Spider-orchid	EN		1		Dry woodland and mallee in sandy loam soils (Botanic Gardens of South Australia, 2021d).	Unlikely -Although habitat in the Project Area may be suitable, there are no historical records of the species within 5 km of the Project Area.
<i>Caladenia versicolor</i>	Candy Spider-orchid	VU	E	1		Grassy woodlands on shallow sandy soil dominated by <i>Eucalyptus leucoxylon</i> (Department of Agriculture, Water and the Environment, 2021b).	Unlikely -There are no <i>Eucalyptus leucoxylon</i> woodlands in the Project Area and no historical records of the species within 5 km of the Project Area.
<i>Dodonaea subglandulifera</i>	Peep Hill Hop-bush	EN	E	1		Occurs on low hills with loamy soils associated with rock outcrops in open woodland and shrubland (Botanic Gardens of South Australia, 2021e).	Unlikely -There is no suitable rocky hill habitat or historical records of the species in the Project Area.
<i>Eucalyptus dalrympleana</i> ssp. <i>dalrympleana</i>	Candlebark Gum		R	2	1998	In South Australia, the species occurs naturally only in the southern Mount Lofty Ranges.	Unlikely -The Project Area is outside the natural distribution of the species. The single historical record is most likely a planted specimen.

Scientific Name	Common Name	Status		Source of Record	Year of Most Recent Record	Habitat	Likelihood of Occurrence
		EPBC Act	NPW Act				
<i>Lepidium monoplacoides</i>	Winged Pepper-cress	EN	E	1		Only a single record from near Berri on the Murray River in 1915 and it has not been collected since in South Australia. It grows in open, sparsely vegetated sites in a range of habitats on heavy clay or clay-loam soils, usually on sites that are seasonally flooded or prone to waterlogging (Botanic Gardens of South Australia, 2021f).	Unlikely -There are no records of the species within 5 km of the Project Area and no suitable habitat in the Project Area.
<i>Phebalium lowanense</i>	Lowan Phebalium	VU	E	1		Populations of Lowan Phebalium occur in open heathy mallee woodland, with sparse to absent cover of <i>Eucalyptus</i> species, but with high richness (and usually cover) of sclerophyllous shrubs and graminoids (Cyperaceae and Restionaceae). Areas of dense <i>Eucalyptus</i> cover (e.g. <i>E. incrassata</i> , <i>E. arenacea</i> , <i>E. dumosa</i> , <i>E. leptophylla</i>) rarely support more than isolated occurrences of <i>P. lowanense</i> (Carter, 2010).	Unlikely -There are no historical records of the species in the Project Area. Vegetation in the project area is typically highly disturbed without a richness of sclerophyllous shrubs. Most areas have a high tree cover.
<i>Pterostylis arenicola</i>	Sandhill Greenhood Orchid	VU	E	1		Found in mallee and <i>Callitris</i> woodlands dominated by <i>Eucalyptus porosa</i> , <i>E. diversifolia</i> and <i>Callitris preissii</i> (Landscape South Australia, 2021).	Unlikely -Despite suitable habitat, there are no records of the species within 5 km of the Project Area.
<i>Pterostylis xerophila</i>	Desert Greenhood	VU	E	1		Dry woodland on fertile red loam soils, on or around granite rock outcrops (Duncan, National Recovery Plan for the Desert Greenhood (<i>Pterostylis xerophila</i>), 2010).	Unlikely -There are no historical records within 5 km of the project area and no suitable habitat.
<i>Senecio macrocarpus</i>	Large-fruit Fireweed	VU	E	1		The Large-fruit Groundsel occurs in a variety of habitats, including grasslands, sedgeland, shrublands and woodlands, generally on sparsely vegetated sites on sandy loam to heavy clay soils, often in depressions that are waterlogged in winter (Sinclair, 2010).	Unlikely -There are no historical records within 5 km of the Project Area, with limited suitable habitat on site.
<i>Thelymitra epipactoides</i>	Metallic Sun-orchid	EN	E	1, 2	2009	Thelymitra epipactoides occurs in a variety of habitats including grasslands, heathlands,	Possible - Habitat is broadly suitable and there are historical

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		EPBC Act	NPW Act				
						heathy and shrubby woodlands and open forest (Duncan & Coates, 2010).	records between 10 and 20 years old.
FISH							
<i>Craterocephalus fluviatilis</i>	Murray Hardyhead	EN		1		Watercourses and wetlands	Unlikely -There are no watercourses or wetlands in the Project Area.
<i>Galaxias rostratus</i>	Flathead Galaxias	CR		1			
<i>Maccullochella peelii</i>	Murray Cod	VU		1			
<i>Nannoperca australis</i>	Southern Pygmy Perch	VU		1			
<i>Nannoperca obscura</i>	Yarra Pygmy Perch	VU		1			
FROGS							
<i>Litoria raniformis</i>	Growling Grass Frog	VU	E	1		Watercourses and wetlands	Unlikely -There are no watercourses or wetlands in the Project Area.
BIRDS							
<i>Actitis hypoleucos</i>	Common Sandpiper	Mi	R	1		Watercourses and wetlands	Unlikely -There are no watercourses or wetlands in the Project Area.
<i>Apus pacificus</i>	Fork-tailed Swift	Mi		1		Widespread but almost exclusively aerial. Mostly occur over inland plains and dry or open habitats.	Unlikely -There are no historical records of the species within 5 km of the Project Area.
<i>Botaurus poiciloptilus</i>	Australasian Bittern	EN	E	1		Watercourses and wetlands	Unlikely -There are no watercourses or wetlands in the Project Area.
<i>Calidris acuminata</i>	Sharp-tailed Sandpiper	Mi		1			
<i>Calidris ferruginea</i>	Curlew Sandpiper	CR		1			
<i>Calidris melanotos</i>	Pectoral Sandpiper	Mi	R	1			
<i>Corcorax melanorhamphos</i>	White-winged Chough		R	2, 3	2021	Open forests and woodlands. They tend to prefer the wetter areas, with lots of leaf-litter, for feeding, and available mud for nest building.	Highly likely -The species was recorded at Curve 9 during the field survey.
<i>Falco hypoleucos</i>	Grey Falcon	VU	R	1		The species frequents timbered lowland plains, particularly acacia shrublands that are	Unlikely -There are no historical records of the species close to

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		EPBC Act	NPW Act				
						crossed by tree-lined water courses (Threatened Species Scientific Committee, 2019).	the project Area and no suitable habitat.
<i>Gallinago hardwickii</i>	Latham's Snipe, Japanese Snipe	Mi	R	1		Watercourses and wetlands	Unlikely - There are no watercourses or wetlands in the Project Area.
<i>Grantiella picta</i>	Painted Honeyeater	VU	R	1		Forest, woodland, dry scrub, often with abundant mistletoe. Dependent on mistletoe berries.	Unlikely - There are no historical records of the species near the Project Area. Habitats in the Project Area lack an abundance and diversity of mistletoe.
<i>Hieraaetus morphnoides</i>	Little Eagle		V	2	2022	Woodland and forested lands and open country.	Possible - Habitat is broadly suitable and there are historical records of the species between 20 and 40 years old near the Project Area.
<i>Hylacola cauta cauta</i>	Shy Heathwren		R	2	2012	Prefers dense shrubby or heath understorey in mallee woodland, mallee shrubland or mallee heath in coastal and semi-arid regions, often where spinifex (<i>Triodia</i>) occurs and with dense shrubs such as Banksia, Hakea and Grevillea, also tea-tree (<i>Leptospermum</i>) and cypress pine (<i>Callitris</i>) (Gregory, 2020).	Likely - There are small areas of potential habitat in the Project Area and nearby historical records between 10 and 20 years old.
<i>Leipoa ocellata</i>	Malleefowl	VU	V	1, 2	2022	Shrublands and low woodlands dominated by mallee and associated habitats such as Broombush (<i>Melaleuca uncinata</i>) and Scrub Pine (<i>Callitris verrucosa</i>). Malleefowl also occur in Red Ironbark (<i>Eucalyptus sideroxylon</i>) woodland at the eastern limit of their distribution and in Brown Stringybark (<i>E. baxteri</i> / <i>E. araneosa</i>) woodland in the south of Victoria and South Australia. A sandy substrate and abundance of leaf litter are	Possible - Historical records approximately 8km from the Project Area. Observed in Heritage agreement north of Peake during field survey. Habitat in Project Area may function as a dispersal corridor for this species, however an EPBC Self-Assessment found that the impact to this species was not likely to be significant.

Scientific Name	Common Name	Status		Source of Record	Year of Most Recent Record	Habitat	Likelihood of Occurrence
		EPBC Act	NPW Act				
						clear requirements for the construction of the birds' incubator-nests (Benshemesh, 2007).	
<i>Lichenostomus cratitius occidentalis</i>	Purple-gaped Honeyeater		R	2	2012, 2022	Mallee habitats	Likely - There is suitable habitat in the Project Area, with historical records between 10 and 20 years old within 5 km. Observed during the field survey within the Project Area.
<i>Manorina melanotis</i>	Black-eared Miner	EN	E	1		Restricted to small, local colonies in the mallee region of north-western Victoria, east to Hattah-Kulkyne National Park, and through the Murray mallee of South Australia north to the Murray River, and to the far south-west corner of NSW. Black-eared Miners are restricted to mature mallee eucalypt woodland, in areas that have not been burnt for at least 50 years and have not been cleared.	Unlikely - The Project Area has been extensively cleared, with no suitable habitat for the species. The Project Area is not within the extent of any known population.
<i>Motacilla cinerea</i>	Grey Wagtail	Mi		1		European and Asian species. Migrates south in winter, usually to Indonesia and NG. Rarely reaches Australia, but when it does, favours habitat near freshwater streams (BirdLife Australia, 2020).	Unlikely - No historical records of the species and no suitable habitat in the Project Area.
<i>Motacilla flava</i>	Yellow Wagtail	Mi		1		Open country near swamps, salt marshes, sewage ponds, grassed surrounds to airfields, bare ground (BirdLife Australia, 2020).	Unlikely - No historical records of the species and no suitable habitat in the Project Area.
<i>Myiagra cyanoleuca</i>	Satin Flycatcher	Mi	E	1		Known inhabitant of forest, woodland, mangroves and coastal heath scrub. Prefers dense, wet gullies of heavy eucalypt forest in breeding season (Morcombe, 2011).	Unlikely - No historical records of the species and no suitable habitat in the Project Area.
<i>Numenius madagascariensis</i>	Eastern Curlew	CR	E	1		Watercourses and wetlands	Unlikely - There are no watercourses or wetlands in the Project Area.
<i>Pandion haliaetus</i>	Osprey	Mi	E	1			

Scientific Name	Common Name	Status		Source of Record	Year of Most Recent Record	Habitat	Likelihood of Occurrence
		EPBC Act	NPW Act				
<i>Pedionomus torquatus</i>	Plains-wanderer	CR	E	1		Inhabits sparse, treeless, lowland native grasslands with approximately 50% bare ground, most vegetation less than 5 cm in height, with some widely-spaced plants up to 30 cm high.	Unlikely -No suitable habitat or historical records in the Project Area.
<i>Pezoporus occidentalis</i>	Night Parrot	EN	E	1		The habitat of the Night Parrot consists of Triodia grasslands in stony or sandy environments, and of samphire and chenopod shrublands.	Unlikely - Thought to be extinct in South Australia.
<i>Polytelis anthopeplus monarchoides</i>	Regent Parrot (eastern)	VU	V	1, 2	2006	River Red Gum (<i>Eucalyptus camaldulensis</i>), floodplain woodland and mallee.	Possible - Although there are records within 5 km of the project area between 10 and 20 years old, suitable habitat is limited.
<i>Rostratula australis</i>	Australian Painted Snipe	EN	E	1		Watercourses and wetlands	Unlikely -There are no watercourses or wetlands in the Project Area.
<i>Tringa nebularia</i>	Common Greenshank, Greenshank	Mi		1			
<i>Zanda funerea whiteae</i>	Yellow-tailed Black Cockatoo		V	2, 3	2021	Eucalypt woodland, heathlands, subalpine areas, pine plantations and occasionally in urban areas. The species was observed just east of the Project Area in planted <i>Pinus halepensis</i> trees.	Highly Likely -Recorded during the field survey
MAMMALS							
<i>Nyctophilus corbeni</i>	Corben's Long-eared Bat	VU		1		Inhabits a variety of vegetation types, including mallee, Buloke <i>Allocasuarina luehmannii</i> and box eucalypt dominated communities.	Unlikely -There is limited habitat and no historical records in the Project Area.



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