ebs ecology

Vegetation Clearance Assessment

Iranda Beef Feedlot, Tintinara

Vegetation Clearance Assessment Iranda Beef Feedlot, Tintinara

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Version 6

Prepared by EBS Ecology for Thomas Foods International

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Cover photograph: Remnant *Eucalyptus leucoxylon* ssp. *stephaniae* and exotic grassland in the Project Area.

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GLOSSARY AND ABBREVIATION OF TERMS

BAM	Bushland Assessment Method
BCM	Bushland Condition Monitoring
BDBSA	Biological Database of South Australia (managed by DEW)
cm	centimetre(s)
DEW	Department for Environment and Water
DEE	Department of the Environment and Energy
EBS	Environment and Biodiversity Services Pty Ltd, *trading as* EBS Ecology
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
GPS	Global Positioning System
ha	hectare(s)
IBRA	Interim Biogeographical Regionalisation of Australia
km	kilometre(s)
m	metre(s)
mm	millimetre(s)
MNES	Matters of National Environmental Significance
NatureMaps	Online mapping and information service provided by DEW
NCSSA	Nature Conservation Society of South Australia
NPW Act	*National Parks and Wildlife Act 1972*
NRM	Natural Resources Management
NRM Act	*Natural Resources Management Act 2004*
NV Act	*Native Vegetation Act 1991*
NVC	Native Vegetation Council
PMST	Protected Matters Search Tool (maintained by DEE)
Project Area	Area impacted by the Proposal
Proponent	Iranda Beef
Proposal	The proposed feedlot development that requires the clearance of native vegetation
SA	South Australia(n)
SEB	Significant Environmental Benefit
sp.	Species
spp.	Species (plural)
ssp.	Sub-species
STAM	Scattered Tree Assessment Method
Survey Area	The area surrounding the Project Area where vegetation associations were ground truthed and mapped.
TEC	Threatened Ecological Community
TFI	Thomas Foods International

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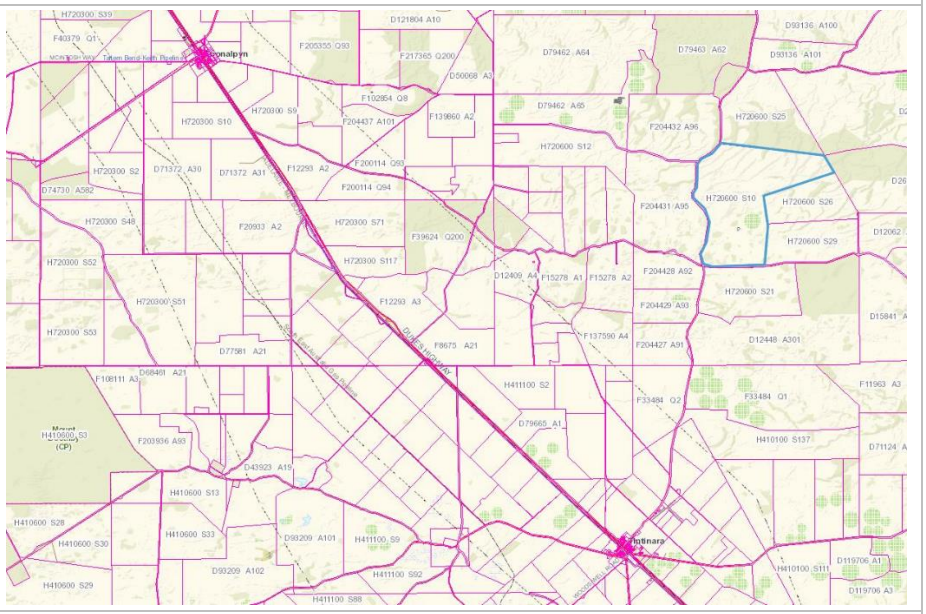
1 APPLICATION INFORMATION

The native vegetation clearance application information for the Proposal is provided in Table 1.

Table 1. Native vegetation clearance application information for the Proposal.

Applicant:	**Iranda Beef** **PO Box 1074** **Kent Town SA 5071**
Direct contact:	Thomas Green Southern Cross General Manager, Thomas Foods International 08 8757 2257 Thomas.green@thomasfoods.com
Accredited Consultant contact:	**EBS Ecology** 125 Hayward Avenue, Torrensville SA 5031 08 7127 5607 info@ebservices.com.au
Landowner:	Thomas Foods International Feedlot PTY LTD Level 2, 162 Fullarton Rd Rose Park SA 5067
Site Address:	1490 Carcuma Rd, Tintinara SA
Map **(Applicant property outlined in blue)**	
Local Government Area:	Coorong District Council
Hundred:	Lewis
Certificate of title:	CT/5566/471
Section/Allotment:	H720600 S10
Summary of proposed clearance	
Proposed clearance area:	Project Area: 93.3 hectares (ha) Native vegetation clearance: 5.88 ha Scattered trees: 63 trees
Applicable regulation and purpose of the clearance:	Proposed clearance required for the development of a cattle feedlot (the Proposal). No regulation exemption. Assessment is considered under section 29 of the NV Act, subject to development application consent
Level of risk:	Level 3 (agricultural zone patch >0.5 ha; Total biodiversity score <250)

2 INTRODUCTION

2.1 The Proposal

Thomas Foods International (TFI) (the Proponent) is proposing to extend their feedlot site near Tintinara, South Australia (SA) (the Proposal). This will increase holding capacity from 15,000 standard cattle units to 27,500 standard cattle units.

As the Proposal requires the clearing of native vegetation, TFI requires a native vegetation clearance assessment to support the Development Application (DA) for the Proposal.

The Proposal is located at 1490 Carcuma Road, Tintinara, as shown in Figure 1. This falls within the Coorong Local Government Area and the South East Natural Resource Management (NRM) region. The Project Area includes the proposed feedlot and covers approximately 93.3 hectares (ha) (Figure 1).

The Proposal includes the development of the following:

- Feedlot and associated infrastructure (54.2 ha)
- Two centre pivot irrigation paddocks (39.1 ha total)
- Water pipeline between feedlot infrastructure and centre pivot irrigation (1822 m length).

The locations of these elements of the Proposal are shown in Figure 2 and is referred to as the Project Area from here on.

2.2 Project scope

The Proponent engaged EBS Ecology (EBS) to undertake the following:

- Desktop review of the Project Area to inform the field survey and assess the likelihood of occurrence of species and/or ecological communities listed as threatened under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the *National Parks and Wildlife Act 1972* (NPW Act)*;*
- Assess native vegetation within the Project Area for clearance using the Bushland Assessment Method (BAM) and Scattered Tree Assessment Method (STAM);
- Calculate the Significant Environmental Benefit (SEB) offset for the Proposal, which is required for approval to clear native vegetation;
- Ground truth and map vegetation associations in the area immediately surrounding the Project Area (Survey Area);
- Lodgement of the Native Vegetation Clearance Application to the Native Vegetation Council (NVC).

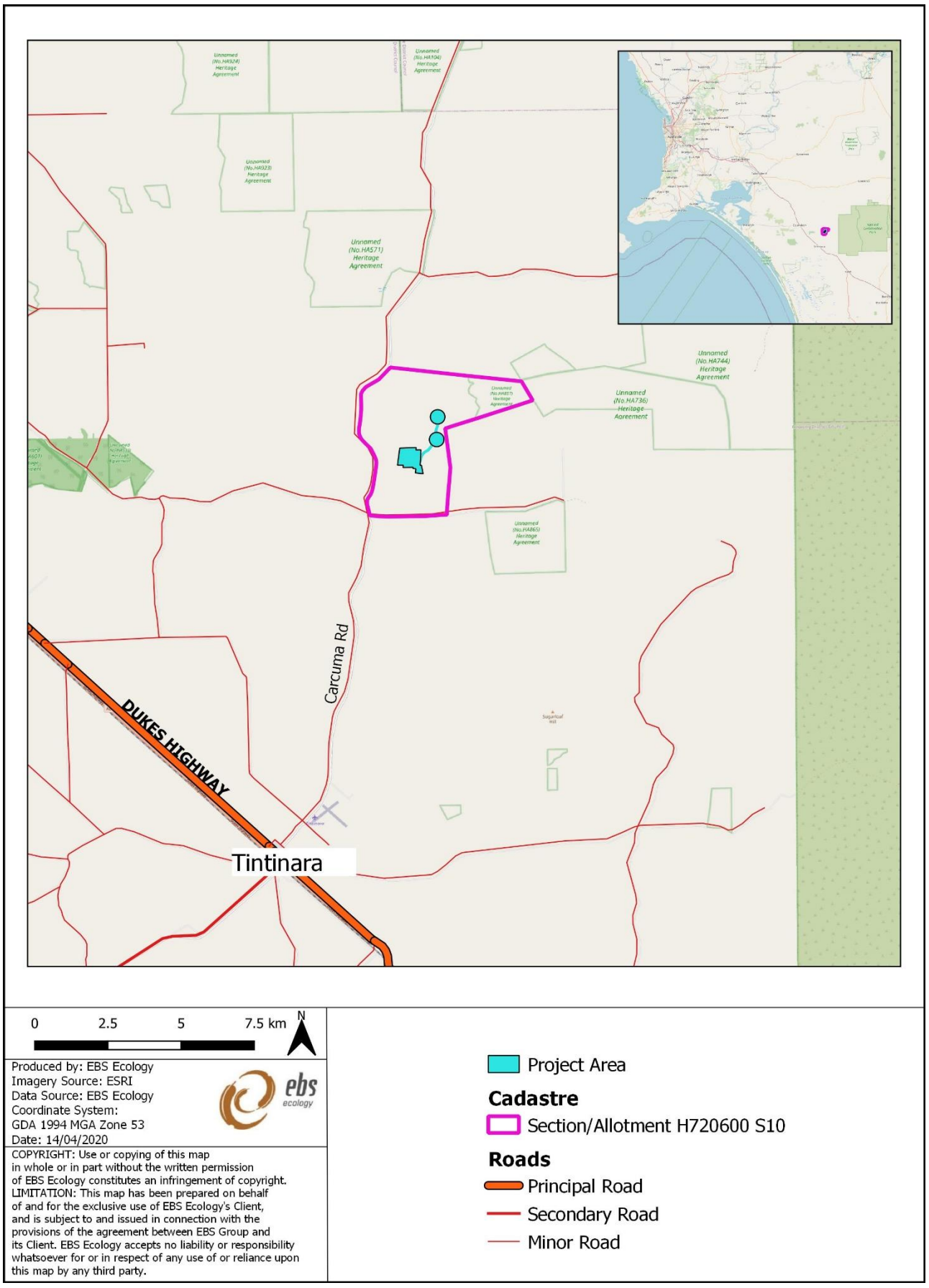


Figure 1. Location of the Project Area.

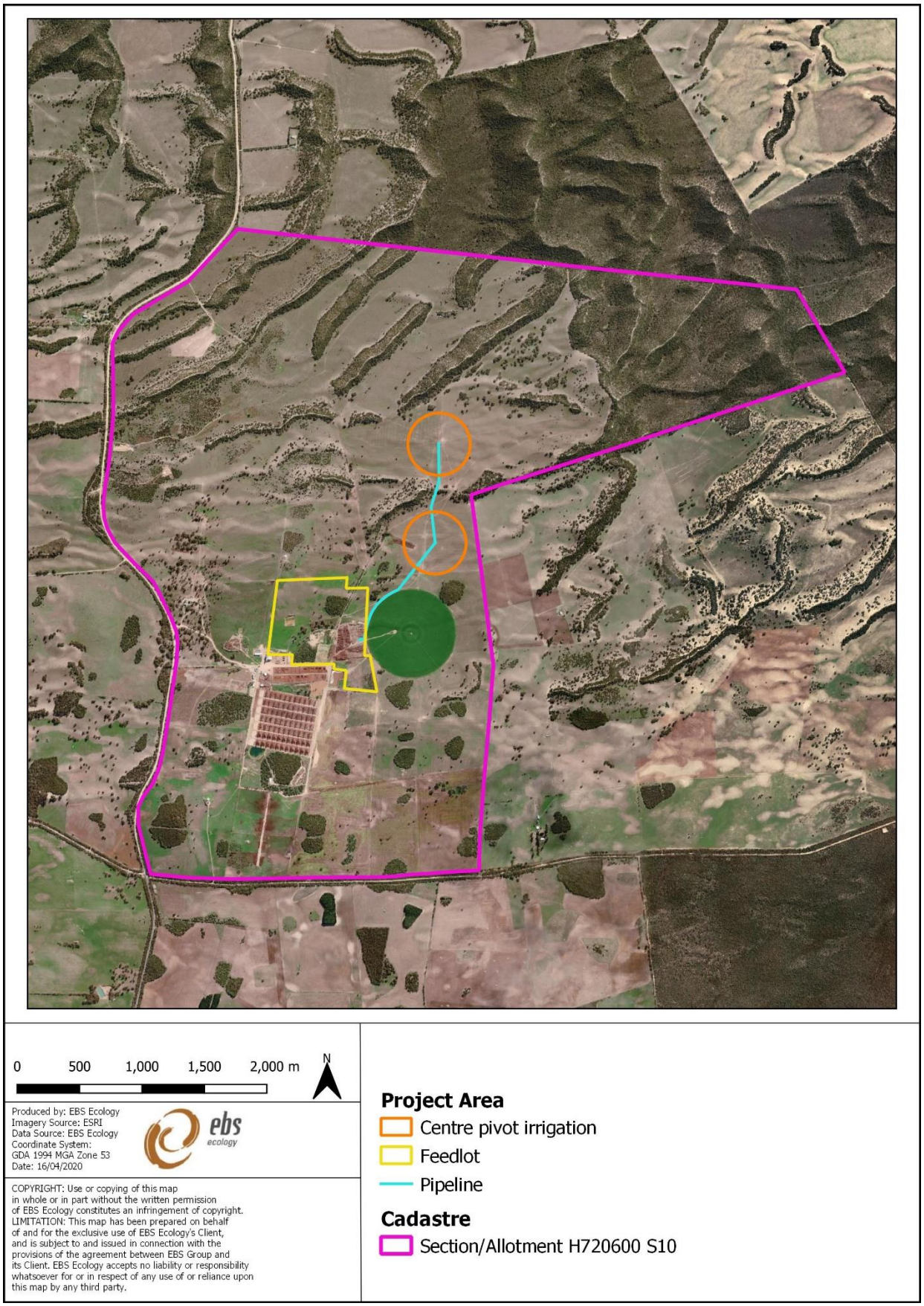


Figure 2. The proposed Iranda Beef Feedlot, referred to as the Project Area.

2.3 Legislative summary

2.3.1 Commonwealth Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act and the *Environment Protection and Biodiversity Conservation Regulations 2000* provide a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places – defined in the Act as Matters of National Environmental Significance (MNES). The nine MNES protected under the Act are:

1. World Heritage properties;
2. National Heritage places;
3. Wetlands of international importance (listed under the Ramsar Convention);
4. Listed threatened species and ecological communities;
5. Migratory species protected under international agreements;
6. Commonwealth marine areas;
7. The Great Barrier Reef Marine Park;
8. Nuclear actions (including uranium mines); and
9. A water resource, in relation to coal seam gas development and large coal mining development.

Any action that has, will have, or is likely to have a significant impact on matters of national environmental significance requires referral under the EPBC Act. Substantial penalties apply for undertaking an action that has, will have or is likely to have significant impact on a MNES without approval.

The EPBC Act Significant Impact Guidelines provide overarching guidance on determining whether an action is likely to have a significant impact on a matter of national environmental significance. In terms of nationally threatened species, the guidelines define an action as likely to have a significant impact if there is a real chance or possibility that it will:

- Lead to a long-term decrease in the population;
- Reduce the area of occupancy of the species;
- Fragment an existing population;
- Adversely affect critical habitat;
- Disrupt breeding cycles;
- Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;
- Result in the establishment of invasive species that are harmful to the species;
- Introduce disease that may cause the species to decline; and
- Interfere with the recovery of the species.

2.3.2 Native Vegetation Act 1991

The Project Area is in the Coorong District Council, which is subject to the *Native Vegetation Act 1991* (NV Act). Therefore, native vegetation within the Project Area is protected under the NV Act and *Native*

Vegetation Regulations 2017. Any proposed clearance of native vegetation in South Australia (unless exempt under the *Native Vegetation Regulations 2017*) is to be assessed against the NV Act Principles of Clearance and requires approval from the NVC. A net environmental benefit is generally conditional on an approval being granted.

Native vegetation refers to any naturally occurring local plant species that are indigenous to South Australia, from small ground covers and native grasses to large trees and water plants.

“Clearance", in relation to native vegetation, means:

- The killing or destruction of native vegetation;
- The removal of native vegetation;
- The severing of branches, limbs, stems or trunks of native vegetation;
- The burning of native vegetation; and
- Any other substantial damage to native vegetation, and includes the draining or flooding of land, or any other act or activity, that causes the killing or destruction of native vegetation, the severing of branches, limbs, stems or trunks of native vegetation or any other substantial damage to native vegetation.

Approval must be obtained before performing any activity that could cause substantial damage to native plants. This also applies to dead trees that may provide habitat for animals. These activities include but are not limited to:

- The cutting down, destruction or removal of whole plants;
- The removal of branches, limbs, stems or trunks (including brush cutting and woodcutting);
- Burning;
- Poisoning;
- Slashing of understorey;
- Drainage and reclamation of wetlands; and
- Grazing by animals (in some circumstances).

Under the NV Act, the NVC considers applications to clear native vegetation under ten principles. Native vegetation should not be cleared if it is significantly at odds with these principles:

- It contains a high level of diversity of plant species;
- It is an important wildlife habitat;
- It includes rare, vulnerable or endangered plant species;
- The vegetation comprises a plant community that is rare, vulnerable or endangered;
- It is a remnant of vegetation in an area which has been extensively cleared;
- It is growing in, or association with, a wetland environment;
- It contributes to the amenity of the area;
- The clearance of vegetation is likely to contribute to soil erosion, salinity, or flooding;
- The clearance of vegetation is likely to cause deterioration in the quality of surface or underground water; and

- After clearance, the land is to be used for a purpose which is unsustainable.

The principles apply in all cases, except where the vegetation has been considered exempt under the *Native Vegetation Regulations 2017* or can be classified as an 'intact stratum'. 'Intact stratum' means that applications will usually be denied when the vegetation has not been seriously degraded by human activity within the last 20 years.

All approved vegetation clearance must also be conditional on achieving a Significant Environmental Benefit (SEB) to offset the clearance. The requirement for a SEB also applies to several of the exemptions. Potential SEB offsets include:

- The establishment and management of a set-aside area to encourage the natural regeneration of native vegetation;
- The protection and management of an established area of native vegetation;
- Entering into a Heritage Agreement on land where native vegetation is already established to further preserve or enhance the area in perpetuity; and
- A payment to the Native Vegetation Fund.

2.3.3 National Parks and Wildlife Act 1972

Native plants and animals in South Australia are protected under the NPW Act. It is an offence to take a native plant or protected animal without approval. Threatened plant and animal species are listed in Schedules 7 (Endangered species), 8 (Vulnerable species) and 9 (Rare species) of the Act. Persons must not:

- Take a native plant on a reserve, wilderness protection area, wilderness protection zone, land reserved for public purposes, a forest reserve or any other Crown land;
- Take a native plant of a prescribed species on private land;
- Take a native plant on private land without the consent of the owner (such plants may also be covered by the NV Act);
- Take a protected animal or the eggs of a protected animal without approval;
- Keep protected animals unless authorised to do so; and
- Use poison to kill a protected animal without approval.

Conservation rated flora and fauna species listed on Schedules 7, 8, or 9 of the NPW Act are known to or may occur within the Project Area. Persons must comply with the conditions imposed upon permits and approvals.

2.3.4 Natural Resource Management Act 2004

Under the *Natural Resources Management Act 2004* (NRM Act) landholders have a legal responsibility to manage declared pest plants and animals and prevent land and water degradation.

Key components under the NRM Act include the establishment of regional (NRM) Boards and development of regional NRM Plans; the ability to control water use through prescription, allocations and restrictions; requirement to control pest plants and animals and activities that might result in land degradation.

A 'duty of care' is a fundamental component of this Act, i.e. ensuring one's environmental and civil obligation by taking reasonable steps to prevent land and water degradation. Persons can be prosecuted if they are considered negligent in meeting their obligations.

The *Landscape South Australia Act 2019* will replace the NRM Act, which will enable the establishment of new regional landscape boards and reform natural resource management in South Australia. The aim is to deliver effective water management, pest plant and animal control, soil and land management and support for broader sustainable primary production programs.

The new Act was assented to by the Governor of South Australia in November 2019. Until the new Act comes into full operation, NRM boards will continue to deliver NRM services to regional communities.

2.4 Landscape context

2.4.1 Interim Bioregionalisation of Australia

The Project Area is in the Tintinara subregion of the Naracoorte Coastal Plain Bioregion, according to the Interim Bioregionalisation of Australia (IBRA) Version 7.0. The landforms, geology and vegetation that characterises these regions are summarised in Table 2.

Table 2. IBRA bioregion, subregion, and environmental association environmental landscape summary.

Naracoorte Coastal Plain IBRA bioregion	
A broad coastal plain of Tertiary and Quaternary sediments with a regular series of calcareous sand ridges separated by inter-dune swales closed limestone depressions and young volcanoes at Mount Gambier. Vegetation is dominated by heathy woodlands and mallee shrublands with wet heaths in the inter-dune swales. Extensively cleared for agriculture.	
Tintinara IBRA subregion	
This area mainly consists of calcarenite dune ridges with shallow sands and intervening swampy plains with yellow grey duplex soils. The dune free plains near Keith in the east have shallow loams derived from the underlying limestone. Large areas of remnant vegetation are found in the sandy soils of the dunes and swales or in swamp areas. *Eucalyptus fasciculosa* low woodland and *E. diversifolia* open mallee and *Banksia ornata* shrubland are found on sandy, pedal mottled-yellow duplex soils and bleached sands, whilst *Melaleuca halmaturorum* ssp. *halmaturorum* tall shrubland and *B. marginata* shrubland are found in the lower lying areas on clay soils. Most native vegetation has been cleared for grazing although large areas remain in National Parks and Wildlife reserves and privately owned heritage agreements.	
Remnant vegetation	Approximately 19% (136133 ha) of the subregion is mapped as remnant native vegetation, of which 63% (85185 ha) is formally conserved.
Landform	Undulating lands of limestone dunes and sandhills. Coastal barrier lagoons. Exposed limestone substrata (calcrete) in some places. Lakes Alexandria and Albert at the outflow of the Murray River.

Geology	Sand, silt & clay in lowland coastal swamps, some dune sands on the edge of Little & Big Desert regions.
Soil	Sandy soil with mottled yellow clayey subsoils, beach sand soils, friable loamy soils.
Vegetation	Mallee heath and shrublands.
Conservation significance	78 species of threatened fauna, 92 species of threatened flora. 4 wetlands of national significance.
Carcuma IBRA environmental association	
Remnant vegetation	Approximately 48% (40387 ha) of the association is mapped as remnant native vegetation, of which 78% (31534 ha) is formally conserved.
Landform	Calcarenite dune ridges which form the northern margin of the stranded dune ridge complex, overlain with irregular sand dunes.
Geology	Calcarenite, sand and clay.
Soil	Red weakly structured sandy soils, brown friable loams, bleached sands and sandy pedal mottled-yellow duplex soils.
Vegetation	Open heath of Yacca, Desert Banksia and Dwarf Sheoak and open scrub of coastal mallee.
Conservation significance	22 species of threatened fauna, 17 species of threatened flora. 0 wetlands of national significance.

2.4.2 Climate

The Project Area experiences warm summers and cool to mild winters, with average maximum temperatures ranging from 15ºC in July to 30.1ºC in January (Figure 3). August is the wettest month on average, with 58.4 millimetres (mm) recorded at Tintinara. The driest month is February, with an average of 19 mm (Figure 3).

At the time of the field survey, prevailing conditions were hot and dry, with below average rainfall having been recorded throughout 2019 leading up to the survey in January 2020: 371.9 mm compared to the average of 460.3 mm (Bureau of Meteorology, 2020a). On 13 January 2020, the day of the field survey, the temperature reached 35.8ºC (Bureau of Meteorology, 2020b).

For the purposes of calculating the SEB of the proposed clearance, Mean Average Rainfall 1976 – 2005 mapping available from NatureMaps is used. Taken from the centre of the Project Area, mean average rainfall used in assessment scoresheets is 424 mm (Government of South Australia, 2020a).

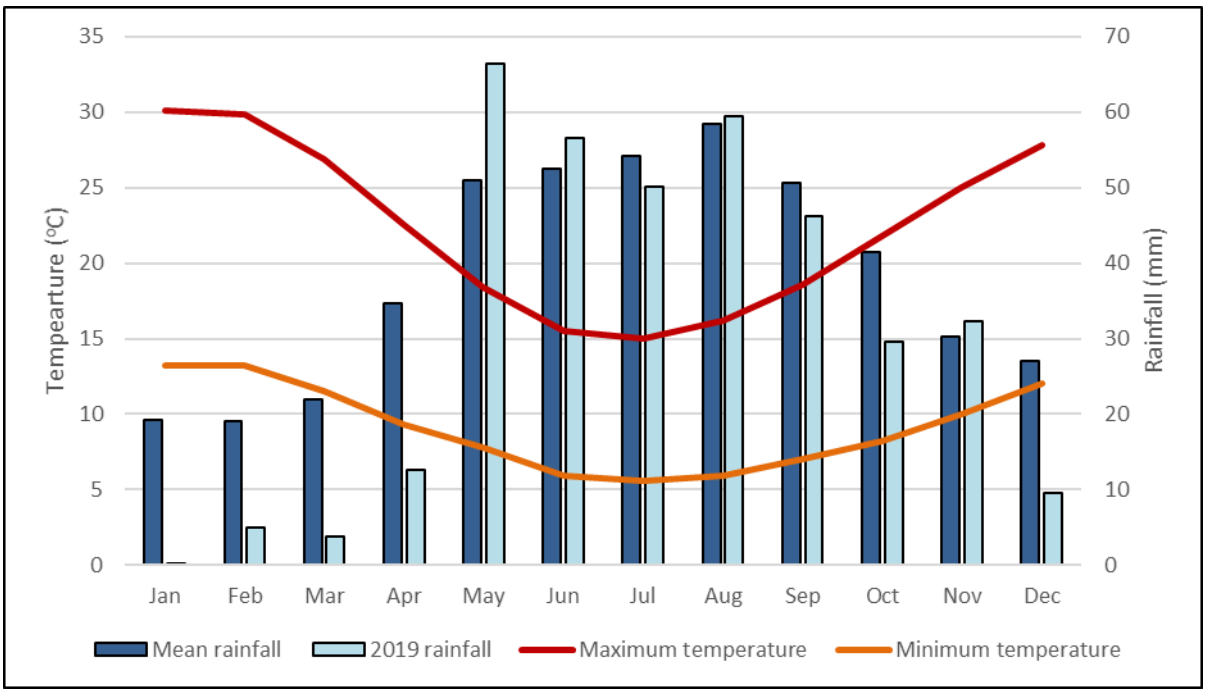


Figure 3. Climate data for the Project Area. The chart shows average rainfall and 2019 rainfall recorded at Tintinara (Bureau of Meteorology, 2020a) and average minimum and maximum temperatures recorded at Keith (Bureau of Meteorology, 2020b and 2020c).

2.4.3 Native vegetation cover

The percentage of native vegetation cover within 5 kilometres (km) of the Project Area is used in calculating the SEB of the proposed clearance. Native Vegetation Areas mapping available from NatureMaps has been used to obtain the native vegetation percent, taken from the centre of each Block of vegetation to be cleared. Within the Project Area, native vegetation cover within 5 km ranges from 10 – 25% (Government of South Australia, 2020a).

The Project Area and Survey Area consist of cleared agricultural land with or without scattered remnant trees. Three isolated patches of degraded mallee vegetation are located within the Project Area. Vegetation associations present and their condition are discussed further in Section 4.3.

3 METHODS

3.1 Desktop assessment

A desktop assessment was undertaken to determine the potential for any threatened species and ecological communities to occur within the Project Area. Relevant databases were searched using a 5 km or 10 km buffer of the Project Area for known records of species and communities listed as threatened under the EPBC Act and the NPW Act.

3.1.1 EPBC Act Protected Matters Search Tool

A Protected Matters Search Tool (PMST) report was generated on 11 December 2019 to identify MNES under the EPBC Act relevant to the Project Area. The PMST is maintained by the Department of the Environment and Energy (DEE) and was used to identify species or communities of national environmental significance that may occur or have suitable habitat within the Project Area. A 10 km buffer was applied to the search.

3.1.2 Biological Database of South Australia

The Biological Database of South Australia (BDBSA) was searched through NatureMaps, the web portal maintained by the Department for Environment and Water (DEW) and available at http://spatialwebapps.environment.sa.gov.au/naturemaps/?locale=en-us&viewer=naturemaps. The BDBSA is comprised of a collection of species records compiled from the South Australian Museum, conservation organisations, Birdlife Australia and other information sources. A 5 km buffer surrounding the Project Area was used to search the BDBSA for known records of threatened species. The search was undertaken on the 11 December 2019.

3.1.3 Likelihood of occurrence assessment

Each threatened species and community identified by the searches described above was assessed as to the likelihood of its occurrence in the Project Area. Each was assigned a rating to describe the nature of its presence; Known, Highly Likely, Likely, Possible and Unlikely. Criteria such as habitat constraints and date and proximity of most recent records were considered in the context of the features of the Project Area when assigning a likelihood rating. This is described further in Table 3.

Table 3. Likelihood rating and criteria for the presence of threatened species and communities.

Likelihood	Criteria
Known	• The species was recorded during the field survey.
Highly Likely	• Records in the last 10 years, the species does not have highly specific niche requirements (or these requirements occur on site), the habitat is largely intact and falls within the known distribution of the species.
Likely	• Records within the last 20 years, the area falls within the known distribution of the species and the area provides species habitat that is largely intact.
Possible	• Records within the last 20 years, the area falls within the known distribution of the species, but the area does not provide species habitat which is largely intact. • Records within 20 – 40 years, survey effort is considered inadequate, habitat is present and intact and species of similar habitat needs have been recorded in the area.
Unlikely	• Records 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 within the last 40 years despite suitable habitat being known to occur in the area. • The species was not recorded during surveys of the Project Area despite adequate survey effort.

3.2 Native Vegetation Assessment

The native vegetation assessment was undertaken by Native Vegetation Council (NVC) Accredited Consultant Julia Bignall and assisted by Ecologist Jesse Carpenter on 7 January 2020. Following changes to the Project Area, the site was visited again on 7 April 2020 to assess additional scattered trees. The assessment was conducted in accordance with the BAM and STAM, both endorsed by the NVC.

3.2.1 Bushland Assessment Method

The BAM (Native Vegetation Council, 2019a) was developed by the Native Vegetation Management Unit to assess areas of native vegetation requiring clearance and to calculate the SEB requirements. The method is derived from the Nature Conservation Society of South Australia's (NCSSA) Bushland Condition Monitoring methodology and is suitable for native vegetation assessments in South Australia's agricultural regions.

The BAM requires quantitative on ground and desktop assessments of native vegetation and ecological values. When using the BAM, each area to be assessed (i.e. each application area) is termed a 'Block', which is stratified into 'Sites'. Each Site relates to a Vegetation Association found within the Block, which are assessed in representative 1 ha quadrats and compared to NCSSA 'benchmark' vegetation communities.

Three components of the biodiversity value of the Site are measured and scored:

- Landscape context;
- Vegetation condition; and
- Conservation value.

The factors that influence each of these components and their score ranges are described in Table 4. The scores of these three components are combined to provide the Unit Biodiversity Score (per ha) and multiplied by the size (ha) of each Site to provide the Total Biodiversity Score for each Site.

Table 4. Factors that influence the value of the three components used to calculate the total SEB area and value in the BAM (Native Vegetation Council, 2019a).

Component	Factors
Landscape context	• Percentage vegetation cover within 5 km • Block shape (cleared perimeter:area ratio) • Native vegetation remnancy of IBRA association • Percentage of native vegetation protected within the IBRA association • The presence of riparian vegetation, swamps or wetlands
Vegetation condition	• Native plant species diversity • Number of native lifeforms and their cover • Number of regenerating species • Weed cover and the level of invasiveness of dominant weed species • Mature tree health, fallen timber, hollow-bearing trees and tree canopy • Native:exotic understorey biomass
Conservation value	• The presence of federal or state listed threatened ecological communities and their conservation rating • Number of threatened plant species recorded at the site and their conservation rating • Number of threatened fauna species and their conservation rating or potential habitat occurs within the site

3.2.2 Scattered tree assessment

The STAM (Native Vegetation Council, 2019b) was developed by the Native Vegetation Management Unit. The method is derived from the report *Scattered tree clearance assessment in South Australia: streamlining, guidelines for assessment and rural industry extension* (Cutten & Hodder, 2002).

The STAM is suitable for assessing scattered trees in the following instances (Native Vegetation Council, 2019b):

- Individual scattered trees, where canopies do not overlap, including single isolated trees in the middle of a paddock.
- Dead trees, where it is considered native vegetation as defined in the Scattered Tree Assessment Manual.
- Clumps of trees (i.e. contiguous overlapping canopies) where the clump is <0.1 ha.
- The ground layer comprises;
    - Wholly or largely introduced species
    - Some colonising native species may be present, but as <5% of the ground cover
    - The area around the trees consists of introduced pasture or crops.

The STAM uses a point scoring system (PSS) to determine the SEB requirements for the clearing of scattered trees. The PSS uses data collected in the field to quantify the relative biodiversity value of a tree, including the following parameters:

- Tree species
- Tree height
- Trunk diameter
- Tree health, represented by canopy dieback
- The presence of and number of large, medium and small hollows.

3.2.3 Significant Environmental Benefit calculations

The SEB was calculated according to the methods set out in the *Guide for calculating a Significant Environmental Benefit under the Native Vegetation Act 1991* and *Native Vegetation Regulations 2017* (Department for Environment and Water, 2019).

3.3 Fauna assessment

All fauna species observed opportunistically during the vegetation assessment were recorded, including their GPS location, number of individuals observed and notes on habitat. Signs of fauna, such as scats, tracks and nests, were also noted and recorded.

The Project Area was searched for important habitat features that might indicate the possible presence of threatened species. This included hollow-bearing trees, wetland/watercourse areas, rock outcrops and foraging resources. The presence of these features informed the assessment of habitat suitability for threatened species predicted to occur on site by the desktop assessment.

At each of the BAM sites, birds observed within the 1 ha survey site were recorded. An observer traversed the site at random and recorded birds identified by observation or call. 20 minutes was spent searching each site.

Otherwise, no targeted fauna survey, such as trapping or use of remote detecting equipment (e.g. cameras, anabats) was undertaken as part of the assessment.

3.4 Limitations

The field assessment was undertaken over a single day in mid-late summer. Climatic conditions at the time of the survey were hot and dry, with dry conditions prevailing for the 12 months prior. The flora recorded represents those species with distinguishable identification features at the time of the survey. Methods used for fauna survey was limited to those discussed in Section 3.3.

The above limited the results of the field survey in the following ways:

- The timing of the survey was not ideal to detect herbaceous species.
- Prevailing dry conditions may have influenced plant diversity, with annual species that require good rainfall to persist unlikely to be present.
- The survey occurred outside the flowering season for some cryptic plant species, making them difficult to detect if present.

- The fauna observed is not a thorough representation of the species that would utilise the Project Area.
- Seasonal variation in the presence and/or abundance of fauna species was not accounted for.
- Cryptic fauna species that require more targeted survey methodology would not have been detected, if present.

These limitations were partly overcome by adopting a precautionary approach to the likelihood assessments carried out for the presence of threatened species, as discussed in Section 3.1.3.

4 RESULTS

4.1 State threatened species

4.1.1 State threatened flora

Thirty-one plant species were recorded, including 14 exotic species (Appendix 1). None are listed as threatened under the NPW Act.

No plants listed as threatened under the NPW Act have been recorded within 5 km of the Project Area (Appendix 2). Although the survey occurred outside the flowering season for many plant species, making detection difficult, it is unlikely that any threatened species occur. Remnant vegetation in the Project Area is heavily dominated by exotic grass species and has been subject to heavy grazing pressure, with few native understorey species recorded in general.

4.1.2 State threatened fauna

Fauna recorded during the field survey was not diverse, with nine birds and four mammals being recorded. No reptiles were observed. These numbers include nine native and four exotic species (Appendix 3).

Three threatened fauna species listed under the NPW Act have been recorded within 5 km of the Project Area (Figure 4 and Appendix 4). Two were assessed as possibly occurring based on the vegetation and habitat characteristics in the Project Area (Table 5). Discussion of the likelihood assessment for each species is given in Appendix 4.

Species listed in Table 5 have been entered in the vegetation assessment scoresheets for the purpose of calculating the SEB associated with the Proposal. Scattered trees may also provide possible breeding and foraging habitat for these species.

Table 5. State threatened fauna species potentially occurring within the Project Area.

Scientific name	Common name	Conservation status		Likelihood of occurrence within Project Area
		Aus	SA	
BIRD				
Lichenostomus cratitius occidentalis	Purple-gaped Honeyeater (mainland SA)		R	Possible
Neophema elegans	Elegant Parrot		R	Possible

Aus: Australia (*Environment Protection and Biodiversity Conservation Act 1999*). SA: South Australia (*National Parks and Wildlife Act 1972*). Conservation codes: CE/CR: Critically Endangered. EN/E: Endangered. VU/V: Vulnerable. R: Rare.

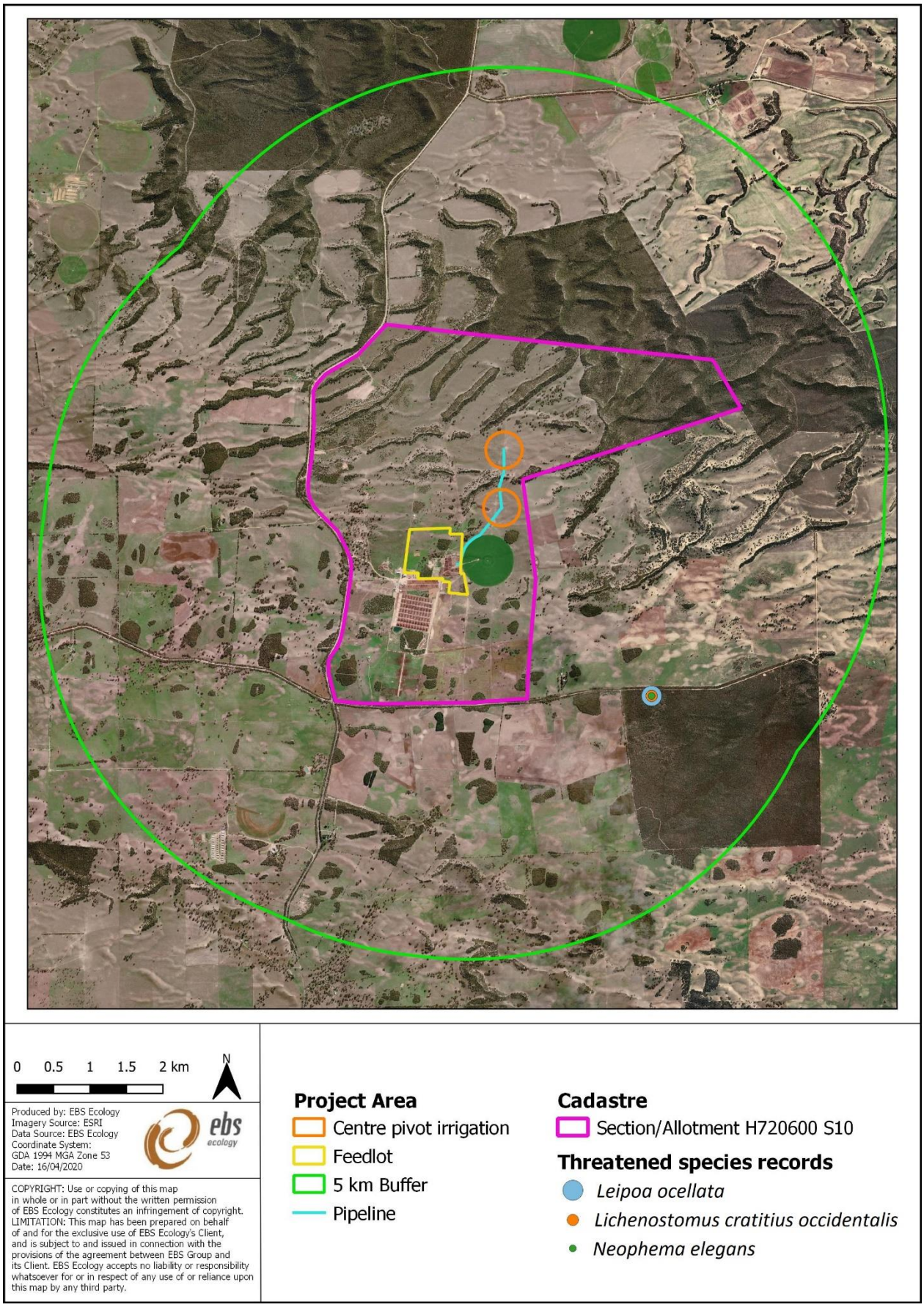


Figure 4. Past records of threatened species within 5 km of the Project Area (Government of South Australia, 2020a).

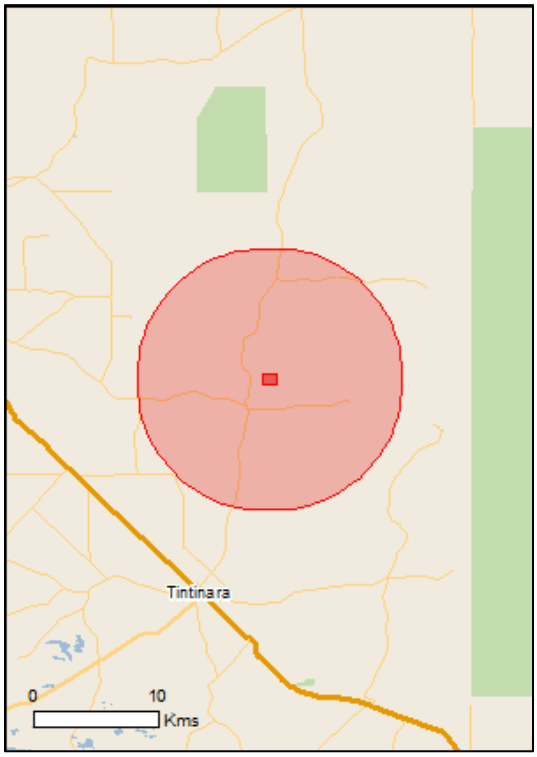
4.2 Matters of National Environmental Significance

4.2.1 Summary of Matters of National Environmental Significance

The PMST identifies three MNES as potentially occurring in the Project Area; threatened ecological communities, threatened species and migratory species.

The results of the PMST are summarised in Table 6.

Table 6. Matters of National Environmental Significance identified as potentially within the Project Area (Department of the Environment and Energy, 2019).

Search area (10 km buffer)	Matters of National Environmental Significance	Identified within the search area
	World Heritage Properties	None
	National Heritage Properties	None
	Wetlands of International Importance	None
	Great Barrier Reef Marine Park	None
	Commonwealth Marine Areas	None
	Threatened Ecological Communities	1
	Threatened Species	16
	Migratory Species	11
	Other matters protected by the EPBC Act	
	Commonwealth Lands	None
	Commonwealth Heritage Places	None
	Listed Marine Species	17
	Whales and other Cetaceans	None
	Critical Habitats	None
	Commonwealth Terrestrial Reserves	None
	Australian Marine Parks	None
	State and Territory Reserves	6
	Regional Forest Agreements	None
	Invasive Species	19
	Nationally Important Wetlands	None
	Key Ecological Features (Marine)	None

4.2.2 Nationally threatened flora and fauna

Five EPBC Act listed threatened flora and 10 threatened fauna species were identified by the PMST (Table 7) (Department of the Environment and Energy, 2019). Of these, all have been assessed as unlikely to occur in the Project Area based on vegetation condition and habitat features present and known records. Assessments for the likelihood of presence for each species identified by the PMST is provided in Appendix 2 (flora) and Appendix 4 (fauna).

There is not likely to be any significant impact to EPBC listed threatened species as a result of the Proposal.

Table 7. EPBC Act listed threatened species potentially occurring within the Project Area.

Scientific name	Common name	Conservation status		Likelihood of occurrence within Project Area
		Aus	SA	
Flora				
Caladenia colorata	Coloured Spider-orchid	EN		Unlikely
Caladenia conferta	Coast Spider-orchid	EN	E	Unlikely
Caladenia tensa	Greencomb Spider-orchid	EN		Unlikely
Pterostylis arenicola	Sandhill Greenhood Orchid	VU	V	Unlikely
Thelymitra epipactoides	Metallic Sun-orchid	EN	E	Unlikely
Fauna				
Botaurus poiciloptilus	Australasian Bittern	EN	E	Unlikely
Calidris ferruginea	Curlew Sandpiper	CR		Unlikely
Grantiella picta	Painted Honeyeater	VU	R	Unlikely
Numenius madagascariensis	Eastern Curlew	CR	E	Unlikely
Pedionomus torquatus	Plains-wanderer	CR	E	Unlikely
Pezoporus occidentalis	Night Parrot	EN	E	Unlikely
Psophodes leugogaster leucogaster	Mallee Western Whipbird	VU	E	Unlikely
Stipiturus mallee	Mallee Emu-wren	EN	E	Unlikely
Pteropus poliocephalus	Grey-headed Flying Fox	VU	R	Unlikely
Leipoa ocellata	Malleefowl	VU	V	Unlikely

Aus: Australia (*Environment Protection and Biodiversity Conservation Act 1999*). SA: South Australia (*National Parks and Wildlife Act 1972*). Conservation codes: CE/CR: Critically Endangered. EN/E: Endangered. VU/V: Vulnerable. R: Rare.

4.2.3 Threatened ecological communities

One threatened ecological community (TEC) was identified by the PMST:

Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions (listed as Endangered).

Vegetation Associations in the Project Area do not match any that might be identified as this TEC. There are no TEC present in the Project Area.

There is not likely to be any significant impact to EPBC listed TEC as a result of the Proposal.

4.3 Native vegetation assessment

4.3.1 Summary of site stratification

The Project Area was assessed as five Blocks of vegetation, named Block A through to Block E (Figure 5). Each Block was clearly isolated from the nearest native vegetation by cleared land used for cropping and grazing activities. Each Block consisted of a single Vegetation Association without any change in condition within the Block, with the largest being Block C (2.77 ha). One Bushland Assessment Method site was surveyed within each Block, as indicated in Table 8 and Figure 5.

Scattered remnant trees were present within cleared land within the Project Area. The STAM was applied to these trees. In total, 23 individual trees and nine clumps of trees were assessed in this way (Figure 5).

Table 8. Site stratification in the Project Area.

Block	BAM site	Vegetation Association	UBS*	Area (ha)	Impact Area (ha)
A	A1	*Eucalyptus diversifolia* + *Melaleuca acuminata* / *Melaleuca lanceolata* low mallee over exotic grasses	28.16	2.35	2.35
B	B1	*Eucalyptus diversifolia* + *Melaleuca acuminata* / *Melaleuca lanceolata* low mallee over exotic grasses	16.56	0.31	0.31
C	C1	*Eucalyptus diversifolia* + *Melaleuca acuminata* / *Melaleuca lanceolata* low mallee over exotic grasses	28.16	2.77	2.77
D	D1	*Eucalyptus leucoxylon* ssp. *stephaniae* woodland over exotic grasses	13.51	0.23	0.23
E	E1	*Eucalyptus leucoxylon* ssp. *stephaniae* woodland over exotic grasses	11.53	0.22	0.22

***UBS: Unit Biodiversity Score as calculated by the BAM scoresheet.**

4.3.2 Vegetation Association summary

Seven Vegetation Associations were mapped in the Project Area, of which only two consist of native vegetation (Table 9 and Figure 6).

The majority of the Project Area, over 80 ha, is cleared farmland, utilised for cropping and grazing, including centre-pivot irrigation. These areas contain some scattered remnant trees of *Eucalyptus leucoxylon* ssp. *stephaniae* and *Eucalyptus diversifolia,* but consist largely of exotic grasses and forbs, notably *Bromus diandrus*, *Ehrharta calycina* and *Avena barbata*. The area is situated on the mid-lower slopes of low hills with sandy soils.

Native vegetation is mainly restricted to calcareous hill tops, where two remnant patches of low mallee occur. These patches are dominated by *Eucalyptus diversifolia* with an exotic grassy understorey and are grazed by domestic stock. Two small patches of *Eucalyptus leucoxylon* ssp. *stephaniae* woodland also occur in the centre of the Project Area. Woodland vegetation contains an understorey of wholly exotic species and is also grazed, although no stock were present at the time of the survey. In total, native vegetation patches cover 5.88 ha of the Project Area.

Where past earth works and rock extraction has occurred, vegetation consists of exotic grasses and forbs and planted *Eucalyptus sp.* These planted trees were still in juvenile growth and could not be identified. They appear to have been direct seeded in rows. Areas used for the storage of feedlot waste (mainly manure) are devoid of vegetation except for sparse exotic forbs and grasses.

Table 9. Vegetation Associations of the Project Area.

ID	Vegetation Association	Area (ha)
VA1	*Eucalyptus diversifolia* + *Melaleuca acuminata* / *M. lanceolata* low mallee over exotic grasses	5.43
VA2	*Eucalyptus leucoxylon* ssp. *stephaniae* woodland over exotic grasses	0.45
VA3	Exotic grassland +/- scattered remnant trees	14.22
VA4	Cropland +/- scattered remnant trees	24.89
VA5	Exotic grassland +/- planted *Eucalyptus* spp.	0.73
VA6	Cropland	39.07
VA7	No vegetation	8.52

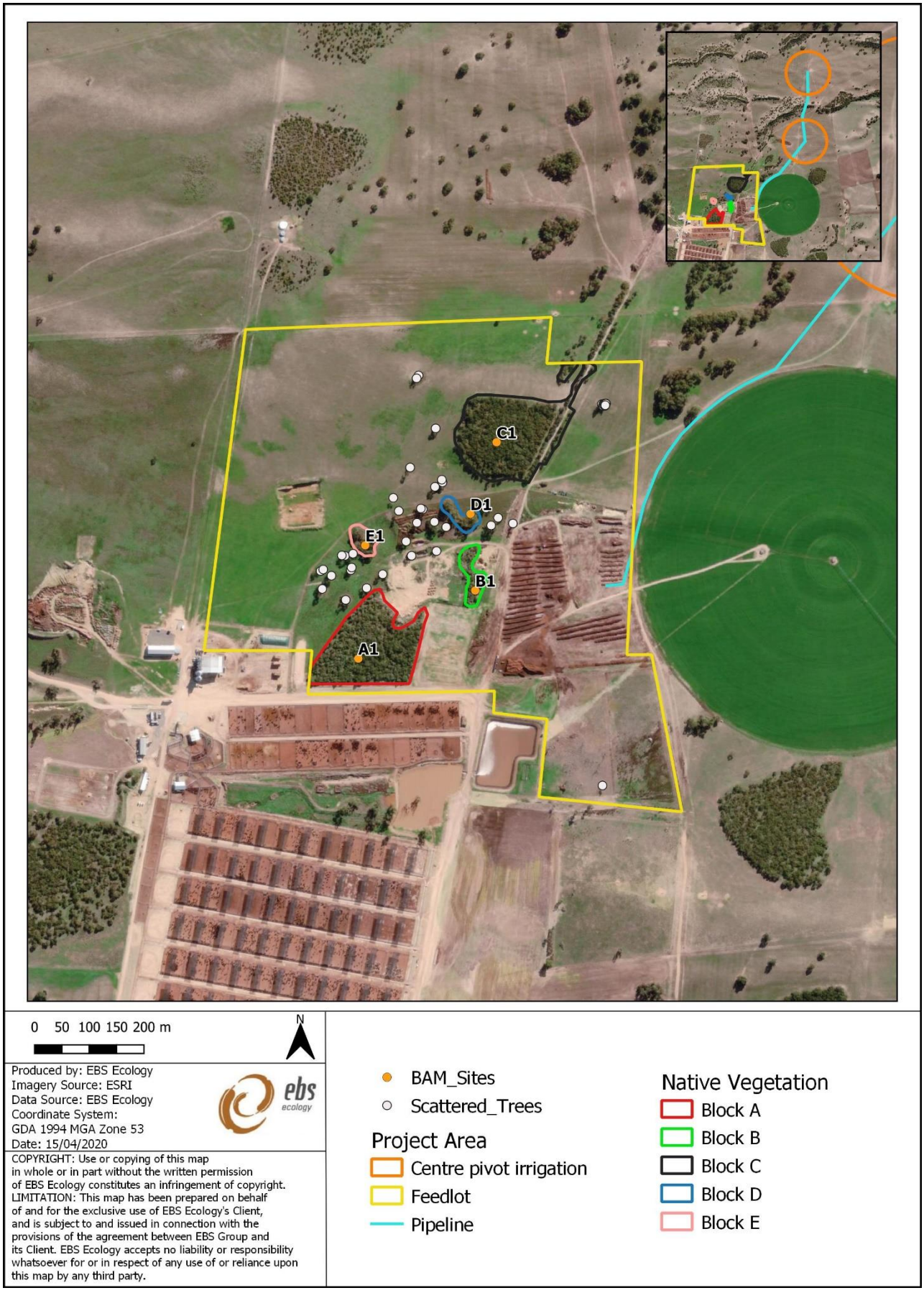


Figure 5. Native vegetation Blocks and site stratification in the Project Area.

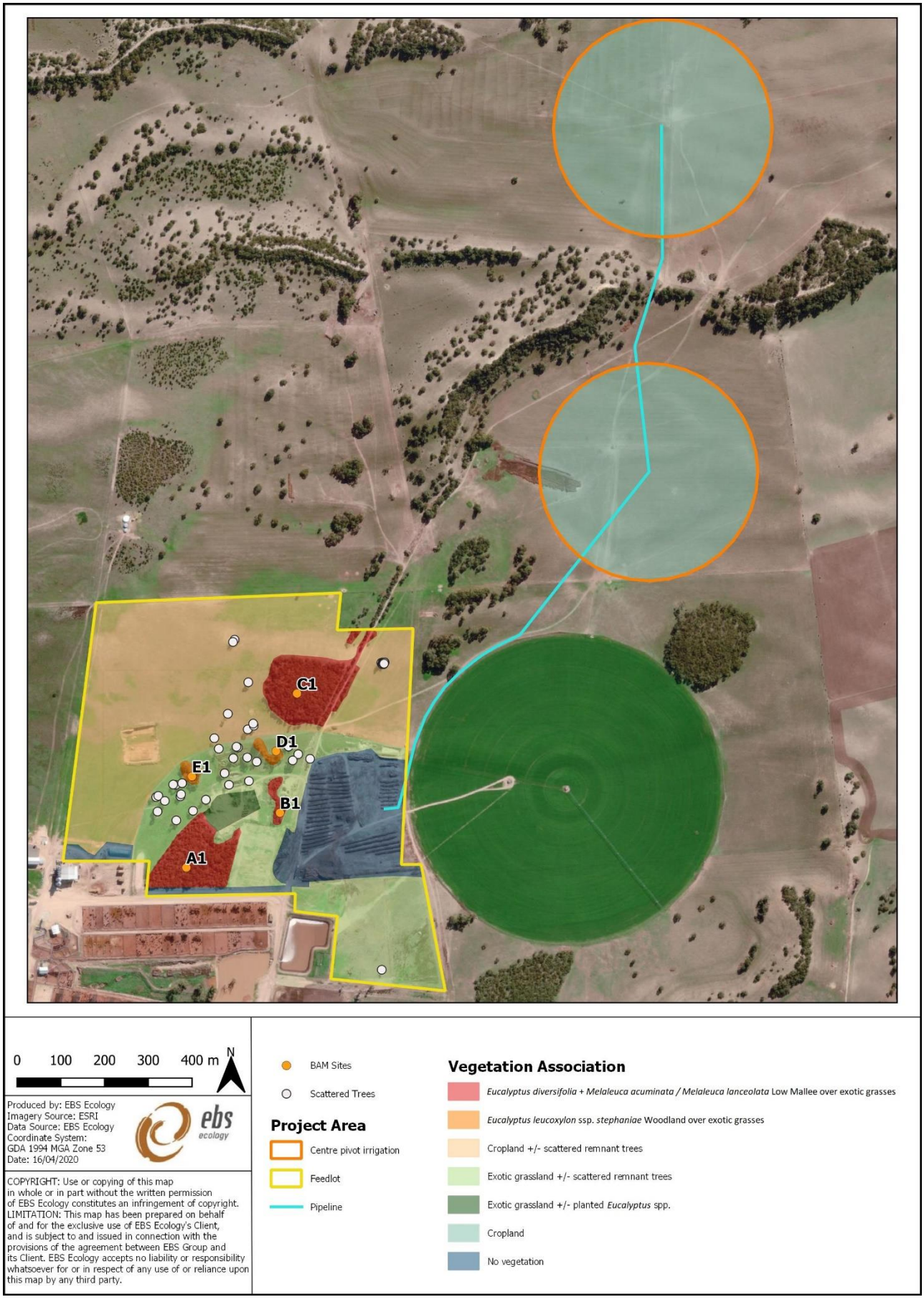


Figure 6. Vegetation Associations of the Project Area.

4.3.3 Vegetation Association descriptions

VA1: *Eucalyptus diversifolia* ssp. *diversifolia* + *Melaleuca acuminata* / *M. lanceolata* low mallee over exotic grasses

This Vegetation Association (VA1) consisted of remnant low mallee on the upper slopes and crests of two low hills in the Project Area. These areas were characterised by calcareous sandy soils, with limestone near or at the surface in places. It included three distinct patches of vegetation, named Block A, B and C for the purposes of the BAM survey.

All Blocks were characterised by a dominant canopy of *Eucalyptus diversifolia* ssp. *diversifolia,* mostly <5 m, with an understorey of tall *Melaleuca* spp. shrubs and exotic grasses. Low shrubs were sparse to absent and there was a low diversity of native understorey plants, although some native grass (e.g. *Rhytidosperma caespitosum*) and sedge species (e.g. *Lepidosperma carphoides*) were recorded.

Some regeneration of shrub and canopy species was present; however, no regeneration of ground layer species was observed.

Block C was heavily grazed at the time of the survey, with stock present while the survey was taking place. Despite this, similar species were recorded at BAM site C1, with regeneration of the shrub and canopy species present.

Vegetation condition, expressed as the vegetation condition score calculated by the SEB scoresheets, varied between Blocks, as did conservation significance and biodiversity score. These values are shown in Table 10.

Table 10. *Eucalyptus diversifolia* + *Melaleuca acuminata* / *M. lanceolata* low mallee over exotic grasses.

Overstorey species	*Eucalyptus diversifolia* +/- *E. leptophylla* / *E. incrassata*
Midstorey species	*Melaleuca acuminata* *M. lanceolata*
Understorey species	*Bromus diandrus* *Ehrharta calycina* *Brassica* sp. *Avena barbata* *Lepidosperma carphoides* *Rhytidosperma caespitosum* *Clematis microphylla*
Threatened species	Elegant Parrot Purple-gaped Honeyeater (mainland SA)
Declared weeds	*Marrubium vulgare*
Vegetation Condition Score	Block A – 26.03 (Figure 7) Block B – 15.31 (Figure 8) Block C – 26.03 (Figure 9)
Conservation Significance Score	Block A – 1.06 Block B – 1.06 Block C – 1.06
Unit Biodiversity Score	Block A – 28.70 Block B – 16.88 Block C – 28.70
Threatened Fauna Score	0.04

Figure 7. *Eucalyptus diversifolia* + *Melaleuca acuminata* / *M. lanceolata* low mallee over exotic grasses, Site A1.

Figure 8. *Eucalyptus diversifolia* + *Melaleuca acuminata* / *M. lanceolata* low mallee over exotic grasses, Site B1.

Figure 9. *Eucalyptus diversifolia* + *Melaleuca acuminata* / *M. lanceolata* low mallee over exotic grasses, Site C1.

VA2: *Eucalyptus leucoxylon* ssp. *stephaniae* woodland over exotic grasses

This Vegetation Association (VA2) consisted of remnant *Eucalyptus leucoxylon* ssp. *stephaniae* over exotic grasses and some forbs. No shrub layer was present, and no native species were recorded in the ground layer. Trees were generally <15 m tall with healthy canopies. Larger trees had hollows, mostly small, although some larger hollows were observed. VA2 was situated on sandy lower slopes and flats.

The ground layer was dominated by the exotic grasses *Ehrharta calycina* and *Bromus diandrus* (Great Brome), with *Avena barbata* (Bearded Oat) also present. Evidence of grazing activities were present, with some areas disturbed by past excavation earth works and dumping of waste plant material and organic refuse from the nearby feedlot.

Two Blocks of VA 2 were found within the Project Area; Blocks D and E. Both Blocks were found to be in similar condition, although there was a slight difference in the vegetation condition score and unit biodiversity score calculated for each (Table 11).

Table 11. *Eucalyptus leucoxylon* ssp. *stephaniae* woodland over exotic grasses.

Overstorey species	*Eucalyptus leucoxylon* ssp. *stephaniae*
Midstorey species	Absent
Understorey species	*Ehrharta calycina* *Bromus diandrus* *Ehrharta longiflora* *Avena barbata* *Marrubium vulgare*
Threatened species	Elegant Parrot Purple-gaped Honeyeater (mainland SA)
Declared weeds	*Marrubium vulgare*
Vegetation Condition Score	Block D – 12.49 (Figure 10) Block E – 10.66 (Figure 11)
Conservation Significance Score	Block D – 1.08 Block E – 1.08
Unit Biodiversity Score	Block D – 14.03 Block E – 11.97
Threatened Fauna Score	0.04

Figure 10. *Eucalyptus leucoxylon* ssp. *stephaniae* woodland over exotic grasses, Site D1.

Figure 11. *Eucalyptus leucoxylon* ssp. *stephaniae* woodland over exotic grasses, Site E1.

VA3: Exotic grassland +/- scattered remnant trees

The Project Area is dominated by land formerly cleared for cropping and grazing activities, with scattered remnant trees. Where cropping has not occurred, a ground layer of exotic grasses such as *Ehrharta calycina* and *Bromus diandrus* is present. Scattered *Eucalyptus leucoxylon* ssp. *stephaniae* occur, although they were absent from some parts of the Project Area. No shrubs were present. A summary of VA3 is shown in Table 12 and Figure 12.

For the purposes of calculating the SEB, VA3 was assessed as scattered trees, not as a native Vegetation Association.

Table 12. Exotic grassland +/- scattered remnant trees.

Overstorey species	*Eucalyptus leucoxylon* ssp. *stephaniae*
Midstorey species	Absent
Understorey species	*Ehrharta calycina* *Bromus diandrus* *Ehrharta longiflora* *Avena barbata* *Marrubium vulgare*
Threatened species	Elegant Parrot Purple-gaped Honeyeater (mainland SA)
Declared weeds	*Echium plantagineum* *Marrubium vulgare*
Vegetation Condition Score **Conservation Significance Score**	Assessed as scattered trees – no scores calculated.
Unit Biodiversity Score	91.96
Threatened Fauna Score	0.04

Figure 12. Exotic grassland +/- scattered remnant trees.

VA4: Cropland +/- scattered remnant trees

This Vegetation Association occurred on cleared land on mid-lower slopes and flats with a sandy soil. Crops had recently been grown and harvested, with cattle grazing remaining stubble. Ground layer vegetation was absent or consisted of sparse exotic forbs, such as *Echium plantagineum* (Salvation Jane) and exotic grasses. Scattered *Eucalyptus leucoxylon* ssp. *stephaniae* trees, <15 m tall, were present in places.

A summary of VA4 is provided in Table 13 and photograph of the association is shown in Figure 13. For the purposes of calculating the SEB, the association was assessed as scattered trees, not as a native Vegetation Association.

Table 13. Cropland +/- scattered remnant trees

Overstorey species	*Eucalyptus leucoxylon* ssp. *stephaniae*
Midstorey species	Absent
Understorey species	Crop stubble
Threatened species	Elegant Parrot Purple-gaped Honeyeater (mainland SA)
Declared weeds	*Echium plantagineum* *Marrubium vulgare*
Vegetation Condition Score **Conservation Significance Score**	Assessed as scattered trees – no scores calculated.
Unit Biodiversity Score	See Appendix 5

Figure 13. Cropland +/- scattered remnant trees.

VA5: Exotic grassland +/- planted *Eucalyptus* spp.

This Vegetation Association occurred in an area of historical clearing and extractive activities. Significant ground disturbance occurred at the site.

Vegetation consisted of exotic grassland dominated by *Ehrharta calycina* with *Avena barbata.* Exotic forbs were also present, including *Marrubium vulgare* (Horehound), *Echium plantagineum, Sonchus oleraceus* (Sow Thistle) and *Heliotropium* sp. (Table 14, Figure 14).

Planted *Eucalyptus* spp. occurred in distinct rows throughout. Although species could not be identified due to the presence of only juvenile plants, at least two species were present. There was no natural regeneration of native plants.

VA5 was not considered native vegetation and has not been assessed using the BAM.

Table 14. Exotic grassland +/- planted *Eucalyptus* spp.

Overstorey species	*Eucalyptus* spp.
Midstorey species	Absent
Understorey species	*Ehrharta calycina* *Bromus diandrus* *Ehrharta longiflora* *Avena barbata* *Marrubium vulgare*
Threatened species	None
Declared weeds	*Echium plantagineum* *Marrubium vulgare*
Vegetation Condition Score	Site formerly cleared and disturbed for extraction of rock and earth. Rehabilitated with direct seeded *Eucalyptus* spp., but dominated by exotic grasses and forbs.
Conservation Significance Score **Unit Biodiversity Score**	Not assessed as native vegetation, therefore no scores calculated.

Figure 14. Exotic grassland +/- planted *Eucalyptus* spp.

VA6: Cropland

VA 6 (Figure 15) is situated in the north of the Project Area between sand hills. There are no scattered remnant trees, midstorey is absent and understorey species are exotic (Table 15). The area has been used for cropping in the past and is currently being grazed by cattle. The proposed centre pivot irrigations areas have been placed in this Vegetation Association.

Table 15. Cropland

Overstorey species	Absent
Midstorey species	Absent
Understorey species	Crop stubble *Heliotropium* sp. *Medicago polymorpha* *Avena barbata* *Bromus diandrus* *Malva* sp. *Echium plantagineum* *Brassica sp.*
Threatened species	None
Declared weeds	*Echium plantagineum* (Salvation Jane)
Vegetation Condition Score **Conservation Significance Score** **Unit Biodiversity Score**	No native vegetation or scattered trees present.

Figure 15. Cropland.

VA7: No vegetation

Parts of the Project Area were utilised for the stockpiling of organic waste from the adjacent feedlot. These areas were largely devoid of vegetation, although very sparse exotic grasses and forbs were present (Table 16, Figure 16).

VA6 is not considered native vegetation and has not been assessed using the BAM.

Table 16. No vegetation.

Overstorey species	Absent
Midstorey species	Absent
Understorey species	*Onopordum* sp. *Heliotropium* sp. *Marrubium vulgare* *Avena barbata* *Bromus diandrus* *Malva* sp. *Echium plantagineum* *Mesembryanthemum crystallinum* *Brassica sp.*
Threatened species	None
Declared weeds	*Echium plantagineum* (Salvation Jane) *Marrubium vulgare* (Horehound)
Vegetation Condition Score	Cleared areas utilised for waste (manure) storage. Some sparse exotic grasses and forbs present, but largely clear of vegetation.
Conservation Significance Score	
Unit Biodiversity Score	Not assessed as native vegetation, therefore no scores calculated.

Figure 16. The area used for storage of feedlot waste, with vegetation absent to sparse.

4.3.4 Benchmark vegetation communities

The SEB is calculated in part by comparing the condition of native vegetation in the Project Area with benchmark values. For this purpose, each Vegetation Association has been assigned a benchmark community, as shown in Table 17. Benchmark communities have been taken from the Nature Conservation Society of South Australia's *Bushland Condition Monitoring Manual: South East and Kangaroo Island*.

Table 17. Benchmark communities for the Project Area.

Vegetation Association	Benchmark Community
Eucalyptus diversifolia + *Melaleuca acuminata* / *M. lanceolata* low mallee over exotic grasses.	SE 7.5 Coastal, Sub coastal and Inland Mallee with mid dense shrub and sedge understorey on calcareous dunes.
Eucalyptus leucoxylon ssp. *stephaniae* woodland over exotic grasses.	SE 3.1 Grassy woodlands on sandy loams/loams.

4.3.5 Scattered tree assessment

Scattered trees were distributed throughout lower slopes and flats historically cleared for grazing and cropping purposes. Within the Project Area, 29 scattered trees and nine clumps of trees were assessed using the STAM. This totalled 63 trees.

Three (3) tree species were present, none of which are threatened species:

- *Eucalyptus leucoxylon* ssp. *stephaniae* (43 trees, Figure 17)
- *Eucalyptus phenax* ssp. *phenax* (6 trees, Figure 18)
- *Eucalyptus diversifolia* (14 trees, Figure 19)

Trees ranged in height from 4.5 metres (m) to 15 m, with trunk diameters recorded from 20 centimetres (cm) to 81 cm. Five trees contained hollows (Figure 20).

Scattered trees are known to provide habitat for foraging birds such as honeyeaters. Hollow-bearing trees also provide breeding habitat for hollow-using birds and mammals. Although not recorded during the survey, scattered trees in the Project Area provide possible habitat for Elegant Parrot and Purple-gaped Honeyeater. Given the limitations of the survey discussed previously and the proximity of known records, it is possible these species at least occasionally occur.

The locations of scattered trees assessed are shown in Figure 6. Results of the scattered tree assessment, including photographs, are presented in Appendix 5.

4.3.6 Presence of substantially intact vegetation

Native vegetation in the Project Area is characterised by degrading factors resulting from current land use practices. Grazing has had a high impact and past clearing activities have removed large, old trees. Ground layer vegetation is dominated by introduced grasses, with a very low diversity of native species present.

The presence of substantially intact vegetation in the Project Area has been assessed according to the *Guide for applications to clear native vegetation* (Native Vegetation Council, 2019c). This assessment is summarised in Table 18.

The Assessment indicates the following:

- Overstorey stratum in Blocks A and C is intact, although not in other Blocks, as these are < 1 ha in area.
- Ground and mid storey stratum is not intact as it does not constitute a continuous stratum and has been subjected to degradation.

Scattered trees do not meet the definition of an intact stratum.

Table 18. Assessment of substantially intact stratum.

1. Does the native vegetation constitute a continuous stratum?	
The plants within the stratum of interest are growing at original (pre-European) density for that community.	Vegetation is in poor condition, as indicated by the Vegetation Condition Scores. Ground layer vegetation is dominated by introduced species and density of mid storey is reduced to sparse to absent. Density of overstorey within both Vegetation Associations probably approaches pre-European density, although it is of reduced diversity.
Contains a diversity of species similar to original (pre-European) vegetation of that community.	Mid and ground stratums show a reduced diversity of species. Midstorey was either absent or limited to no more than two species and ground layer vegetation consisted of exotic grasses with few to no native species present. Both Vegetation Associations had an overstorey consisting of one to three tree species which is similar to original condition.
Is part of a contiguous area of vegetation consisting of the stratum, including on adjacent properties, that is at least one hectare in area.	Block A and Block C are greater than 1 ha in area.
Does not contain introduced perennial species occupying greater than 20% cover within that stratum.	Although annual grasses and weeds may occupy >20% cover in the ground layer, introduced perennial species do not.
2. Has the vegetation been subjected to degradation within the past 20 years?	
Any degradation must have been undertaken in compliance with the NV Act.	Degradation has occurred as part of routine grazing activities in compliance with the NV Act.
Must have occurred within the past 20 years from the date of application.	Degradation of the vegetation has occurred within the past 20 years, with cattle currently having access to all areas of the Project Area at the time of the field survey.
Must be a direct result of human activity, including: • **Fragmentation of the area of vegetation.** • **Modifying, destroying or removing vegetation cover or plant species diversity.** • **Changing abiotic factors such as water, nutrients or soil which subsequently impacts native vegetation.**	Degradation of the vegetation is the result of human activity including: • Historical clearing and fragmentation of the landscape. • Current land use of the Project Area, including cropping and grazing activities. • Changing abiotic factors caused by agricultural activities including soil compaction and erosion and nutrient enrichment.
Does not include degradation as a result of fire.	There is no evidence of recent fire events having impacted on vegetation in the Project Area.

Figure 17. An example of a scattered *Eucalyptus leucoxylon* ssp. *stephaniae* (Tree 1) in the Project Area.

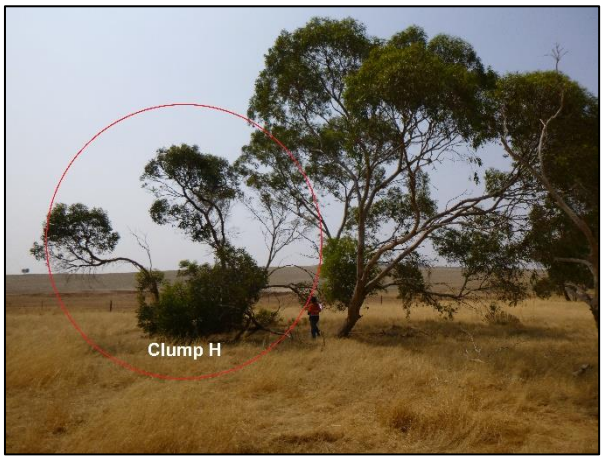


Figure 18. A clump of *Eucalyptus phenax* ssp. *phenax* in the Project Area (circled in red).

Figure 19. *Eucalyptus diversifolia* (Tree 11, circled in red) in the Project Area.

Figure 20. Four scattered trees had one or more hollows, such as the medium sized spout hollow pictured.

5 REQUIREMENTS OF REGULATION

5.1 Regulation under which the clearance is applicable

Native vegetation within the Project area is protected under the *Native Vegetation Act 1991* (NV Act) and *Native Vegetation Regulations 2017*. Any proposed clearance of native vegetation in South Australia (unless exempt under the *Native Vegetation Regulations 2017*) is to be assessed against the NV Act Principles of Clearance, and requires approval from the Native Vegetation Council (NVC). A net environmental benefit is generally conditional on an approval being granted.

There is no regulation exemption for this type of project and therefore the assessment is considered under section 29 of the NV Act.

5.2 Risk Assessment

The Project requires the clearance of 5.88 ha of native vegetation and 36 scattered trees, with a total Biodiversity Score of 259.06, as shown in Table 19.

The Project constitutes a Level 3 Clearance according to the *Native Vegetation Regulations 2017* and is at variance with Principles of clearance (a), (b) and (e), as discussed in Section 5.2.1.

Table 19. Biodiversity scores for native vegetation in the Project Area.

Vegetation Block	Survey Site	Landscape Context Score	Threatened Fauna Score	Conservation Significance Score	Vegetation Condition Score	Unit Biodiversity Score	Total Biodiversity Score
Block A	A1	1.04	0.04	1.04	26.03	28.16	66.17
Block B	B1	1.04	0.04	1.04	15.31	16.56	5.13
Block C	C1	1.04	0.04	1.04	26.03	28.16	77.99
Block D	D1	1.04	0.04	1.04	12.49	13.51	3.11
Block E	E1	1.04	0.04	1.04	10.66	11.53	2.55
Scattered trees	Trees 1 - 36	Not applicable	Not applicable	Not applicable	Not applicable	See Appendix 5	104.11
						Total	**259.06**

5.2.1 Principles of clearance

The Proposal has been assessed against the Principles of clearance, as defined in Schedule 1 of the NV Act. Assessment against these principles is discussed below.

Principle a) Vegetation comprises a high level of diversity of plant species

Each Block of native vegetation in the Project Area has been assessed against this Principle in accordance with the *Guide for applications to clear native vegetation* (Native Vegetation Council, 2019c). This uses the native plant species diversity score to determine variance with the Principle, as shown in Table 20.

Table 20. Determining the level of diversity of plant species (Native Vegetation Council, 2019c).

Native plant species diversity score	At variance with the principles
<10	Not at variance
10 - 20	At variance
>20	Seriously at variance
Moderating factor	
Where only a very small area of vegetation will be impacted relative to the amount of vegetation within the local vicinity (less than 10% of the native vegetation within a 5 km radius to be impacted), this may reduce the impact from 'Seriously at variance' to 'At variance', or 'At variance' to 'Not at variance'.	

The native plant species diversity score for each Block and whether clearing is at variance with the Principle is shown in Table 21. Blocks A and C have been assessed as at variance with the Principle.

The NVC may choose to apply moderating factors to reduce the level of variance. Moderating factors are as follows:

i. The total area of a 5 km buffer around the Project Area has been calculated using GIS software.

ii. This figure and the percent of native vegetation within 5 km, as obtained from NatureMaps and stated in the BAM scoresheet for each vegetation Block, has been used to calculate the approximate hectares of native vegetation within 5 km radius.

iii. The extent of each Block to be cleared has been calculated as a percent of the total native vegetation within a 5 km radius.

Assessment against the moderating factors is shown in Table 22.

Table 21. Assessment of variance with Principle (a).

Block	Native plant species diversity score	At variance with the principle
A	10	At variance
B	4	Not at variance
C	10	At variance
D	2	Not at variance
E	2	Not at variance

Table 22. Application of the moderating factor for clearing at variance with Principle (a).

Block	Remnancy (%)	5 km buffer extent (ha)	Total native vegetation (ha)	Clearing extent (ha)	% cleared within 5 km radius
A	18	8801	1584.18	2.35	0.15
C	20	8801	1760.20	2.77	0.06

Principle b) Vegetation has significance as a habitat for wildlife

The *Guide for applications to clear native vegetation* (Native Vegetation Council, 2019c) has been used to determine if the Proposal is at variance with this principle, using the parameters shown in Table 23 and Table 24. Based on these tables, the Proposal is at variance with the principle since vegetation associations have a Threatened Fauna score of 0.04.

Scattered trees have been assessed as potential habitat for two species listed as Rare under the NPW Act. Clearing these trees is also at variance. One clump of trees assessed (Clump A) has a Biodiversity score of >7. Clearing Clump A is seriously at variance with the principle. Significance of impact to threatened fauna is addressed in Section 5.2.1.

Table 23. Determining the significance of vegetation as wildlife habitat for sites using the BAM (Native Vegetation Council, 2019c).

Fauna habitat	At variance with the principles
Threatened Fauna Score of 0.	Not at variance
Threatened Fauna Score of <0.05.	At variance
Threatened Fauna Score of >0.05.	Seriously at variance
Vegetation association with a Unit Biodiversity Score of >60.	Seriously at variance

Table 24. Determining the significance of vegetation as wildlife habitat for sites using the STAM (Native Vegetation Council, 2019c).

Fauna habitat	At variance with the principles
Not habitat for any threatened fauna.	Not at variance
Habitat for regionally uncommon species or NPW Act Rare species.	At variance
Habitat for Vulnerable or Endangered species under the NPW Act or any EPBC Act listed species	Seriously at variance
A tree with a Total Biodiversity Score of >7	Seriously at variance

Principle c) Vegetation includes plants of a rare, vulnerable or endangered species

No threatened plant species were recorded during the comprehensive field survey. No threatened plants predicted by desktop searches as having potential to occur in the Project Area were assessed as possible, likely or highly likely to occur (Section 4.1.1 and Section 4.2.2). The Proposal is not at variance with this Principle.

Principle d) The vegetation comprises the whole, or part, of a plant community that is Rare, Vulnerable or Endangered

Native vegetation in the Project Area is not, or does not form part of, a threatened ecological or plant community (Section 4.2.3). The Proposal is not at variance with this Principle.

Principle e) Vegetation is significant as a remnant of vegetation in an area which has been extensively cleared.

The *Guide for applications to clear native vegetation* (Native Vegetation Council, 2019c) has been used to determine if the Proposal is at variance with this principle, using the percent of native vegetation cover for the Environmental Association and IBRA subregion, as indicated in Table 25.

Table 25. Parameters for assessing variance with Principle (e) (Native Vegetation Council, 2019c).

Remancy (%)*	Total Biodiversity Score for total area of impact (using BAM)			Scattered tree assessment
	>500	50 – 500	<50	Scattered trees
>30	At variance	At variance	Not at variance	Not at variance
11 – 30	Seriously at variance	At variance	Not at variance	Not at variance
1 – 10	Seriously at variance	Seriously at variance	At variance	At variance
<1	Seriously at variance	Seriously at variance	Seriously at variance	At variance
Last remnant in Environmental Association	Seriously at variance	Seriously at variance	Seriously at variance	Seriously at variance

***Percent native remnant vegetation for IBRA environmental association and IBRA subregion.**

The landscape context of the Project Area according to Environmental Association and IBRA subregion has previously been discussed in Section 2.4.1. Using remnancy figures presented in that Section and the Total Biodiversity Scores for each Block as calculated by the BAM assessment scoresheets, the Proposal has been assessed against Principle (e). Results are presented in Table 26.

Table 26. Assessment of variance with Principle (e).

Remancy (%)	Block	Block Total Biodiversity Score	Impact area Total Biodiversity Score	Native Vegetation Blocks	Scattered trees
48* 19+	A	66.17	154.95	At variance	Not at variance
	B	5.13			
	C	77.99			
	D	3.11			
	E	2.54			

***Percent native remnant vegetation for Carcuma IBRA environmental association.**
+Percent native remnant vegetation for Tintinara IBRA subregion.

Table 26 indicates that clearing of vegetation Blocks is at variance with the Principle, however clearing of scattered trees is not.

Note that the Proposal may be reduced to not at variance if the impact area Total Biodiversity Score is reduced to <50. This could be achieved by avoiding and/or reducing the extent of clearing within Block A and C.

Principle f) Vegetation is growing in, or in association with, a wetland environment.

There are no wetland areas or watercourses in, or associated with, the Project Area. The Proposal is not at variance with this Principle.

Principle g) Vegetation contributes significantly to the amenity of the area in which it is growing or is situated.

The location of the development has been selected in part to consider the impacts on the amenity of the area for nearby receptors (neighbouring property owners). The Project Area is situated immediately adjacent to existing feedlot infrastructure that already forms a large part of the overall aesthetics of the property.

The impact area is set well back from Carcuma Road (approximately 1 km), with the low rolling hills of the surrounding landscape shielding the Project Area from view from travellers using the road. The Project Area is a fragmented landscape mostly cleared for agriculture with significant built infrastructure in place. Remnant vegetation on site does not contribute significantly to the amenity of the area and the Project is therefore not at variance with Principle (g).

5.2.2 Impact significance for threatened species

Two NPW Act threatened species have been assessed as possibly occurring in the Project Area. Significance of impact to these species has been assessed according to the *Guide for applications to clear native vegetation* (Native Vegetation Council, 2019c) (Table 27 and Table 28). No EPBC Act listed threatened species are likely to occur.

Table 27. Significant impact assessment for Elegant Parrot.

Significant Impact Criteria	Assessment
Proposal will lead to a long-term decrease in the size of a population.	Any Elegant Parrot that might occur in the Project Area would be part of a larger population distributed throughout the upper south-east of SA. The small scale of the Proposal is not likely to lead to a long-term decrease in the size of this population.
Proposal will reduce the area of occupancy of the species.	The Elegant Parrot is distributed throughout south-eastern mainland Australia. Significant areas of contiguous habitat for the species occurs close to the Project Area, including Carcuma and Ngarkat Conservation Parks. The small scale of the Proposal is unlikely to reduce the area of occupancy of the species.
Proposal will fragment an existing population into two or more populations.	Any individuals of the species within the Project Area would be part of the wider population within the landscape, not part of a population restricted to the vicinity of the Project Area. The proposal is not sufficient in extent to fragment this population. It does not prevent the movement of individuals from one area of suitable habitat to another, as the birds are known to occur in open habitats and to disperse widely through the landscape.
Proposal will adversely affect habitat critical to the survival of the species.	Critical habitat for the species is not defined, however Elegant Parrots inhabit open farmland, woodland and mallee (Morcombe, 2003). The highly disturbed condition of the Project Area and its extent in the context of similar habitat in the surrounding landscape, indicates it is not likely to be critical to the survival of the species.
Proposal will modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	The Similar habitat to the Project Area (i.e. scattered remnant trees in agricultural land with isolated native vegetation patches) is extensive in the surrounding landscape. The small scale of the Proposal is not likely to impact availability of habitat to the extent that the species would decline.
Proposal will result in invasive species that are harmful to a threatened species becoming established.	Invasive animal and plant species that may be harmful to the species (e.g. Red Fox, Feral Cat, European Rabbit) are already established in the Project Area.

Significant Impact Criteria	Assessment
Interfere with the recovery of the species.	There are no recovery plans or efforts with which this Proposal interferes.

Table 28. Significant impact assessment for Purple-gaped Honeyeater.

Significant Impact Criteria	Assessment
Proposal will lead to a long-term decrease in the size of a population.	Any Purple-gaped Honeyeater that might occur in the Project Area would be part of a larger population distributed throughout the upper south-east of SA. The small scale of the Proposal is not likely to lead to a long-term decrease in the size of this population.
Proposal will reduce the area of occupancy of the species.	The Purple-gaped Honeyeater is distributed throughout south-eastern and south-western mainland Australia. Significant areas of contiguous habitat for the species occurs close to the Project Area, including Carcuma and Ngarkat Conservation Parks. The small scale of the Proposal is unlikely to reduce the area of occupancy of the species.
Proposal will fragment an existing population into two or more populations.	Any individuals of the species within the Project Area would be part of the wider population within the landscape, not part of a population restricted to the vicinity of the Project Area. The proposal is not sufficient in extent to fragment this population.
Proposal will adversely affect habitat critical to the survival of the species.	Purple-gaped Honeyeaters requires diverse mallee and heath vegetation to persist is an area (NSW Office of Environment and Heritage, 2020a). The Project Area does not provide this habitat, with vegetation likely to provide marginal foraging habitat at best. The Proposal is not likely to impact critical habitat.
Proposal will modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	The Similar habitat to the Project Area (i.e. scattered remnant trees in agricultural land with isolated native vegetation patches) is extensive in the surrounding landscape. The small scale of the Proposal is not likely to impact availability of habitat to the extent that the species would decline.
Proposal will result in invasive species that are harmful to a threatened species becoming established.	Invasive animal and plant species that may be harmful to the species (e.g. Red Fox, Feral Cat, European Rabbit) are already established in the Project Area.
Interfere with the recovery of the species.	There are no recovery plans or efforts with which this Proposal interferes.

5.3 Impact Mitigation Hierarchy

5.3.1 Avoidance

The Proponent has advised that the Proposal requires substantial construction and earthworks to develop the feedlot. The positioning of the Proposal has been selected for the following reasons:

- Limit impacts (e.g. aesthetic, noise, smells) to neighbouring landowners. Housing to the east of the current feedlot limits expansion in that direction.
- Construction requires rock and clay material. The Proponents wish to source and utilise material from on-site to maintain cost viability of the Proposal. Suitable material is located beneath mallee vegetation on site.

- Siting of feedlot expansion close to existing infrastructure, including office, loading areas and feed storage, to limit the overall footprint of the development and increase the cost viability of the Proposal.

Where possible while maintaining the economic viability of the Proposal, project design has avoided native vegetation. This includes the following avoidance measures:

- Centre pivot irrigation areas have been located in previously cropped areas of exotic grassland where no remnant scattered trees occur.
- The water pipeline will be micro sited to avoid any clearing of native vegetation patches or impact to scattered trees.

5.3.2 Minimisation

Where impact to native vegetation cannot be avoided under this Proposal, the Proponent will seek to minimise their impact by undertaking the management actions listed in Table 29.

Table 29. Management actions for impact minimisation.

Impact	Management Action	Timing	Responsibility
Over-clearing	Clearly identify and mark the extent of permitted vegetation clearing and areas of native vegetation to be retained. Micro-siting of the development will occur to minimise required extent of clearing to Block C1. All personnel inducted to be aware that disturbance of vegetation outside the approved clearing area could have legislative consequences. Records of inductions kept on file.	Pre-construction	Proponent Contractor/s
Damage to native vegetation outside the impact footprint	Stockpile and compound sites required during construction are to be located within the assessed Project Area and according to the following: • At least 40 m away from the nearest waterway. • In areas of previously disturbed land. • On relatively level ground. • Outside the drip-line of any trees that are to be retained. Outside the Project Area, vehicles and machinery will be restricted to existing access tracks and disturbed areas, where possible.	Pre-construction Construction	Proponent Contractor/s
Disturbance to fallen timber, dead wood and bush rock	Where possible, all fallen timber, dead wood and bush rock cleared from the site will be relocated to the edges of retained native vegetation to enhance habitat and regeneration.	Construction	Proponent Contractor/s
Harm to wildlife and threatened species	The following procedure will be followed during the removal of hollow-bearing trees and Clump A trees that cannot be retained:	Pre-construction Construction	Proponent Contractor/s

Impact	Management Action	Timing	Responsibility
	• Hollow-bearing trees being removed will be clearly marked as habitat trees. • Ground vegetation surrounding the tree will be removed 24 hours prior to felling the tree. • The hollow-bearing tree will be 'knocked' with machinery immediately prior to felling. • After felling, the tree will be inspected for the presence of fauna injured/disturbed in the process. • If injured fauna is encountered, contact RSPCA (1300 477 722), Fauna Rescue (08 8289 0896) or National Parks and Wildlife Coorong office (08 8575 1200). Construction/clearing work will occur only during daylight hours to avoid indirect impact to fauna through incidents such as vehicle strikes.	Post -construction	
Soil and erosion management	Sediment and erosion risks will be managed in accordance with any development approval conditions.	Pre-construction Construction Post -construction	Proponent Contractor/s
Introduction and spread of weeds	Construction machinery will be inspected on arrival at the property to be clean of soil and vegetation material (e.g. grass seeds), prior to accessing the work site. Any fill (e.g. sand, gravel) sourced from offsite will be obtained from a source known to be free of weed seeds.	Pre-construction Construction Post -construction	Proponent Contractor/s

5.3.3 Rehabilitation or restoration

Areas cleared will be utilised as part of the feedlot development and will not be rehabilitated or restored. However, the Proponent will undertake the management actions listed in Table 30 to restore vegetation and habitat elsewhere on the property.

Table 30. Rehabilitation management actions.

Management Action	Timing	Responsibility
Where possible, all fallen timber, dead wood and bush rock cleared from the site will be relocated to the edges of retained native vegetation to enhance habitat and regeneration.	Construction Post-construction	Proponent
As part of meeting the SEB obligation, the Proponent will investigate the feasibility and appropriateness of revegetating cleared land on the property (outside the Project Area).	Post-construction	Proponent

5.3.4 Offset

Any adverse impact on native vegetation or ecosystems that cannot be avoided or minimised will be offset by implementing an SEB that outweighs that impact. Biodiversity offsets address any residual impacts after prevention and mitigation measures have been implemented.

The NVC will only approve clearances if these steps have been fulfilled. Offsetting is only considered by the NVC when a proponent has identified and documented appropriate measures to avoid and minimise negative impacts (direct or indirect) on biodiversity. Biodiversity offsets are only appropriate for projects that have rigorously applied the Mitigation Hierarchy to the fullest extent. Offsets must never be used to circumvent responsibilities to avoid and minimise damage to biodiversity and the NVC will consider this when determining whether the clearance can proceed.

The Proponent has indicated that it will seek to fulfil the SEB associated with the Proposal (Section 6) by one or a combination of the following:

- Establishing a new on-ground SEB Area on land owned by the Proponent, either by revegetating cleared land or managing existing native vegetation. TFI could potentially improve biodiversity in these areas to partially offset the proposed clearance associated with the Project. This is subject to approval and assessment and if approved, appropriate Offset Strategies and Offset Management Plans will need to be developed.
- Payment into the Native Vegetation Fund if the required SEB cannot be achieved through the above methods.

6 SIGNIFICANT ENVIRONMENTAL BENEFIT

A 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 caused by the proposed clearance, a SEB will result in a positive impact on the environment that is over and above the negative impact of the clearance.

6.1 Determination of the SEB obligation

The SEB obligation of the Proposal has been calculated using data collected during the field survey, variables of landscape context and comparison of Project Area vegetation condition with benchmark communities (Table 31). Vegetation in the Project Area has been assessed using both the BAM and STAM to enable the calculation of the total SEB obligation.

As a detailed impact footprint has not been provided, the SEB has been calculated assuming all native vegetation in the Project Area will be removed.

Table 31. SEB obligation for the Proposal.

	Block A	Block B	Block C	Block D	Block D	Scattered Trees
Area of clearance (ha) / No. of trees	2.35 ha	0.31 ha	2.77 ha	0.23 ha	0.22 ha	63 (trees)
SEB points of loss	69.47	5.39	81.89	3.26	2.66	109.31
Hectares required	8.68 ha	0.67 ha	10.24 ha	0.41 ha	0.33 ha	N/A
Payment into the Native Vegetation Fund	$38 393.31	$2972.20	$45 148.61	$1798.34	$1467.90	$63 281.33
Administration fee	$2111.63	$163.47	$2483.17	$98.91	$80.73	$3013.43
Total	**$40 504.94**	**$3135.67**	**$47 631.78**	**$1897.25**	**$1548.63**	**$66 295.40**

6.2 Achieving the SEB

The Proponent intends to achieve the SEB by either of the following:

- Establishing a new SEB area on land owned by the Proponent.
- Payment into the Native Vegetation Fund (if a site suitable for a new SEB area/s is not found).

The Proponent has suggested locating a SEB site on land owned to the north of the Project Area, as shown in Figure 21. The preferred SEB area, shown in red in the figure, totals approximately 15 ha. However, the proponent is prepared to work anywhere within the green polygon (to a similar 15 ha extent) if more appropriate areas for locating a SEB are located or additional hectares are required.

The red polygon in Figure 21 was visited during the field survey to determine the dominant vegetation present. It was found to consist of *Eucalyptus diversifolia* Mallee over sclerophyll shrubs and sedges, ranging from tall mallee on the lower slope of a sand dune to low mallee on the dune crest (Figure 22 and Figure 23).

Although in moderate condition, the area is impacted by grazing and weed invasion and would benefit from management activities such as fencing and weed control activities.

Following clearing approval, the Proponent will engage a suitable accredited assessor to undertake the work required in establishing the SEB.

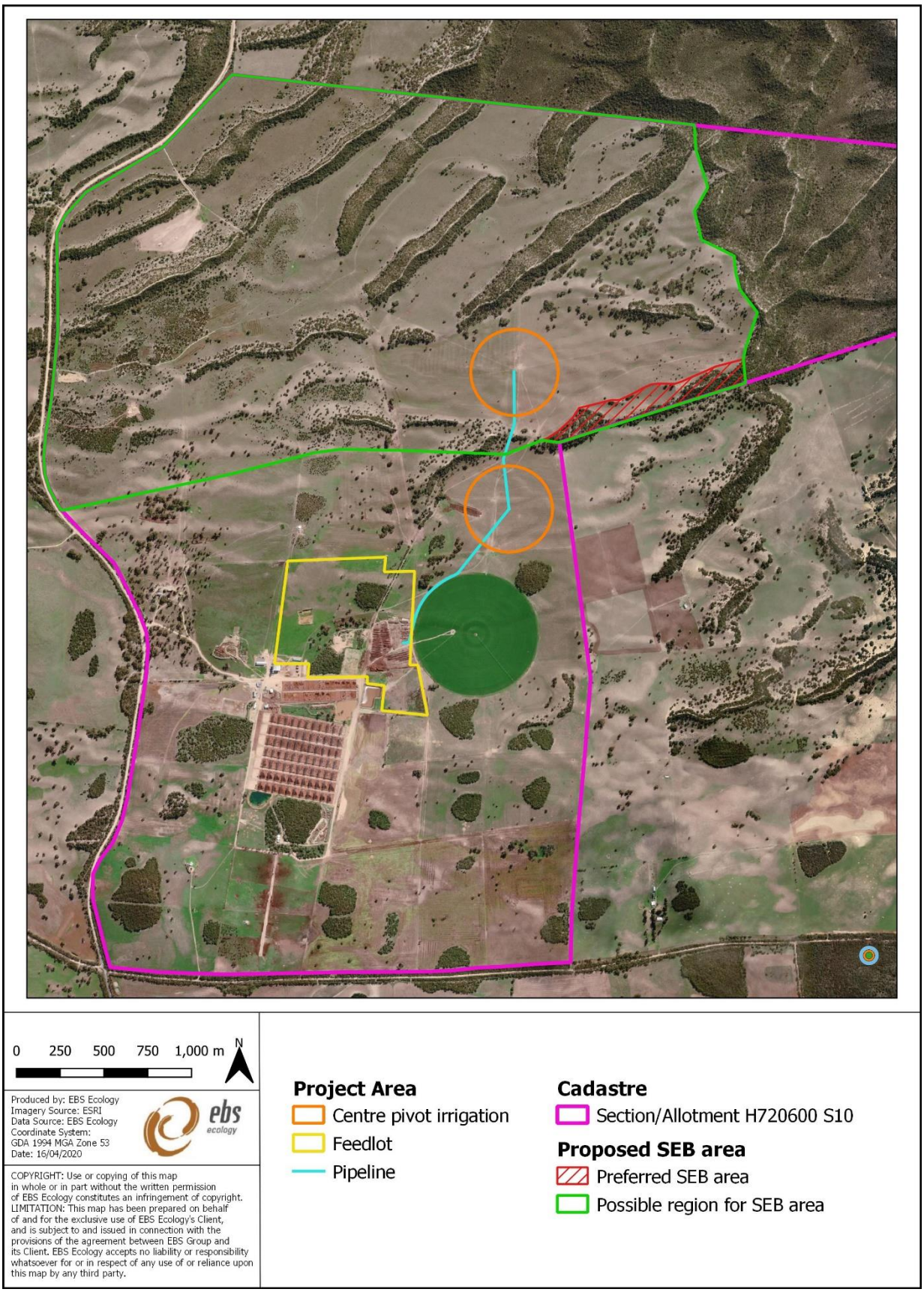


Figure 21. Potential SEB areas.

Figure 22. *Eucalyptus diversifolia* Tall Mallee on the lower slope of the proposed SEB area.

Figure 23. *Eucalyptus diversifolia* Low Mallee on the upper slope of the proposed SEB area.

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8 APPENDICES

Appendix 1. Flora recorded during the field survey.

*	Scientific name	Common name	Conservation status	
			Aus	SA
	Acacia rupicola	Rock Wattle		
	Austrostipa sp.	Spear-grass		
*	*Avena barbata*	Bearded Oat		
	Billardiera cymosa	Sweet Apple-berry		
*	*Brassica sp.*	Brassica		
*	*Bromus diandrus*	Great Brome		
*	*Chenopodium alba*	Fat Hen		
	Clematis microphylla	Old Man's Beard		
	Dampiera rosmarinifolia	Rosemary Dampiera		
*	*Echium plantagineum*	Salvation Jane		
*	*Ehrharta calycina*	Perennial Veldt Grass		
*	*Ehrharta longiflora*	Annual Veldt Grass		
	Enteropogon acicularis	Curly Windmill Grass		
	Eucalyptus diversifolia ssp. diversifolia	Coastal White Mallee		
	Eucalyptus incrassata	Ridge-fruited Mallee		
	Eucalyptus leptophylla	Narrow-leaf Red Mallee		
	Eucalyptus leucoxylon ssp. stephaniae	Scrubby Blue Gum		
*	*Galenia pubescens var. pubescens*	Coastal Galenia		
	Goodenia willisiana	Silver Goodenia		
*	*Lagurus ovatus*	Hare's Tail Grass		
	Lepidosperma carphoides	Black Raiper-sedge		
	Lomandra leucocephala ssp. robusta	Woolly Mat-rush		
*	*Malva sp.*	Mallow		
*	*Marrubium vulgare*	Horehound		
*	*Medicago polymorpha*	Burr-medic		
	Melaleuca acuminata ssp. acuminata	Mallee Honey-myrtle		
	Melaleuca lanceolata	Dryland Tea-tree		
*	*Mesembryanthemum crystallinum*	Common Iceplant		
	Rytidosperma caespitosum	Common Wallaby-grass		
*	*Sonchus oleraceus*	Common Sow-thistle		
	Vittadinia sp.	New Holland Daisy		

Aus: Australia (*Environment Protection and Biodiversity Conservation Act 1999*). SA: South Australia (*National Parks and Wildlife Act 1972*). Conservation codes: CE/CR: Critically Endangered. EN/E: Endangered. VU/V: Vulnerable. R: Rare. *: Introduced.

Appendix 2. Threatened flora predicted to occur or recorded from within 5 km of the Project Area.

Scientific name	Common name	Conservation status		Source of record	Last sighting within 5 km (year)	Habitat constraints	Likelihood of occurrence within Project Area
		Aus	SA				
Caladenia colorata	Coloured Spider-orchid	EN		1	2009	The Painted Spider-orchid grows in sandy, fertile soils but also in rock outcrops and in mallee/broombush associations. This species grows in woodland dominated by South Australian Blue Gum (Eucalyptus leucoxylon), Pink Gum (*E. fasciculosa*), Drooping Sheoak (*Allocasuarina stricta*) and Rottnest Island Pine (*Callitris preissii*) (Department of the Environment and Energy, 2020a).	**Unlikely.** Remnant vegetation in the Project Area consists of dense understorey of exotic grasses, including *Ehrharta calycina.* It is unlikely that the species would persist due to competition from these weeds. There are no records of the species within 5 km of the Project Area.
Caladenia conferta	Coast Spider-orchid	EN	E	1	2003	The Coast Spider-orchid occurs in mallee woodlands or broombush scrubs in terra-rosa soils over limestone, or on fertile red-brown soils amongst granite outcrops. In the upper south-east, collections of the Coast Spider-orchid have been made from granite outcrops, for example at Mount Field, north of Mount Boothby, east of Woods Well and at Mount Monster. At Ngarkat, the species occurs in sedgelands on sandy soils (Department of the Environment and Energy, 2020b).	**Unlikely.** Soils of the Project Area are sands with limestone outcrop. Remnant vegetation in the Project Area consists of dense understorey of exotic grasses, including *Ehrharta calycina.* It is unlikely that the species would persist due to competition from these weeds and unsuitable soil types. There are no records of the species within 5 km of the Project Area.
Caladenia tensa	Greencomb Spider-orchid	EN		1	2010	The Greencomb Spider-orchid grows on red-brown sandy loams on rises in open woodland dominated by Yellow Gum (*Eucalyptus leucoxylon*) and Rottnest Island Pine (*Callitris preissii*). Its habitat, between the Little Desert and Big Desert, was formerly expansive and extended into SA. This species has also been recorded from Black Box *(Eucalyptus largiflorens*)/Yellow Gum woodland and mallee/heathland (Department of the Environment and Energy, 2020c).	**Unlikely.** *E. leucoxylon* woodland vegetation in the Project Area is dominated by a dense understorey of exotic grasses, particularly *Ehrharta calycina.* It is unlikely that the species would persist due to competition from these weeds. There are no records of the species within 5 km of the Project Area.
Pterostylis arenicola	Sandhill Greenhood Orchid	VU	V	1	No record	The Sandhill Greenhood Orchid is restricted to consolidated, coloured sand-hills in near coastal areas.	**Unlikely.** No records of the species within 50 km of the Project Area.

Scientific name	Common name	Conservation status		Source of record	Last sighting within 5 km (year)	Habitat constraints	Likelihood of occurrence within Project Area
		Aus	SA				
						Vegetation associations: Mallee Box (*Eucalyptus porosa*) and Drooping Sheoak (*Allocasuarina verticillata*) woodland, Golden Wattle (*Acacia pycnantha*) +/- Drooping Sheoak low woodland, Mallee Pine (*Callitris gracilis*) +/- Drooping Sheoak woodland and Soap Mallee (*Eucalyptus diversifolia*) +/- Golden Wattle +/- Drooping Sheoak mallee (Department of the Environment and Energy, 2020d).	
Thelymitra epipactoides	Metallic Sun-orchid	EN	E	1	2009	Found in open woodland or mallee habitats. In woodland habitats, the overstorey is dominated by *Eucalyptus leucoxylon, Callitris preissii* and *Allocasuarina verticillata*. In mallee, *Eucalyptus diversifolia* with a heathy and sedge understorey (Natural Resources SA, 2020).	**Unlikely.** Understorey within areas of native vegetation is not heathy and consists largely of dense exotic grasses, e.g. *Ehrharta calycina* and *Bromus diandrus*.

Conservation status

Aus: Australia (*Environment Protection and Biodiversity Conservation Act 1999*). SA: South Australia (*National Parks and Wildlife Act 1972*). Conservation Codes: CE/CR: Critically Endangered. EN/E: Endangered. VU/V: Vulnerable. R: Rare.

Source of Information

1. **EPBC Act Protected Matters Report** (Department of the Environment and Energy, 2019) **– 10 km buffer applied to Project Area.**
2. **Biological Database of South Australia data extract (Government of South Australia, 2020a) - 5 km buffer applied to Project Area.**

Appendix 3. Fauna recorded during the field survey.

*	Scientific name	Common name	Conservation status	
			Aus	SA
	BIRD			
	Acanthiza chrysorrhoa	Yellow-rumped Thornbill		
	Barnardius zonarius barnardi	Mallee Ringneck		
	Corvus mellori	Little Raven		
	Eolophus roseicapilla	Galah		
	Gavicalis virescens	Singing Honeyeater		
	Platycercus eximus	Eastern Rosella		
	Psephotus haematonotus	Red-rumped Parrot		
	Rhipidura leucophrys	Willie Wagtail		
*	*Sturnus vulgaris*	Common Starling		
	MAMMAL			
*	*Lepus eurpaeus*	European Brown Hare		
	Macropus fuliginosus	Western Grey Kangaroo		
*	*Oryctolagus cuniculus*	European Rabbit		
*	*Vulpes vulpes*	Red Fox		

Aus: Australia (*Environment Protection and Biodiversity Conservation Act 1999*). SA: South Australia (*National Parks and Wildlife Act 1972*). Conservation codes: CE/CR: Critically Endangered. EN/E: Endangered. VU/V: Vulnerable. R: Rare. *: Introduced.

Appendix 4. Threatened fauna predicted to occur or recorded from within 5 km of the Project Area.

Scientific name	Common name	Conservation status		Source of record	Last sighting within 5 km (year)	Habitat constraints	Likelihood of occurrence within Project Area
		Aus	SA				
Botaurus poiciloptilus	Australasian Bittern	EN	E	1	No record	Permanent freshwater wetlands with tall, dense vegetation, such as *Typha* sp. and *Eleocharis* sp. (NSW Office of Environment and Heritage, 2020b)	**Unlikely.** No wetland habitat in the Project Area.
Calidris ferruginea	Curlew Sandpiper	CR		1	No record	Wetlands. In South Australia, Curlew Sandpipers occur in widespread coastal and subcoastal areas east of Streaky Bay. Important sites include ICI and Price Saltfields, and The Coorong. Occasionally they occur in inland areas south of the Murray River and elsewhere (Department of the Environment and Energy, 2020f)	**Unlikely.** No wetland habitat in the Project Area.
Grantiella picta	Painted Honeyeater	VU	R	1	No record	Box-Gum woodlands and Box-Ironbark forests. Specialist feeder on mistletoe fruits growing on Eucalyptus and Acacia, preferring mistletoes in the *Amyema* genus (NSW Office of Environment and Heritage, 2020c).	**Unlikely.** Mistletoe is infrequent in the Project Area. Only *Lysiana* sp. was recorded. There are no records of the species from within 5 km of the Project Area.
Leipoa ocellata	Malleefowl	VU	V	1, 2	1991	Occupies shrublands and low woodlands that are dominated by mallee vegetation. It also occurs in other habitat types including eucalypt or native pine Callitris woodlands, acacia shrublands, Broombush Melaleuca uncinata vegetation or coastal heathlands (Department of the Environment and Energy, 2020e).	**Unlikely.** Malleefowl or evidence of Malleefowl presence (e.g. nest mounds) were not recorded despite traversing the entire area of remnant vegetation on foot. There are no records of the species within 5 km in the last 20 years.
Lichenostomus cratitius occidentalis	Purple-gaped Honeyeater (mainland SA)		R	2	2014	Inhabits mallee heathlands and less commonly in associated mallee with a more open understorey (e.g. spinifex associations). Also occasionally recorded from River Red Gums bordering watercourses (NSW Office of Environment and Heritage, 2020a).	**Possible.** Remnant mallee in the Project Area is potentially suitable for the species. However, the species was not recorded during the field survey and previous records of the species within 5 km are >20 years old.
Neophema elgans	Elegant Parrot		R	2	1991	Lightly-timbered grasslands, woodlands, partly cleared farmland, tree-lined watercourses, mallee and mulga (Morcombe, 2003).	**Possible.** Vegetation in the Project Area is potentially suitable for the species, including hollow-bearing trees that may be suitable for breeding. However, the species was not recorded during the field survey.

Scientific name	Common name	Conservation status		Source of record	Last sighting within 5 km (year)	Habitat constraints	Likelihood of occurrence within Project Area
		Aus	SA				
Numenius madagascariensis	Eastern Curlew	CR	E	1	No record	Intertidal mudflats (Morcombe, 2003).	**Unlikely.** The Project Area is not within an intertidal zone.
Pedionomus torquatus	Plains-wanderer	CR	E	1	No record	Short, sparse vegetation on wide plains. Often with many scattered, small surface stones (South Australian Arid Lands Natural Resource Management Board, n.d.)	**Unlikely.** Vegetation in the Project Area is unsuitable for the species. It consists of remnant mallee, woodland, dense exotic grassland and grazed cropping paddocks. Stony substrate is limited to areas of remnant mallee. There are no records from within 5 km of the Project Area.
Pezoporus occidentalis	Night Parrot	EN	E	1	No record	Extinct in the Project Area (Department of the Environment and Energy, 2019).	**Unlikely.** Extinct in the Project Area.
Psophodes leugogaster leucogaster	Mallee Western Whipbird	VU	E	1	No record	Mallee and thicket vegetation on sand flats, dunes and limestone with an overstorey of mallee Eucalypts over a species-rich heathy understorey (Department of the Environment and Energy, 2020g)	**Unlikely.** Remnant mallee vegetation in the Project Area does not have a diverse heathy understorey, due to past clearing, weeds and current grazing activity. There are no records of the species from within 5 km.
Pteropus poliocephalus	Grey-headed Flying Fox	VU	R	1	No record	Grey-headed Flying-foxes have are recorded intermittently in SA, with the only permanent camp, located in Adelaide, established in 2010. The Project Area is outside the foraging range of bats from this camp (Natural Resources Adelaide and Mount Lofty Ranges, 2020).	**Unlikely.** No flying-fox camps were observed in the Project Area. Although flowering Eucalyptus trees may provide suitable foraging habitat at times, there are no records of the species from within 5 km of the Project Area.
Stipiturus mallee	Mallee Emu-wren	EN	E	1	No record	Areas of spinifex with an overstorey of mallee woodland, preferring dense, long unburnt spinifex hummocks (Department of the Environment and Energy, 2020h).	**Unlikely.** There is no mallee-spinifex Vegetation Association in the Project Area. There are no records of the species from within 5 km.

Conservation status

Aus: Australia (Environment Protection and Biodiversity Conservation Act 1999). SA: South Australia (National Parks and Wildlife Act 1972). Conservation Codes: CE/CR: Critically Endangered. EN/E: Endangered. VU/V: Vulnerable. R: Rare. ssp.: the conservation status applies at the sub-species level. Mi: listed as migratory under the EPBC Act.

Source of Information

1. **EPBC Act Protected Matters Report** (Department of the Environment and Energy, 2019) **– 10 km buffer applied to Project Area.**
2. **Biological Database of South Australia data extract (Government of South Australia, 2020a) - 5 km buffer applied to Project Area.**

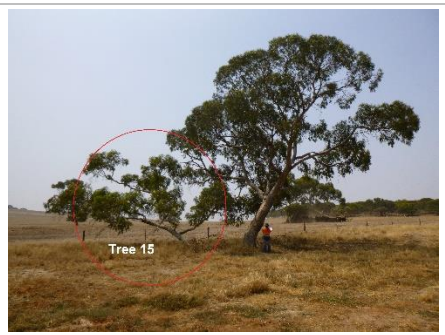
Appendix 5. Scattered Tree Assessment Results.

Tree No.	Species	No. Trees	Height (m) (average for clump)	Diameter (cm) (average for clump)	Dieback (%) (average for clump)	Hollows			Biodiversity Score	Photograph
						S	M	L		
1	*Eucalyptus leucoxylon* ssp. *stephaniae*	1	8	57	10	0	0	0	1.35	
2	*Eucalyptus leucoxylon* ssp. *stephaniae*	1	12	56	20	1	1	0	3.93	
3	*Eucalyptus leucoxylon* ssp. *stephaniae*	1	11	69.5	5	0	0	0	3.46	

Tree No.	Species	No. Trees	Height (m) (average for clump)	Diameter (cm) (average for clump)	Dieback (%) (average for clump)	Hollows			Biodiversity Score	Photograph
						S	M	L		
4	*Eucalyptus leucoxylon* ssp. *stephaniae*	1	11	63	5	0	0	0	2.61	
5	*Eucalyptus leucoxylon* ssp. *stephaniae*	1	4.5	18	5	0	0	0	0.30	
6	*Eucalyptus leucoxylon* ssp. *stephaniae*	1	8	27	10	0	0	0	0.56	

Tree No.	Species	No. Trees	Height (m) (average for clump)	Diameter (cm) (average for clump)	Dieback (%) (average for clump)	Hollows			Biodiversity Score	Photograph
						S	M	L		
7	*Eucalyptus leucoxylon* ssp. *stephaniae*	1	12	43	20	0	0	0	2.12	
8	*Eucalyptus leucoxylon* ssp. *stephaniae*	1	12	51	5	0	0	0	2.55	
Clump A	*Eucalyptus leucoxylon* ssp. *stephaniae*	3	15	51	10	0	0	0	10.34	

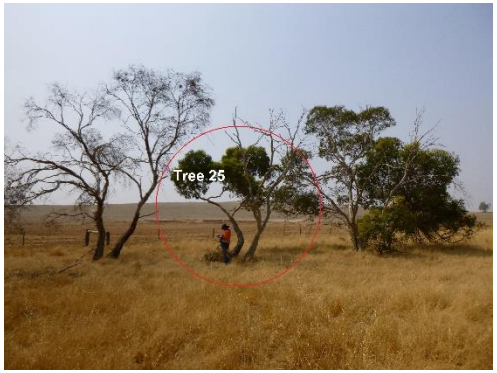
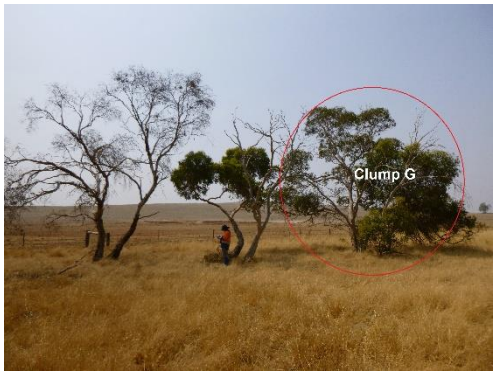
Tree No.	Species	No. Trees	Height (m) (average for clump)	Diameter (cm) (average for clump)	Dieback (%) (average for clump)	Hollows			Biodiversity Score	Photograph
						S	M	L		
10	*Eucalyptus leucoxylon* ssp. *stephaniae*	1	7	53	10	0	0	0	1.18	
11	*Eucalyptus diversifolia*	1	6	27	5	0	0	0	0.64	
12	*Eucalyptus leucoxylon* ssp. *stephaniae*	1	8	31	0	0	0	0	1.00	

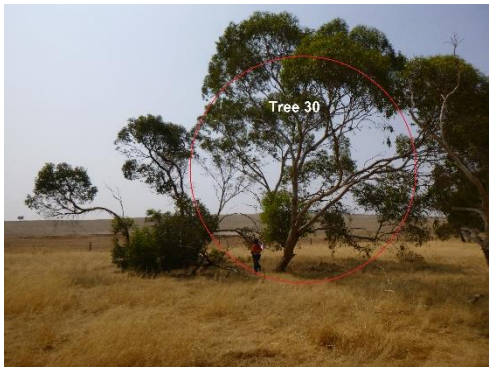
Tree No.	Species	No. Trees	Height (m) (average for clump)	Diameter (cm) (average for clump)	Dieback (%) (average for clump)	Hollows			Biodiversity Score	Photograph
						S	M	L		
Clump B	*Eucalyptus leucoxylon* ssp. *stephaniae*	3	10	56	5	0	0	0	6.71	
14	*Eucalyptus leucoxylon* ssp. *stephaniae*	1	14	81	15	0	1	0	4.87	
15	*Eucalyptus leucoxylon* ssp. *stephaniae*	1	6	34	5	0	0	0	0.55	

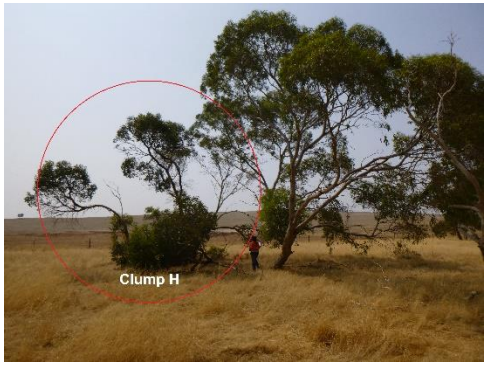
Tree No.	Species	No. Trees	Height (m) (average for clump)	Diameter (cm) (average for clump)	Dieback (%) (average for clump)	Hollows			Biodiversity Score	Photograph
						S	M	L		
16	*Eucalyptus leucoxylon* ssp. *stephaniae*	1	14	57	10	0	0	0	3.64	
17	*Eucalyptus leucoxylon* ssp. *stephaniae*	1	14	55	15	1	1	0	4.47	
18	*Eucalyptus leucoxylon* ssp. *stephaniae*	1	12	48	15	0	0	0	2.31	

Tree No.	Species	No. Trees	Height (m) (average for clump)	Diameter (cm) (average for clump)	Dieback (%) (average for clump)	Hollows			Biodiversity Score	Photograph
						S	M	L		
19	*Eucalyptus leucoxylon* ssp. *stephaniae*	1	12	43	10	0	0	0	2.28	
Clump C	*Eucalyptus leucoxylon* ssp. *stephaniae*	3	5	20	10	0	0	0	0.96	
Clump D	*Eucalyptus leucoxylon* ssp. *stephaniae*	3	10	45	5	0	0	0	6.03	

Tree No.	Species	No. Trees	Height (m) (average for clump)	Diameter (cm) (average for clump)	Dieback (%) (average for clump)	Hollows			Biodiversity Score	Photograph
						S	M	L		
Clump E	*Eucalyptus leucoxylon* ssp. *stephaniae*	2	12	35	20	0	0	0	2.79	
Clump F	*Eucalyptus leucoxylon* ssp. *stephaniae*	4	12	35	30	0	0	0	5.17	
24	*Eucalyptus leucoxylon* ssp. *stephaniae*	1	15	69	20	0	1	0	4.30	

Tree No.	Species	No. Trees	Height (m) (average for clump)	Diameter (cm) (average for clump)	Dieback (%) (average for clump)	Hollows			Biodiversity Score	Photograph
						S	M	L		
25	*Eucalyptus leucoxylon* ssp. *stephaniae*	1	5	27	5	0	0	0	0.41	
Clump G	*Eucalyptus leucoxylon* ssp. *stephaniae*	2	7	25	5	0	0	0	0.99	
27	*Eucalyptus leucoxylon* ssp. *stephaniae*	1	10	68	20	0	0	0	2.25	

Tree No.	Species	No. Trees	Height (m) (average for clump)	Diameter (cm) (average for clump)	Dieback (%) (average for clump)	Hollows			Biodiversity Score	Photograph
						S	M	L		
28	*Eucalyptus leucoxylon* ssp. *stephaniae*	1	10	53	15	0	0	0	2.02	
29	*Eucalyptus phenax* ssp. *phenax*	1	8	30	5	0	0	0	2.14	
30	*Eucalyptus leucoxylon* ssp. *stephaniae*	1	10	37	10	0	0	0	1.30	

Tree No.	Species	No. Trees	Height (m) (average for clump)	Diameter (cm) (average for clump)	Dieback (%) (average for clump)	Hollows			Biodiversity Score	Photograph
						S	M	L		
Clump H	*Eucalyptus phenax* ssp. *phenax*	5	6	20	10	0	0	0	6.29	
32	*Eucalyptus leucoxylon* ssp. *stephaniae*	1	10	60	10	0	0	0	2.47	
Clump I	*Eucalyptus diversifolia*	11	5	25	41	6	7	0	5.90	

Tree No.	Species	No. Trees	Height (m) (average for clump)	Diameter (cm) (average for clump)	Dieback (%) (average for clump)	Hollows			Biodiversity Score	Photograph
						S	M	L		
34	*Eucalyptus diversifolia*	1	8.5	65.6	5	0	0	0	4.12	
35	*Eucalyptus diversifolia*	1	8	76.4	95	1	0	0	1.12	
36	*Eucalyptus leucoxylon* ssp. *stephaniae*	1	13	43.5	95	0	0	0	1.01	

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