succession ecology

Native Vegetation Clearance

Murray Bridge Growth Infrastructure Upgrade

(ES1022-02)

Data Report

Clearance under the *Native Vegetation Regulations 2017*

4/11/2021

Prepared by Doreen Marchesan

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1. Application information

1.1 Application details

Applicant:	SA Water
Key contact:	

Site 1 – White Hill Booster Pump

Landowner:	SA Government – Road Reserve		
Site Address:	Adelaide Road		
Local Government Area:	Murray Bridge Council	**Hundred:**	Mobilong
Title ID:	CR 5884/849 CT6009/540	**Parcel ID**	H170700 SE1061 D39475 AL12

Site 2 – White Hill Node 1 Alignment

Landowner:	SA Government – Road Reserve		
Site Address:	Adelaide Road		
Local Government Area:	Murray Bridge Council	**Hundred:**	Mobilong
Title ID:	NA	**Parcel ID**	NA

Site 3 – Node M Booster Pump (yet to be confirmed)

Landowner:	Costa Adelaide Mushrooms		
Site Address:	Old Princes Hwy		
Local Government Area:	Murray Bridge Council	**Hundred:**	Mobilong
Title ID:	CT5822/788	**Parcel ID**	D54555AL101

Site 4 – Monarto Alignment Node L-N

Landowner:	Adelaide Model Aerosport and SA Government – Road Reserve		
Site Address:	Monarto		
Local Government Area:	Murray Bridge Council	**Hundred:**	Mobilong and Monarto
Title ID:	CT6112/335	**Parcel ID**	H170700 SE524

Site 5 – Alignment Node A-K-J

Landowner:	SA Government – Road Reserve		
Site Address:	Schenscher Road and Old Princes Hwy		
Local Government Area:	Murray Bridge Council	**Hundred:**	Monarto
Title ID:	NA	**Parcel ID**	NA

1.2 Summary of proposed clearance

Purpose of clearance	Native vegetation clearance is required for the installation of SA Water infrastructure. These works are required to rectify water supply pressure issues in the Monarto region and prepare for future growth. The works will be carried out in five locations: Site 1: Booster pump station, 10m x 15m, at White Hill, Adelaide Road Site 2: 2km of water pipeline (DN250) from the White Hill booster station to Node 1, Old Princes Highway Site 3: Booster pump station, 25m x 25m, Old Princes Highway Site 4: 2.5km of water pipeline (DN250) between nodes L-N, road reserve, Monarto Open Range Zoo Site 5: 800m of water pipeline (DN250) between nodes A, K and J, Old Princes Highway and Schenscher Road
Native Vegetation Regulation	Regulation 12, Schedule 1, clause 34, Infrastructure
Description of the vegetation under application	This application area is located across nine different vegetation associations within the Monarto region. The majority of the development occurs adjacent roadside corridors, and one site adjacent a larger patch. Block 1: VA1: Melaleuca shrubland with scattered *Eucalyptus leptophylla* and weedy understorey. Block 2: VA1; VA2: *Callitris gracilis* + *Eucalyptus* mallee open woodland with open sclerophyll and weedy understorey; VA3: *Eucalyptus incrassata* mallee open woodland with sclerophyll and weedy understorey Block 3: VA4: Introduced grassland

	Block4: VA4; VA5: *Eucalyptus socialis + E. phenax mallee woodland + sclerophyll + weedy grass understorey*; VA6: *Eucalyptus socialis + E. porosa mallee woodland + shrub + weedy grass understorey*; VA7: *Eucalyptus porosa + E. gracilis* mallee woodland with open sclerophyll and weedy understorey; VA8: *Eucalyptus leptophylla + E. rugosa* mallee open woodland + very open shrubland + grasses; 8 Scattered trees/clumps Block 5: VA9 condition A and B: *Eucalyptus leucoxylon + E. porosa* open woodland + open sclerophyll ± weedy understorey
Total proposed clearance - area (ha) and number of trees	The proposed clearance is 0.865ha amongst patches, which is likely to be most pruning, but some total clearance also required. Five scattered trees likely subject to pruning; three scattered trees likely subject to removal.
Level of clearance	Level 4
Overlay (Planning and Design Code)	State Significant Native Vegetation Layer (Block 2 only)
Mitigation hierarchy	While the works are required to maintain essential infrastructure, SA Water has undertaken an extensive iterative process of design, assessment, and re-design to avoid and minimize impacts as far as possible. This process has included: • Options analysis of various routes and technical options • Modification of construction work zone • Modification of construction practices
SEB Offset proposal	A payment into the fund of $39,602.72.

2. Purpose of clearance

2.1 Description

SA Water is planning the installation of water pumping stations and water carriage pipelines in the Monarto and White Hill area, West of Murray Bridge (the SA Water development). This infrastructure aims to improve the low water pressure issues currently faced in the Murray Bridge Township.

2.2 Background

The township of Murray Bridge contains a number of zones which are currently experiencing low water pressure, including the Brinkely, Mondarto, Burdette and Palamanna zones. Low water pressure issues are seeking to be resolved by the installation of additional pipeline infrastructure and pumping booster stations at five strategic sites. The infrastructure proposed within this application is the whole of the SA Water development, that is planned at this stage in order to resolve the low water pressure issues.

2.2.1 Administrative Boundaries

The proposed infrastructure is proposed within the Murray Bridge Council area and is all contained within the Murraylands and Riverland Landscape Board area.

The SA Water development is located within two Interim Biogeographic Regionalisation for Australian (IBRA) Regions and Associations, as presented in Table 1.

Table 1: IBRA Regions and Associations within which sites 1-5 are contained.

Site	IBRA Region	IBRA Association
Site 1	Murray Darling Depression	Loydella
Site 2	Murray Darling Depression	Loydella
Site 3	Kanmantoo	Sandergrove
Site 4	Murray Darling Depression/Kanmantoo	Loydella/Sandergrove
Site 5	Murray Darling Depression/Kanmantoo	Loydella/Sandergrove

2.2.2 Native Vegetation Matters

Native vegetation remnancy is low-moderate throughout the whole SA Water development site, with values ranging from 8-13% amongst the five sites (Table 2). Two conservation parks occur within the vicinity of the development area. The Kinchina Conservation Park occurs immediately adjacent Site 2 to the north, and the Monarto Woodlands Conservation Park occurs within 3km to the south of the sites. Due to the vicinity of the Kinchina Conservation Park, a State Significant Vegetation Overlay is applicable to development works within Site 2 (Table 2).

Table 2: Native vegetation remnancy at development Sites and application of the State Significant Vegetation Overlay.

Site	Native Vegetation Remnancy	State Significant Vegetation Overlay Applies
Site 1	8%	No
Site 2	8-9%	Yes (buffer only; 260m Borders with Kinchina Conservation Park)
Site 3	13%	No
Site 4	10-11%	No
Site 5	9%	No

2.2.3 Regional Land Use

The regional land use is a mixture of agriculture and conservation. As well as local conservation parks, the Monarto Open Range Zoo occurs immediately adjacent Site 4, and some development will take place within the grounds of the Zoo.

2.3 General location map

The development area is located within the Murray Bridge Council and is proposed along various sections of the Old Princes Highway and local roads and access tracks. The SA Water development sites are located between 2km and 13km west of the township of Murray Bridge. A general location map is presented in Figure 1, and a general map of development sites is presented in Figure 2 along with IBRA Regions.

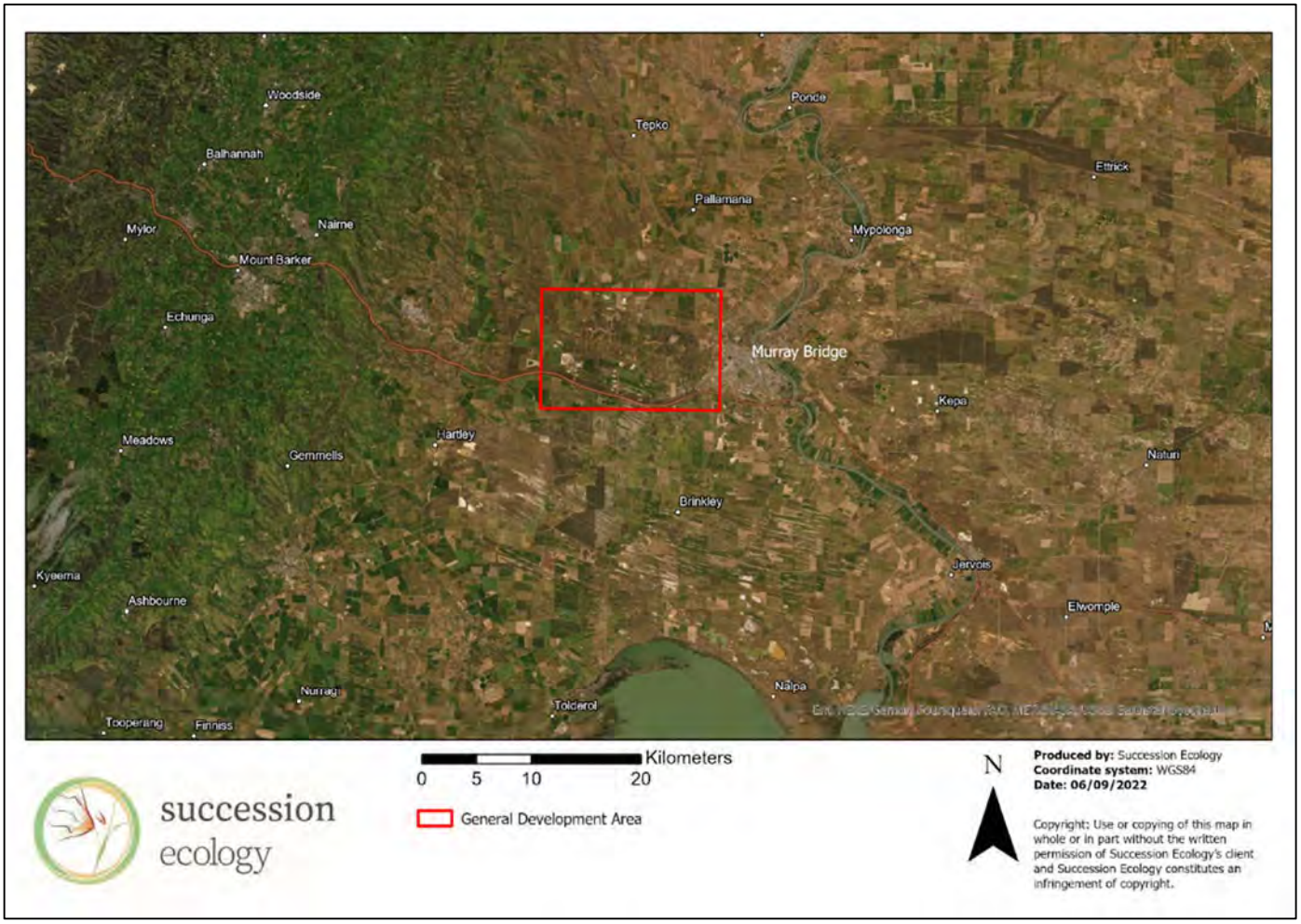

Figure 1: Location map of the SA Water development area.

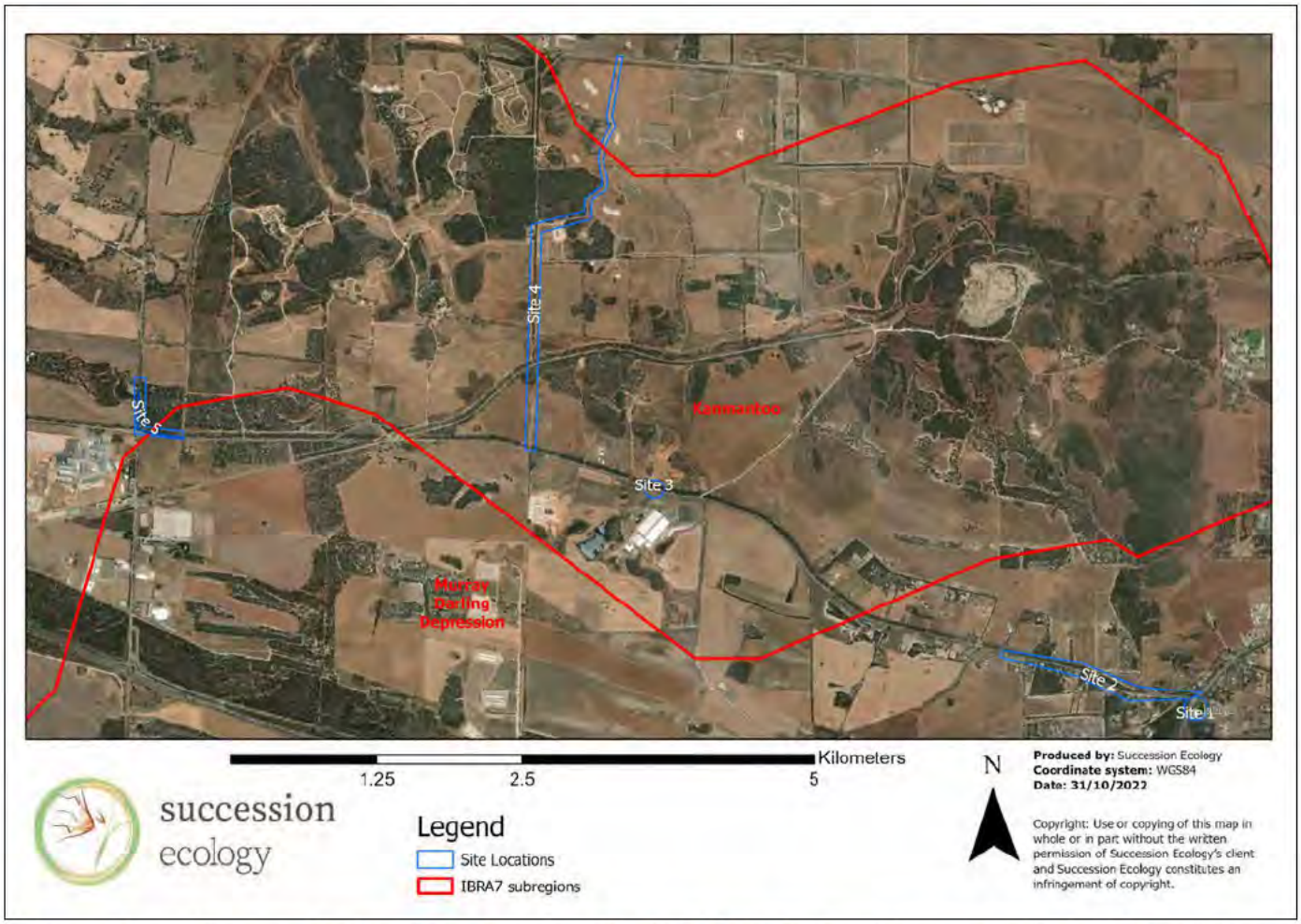

Figure 2: General location of the five infrastructure sites within the SA Water development area, in relation to IBRA associations

2.4 Details of the proposal

The works associated with the SA Water development include the installation of approximately 5.3km of water pipeline and two booster pumping stations. Specific details regarding the requirements at each site are presented in Table 3.

Table 3: Details of proposed infrastructure at each development site.

Site	Infrastructure	Dimensions
Site 1	New booster pumping station at current White Hill tank site (Node G)	10m x 15m
Site 2	New water pipeline from the White Hill tank site to Node H	2km x 12m construction corridor
Site 3	New booster pumping station at Node M	25m x 25m
Site 4	New water pipeline from Node L to Node N	2.5km x 6-12m construction corridor
Site 5	New water pipeline between Nodes A, K and J	0.8km x 12m construction corridor

2.5 Design

The design works are approaching 80% completion. Major changes in alignment are unlikely at this stage.

2.6 Approvals required or obtained

No other approvals with regards to native vegetation clearance are required.

2.7 Native vegetation regulation

The proposed clearance will be assessed under Regulation 12, Schedule 1, clause 34, Infrastructure.

3. Method

3.1 Flora assessment

3.1.1 Desktop assessment

Database searches were used to determine the range of threatened flora species and ecological communities, protected under the *Environment Protection and Biodiversity Conservation* (*EPBC*) *Act 1999* and *National Parks and Wildlife (NPW) Act 1972*, that are likely to occur in the area within a 5 km buffer. The search tools used include:

- A Protected Matters Search to identify matters of national significance under the *EPBC Act 1999,* including threatened species and ecological communities.
- A Biological Database of South Australia (BDBSA) search using NatureMaps and Atlas of Living Australia (ALA) to determine flora species recorded within a 5 km radius of the site and species listed under the *NPW ACT 1972*.
- DEH (in progress) unpublished and provisional list of Threatened Ecosystems to identify threatened and rare ecosystems.

Vegetation types were assessed using satellite imagery and vegetation community data obtained through NatureMaps. All maps were generated using ArcGIS Pro.

3.1.2 Field survey

Vegetation surveys were conducted on the 12th and 26th September 2022. Vegetation communities at all five sites were surveyed using the Bushland (<0.5 ha and >0.5ha) and Scattered Trees Assessment Methodologies, as applicable. During the surveys, a dedicated search occurred for threatened species known to occur in the area.

3.1.3 Options review

Succession Ecology worked with SA Water to review design options against assessment results, to further refine design to minimize impacts. This iterative approach was taken for all five sites and was particularly undertaken to reduce potential impacts to the identified Threatened Ecological Community (discussed below). A full discussion on the design review process is presented within the Mitigation Hierarchy in Section 4.4.

3.2 Fauna assessment

3.2.1 Desktop assessment

A Desktop Assessment was used to determine the range of fauna species that are likely to occur in the area (5 km buffer) and determine whether any threatened fauna may be present. Search tools included:

- A Protected Matters search to identify matters of national significance under the *EPBC Act 1999*, including threatened species.
- A BDBSA search using NatureMaps and ALA to determine fauna species recorded within 5 km radius of the site and species listed under the *NPW Act 1972*.

3.2.2 Field survey

A formal fauna assessment was not undertaken for this site. However, an opportunistic observation-based survey was conducted to identify any fauna species using this vegetation as habitat. Opportunistic observations included incidental records of species observed whilst undertaking the survey.

4. Assessment outcomes

4.1 Vegetation assessment

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

IBRA Regions

The development area is located within two IBRA Regions – the Murray Darling Depression and Kanmantoo. A description regarding the landform, geology, soils and climate of each Region is presented in Table 4.

Table 4: General descriptions of IBRA regions associated with the development sites.

Feature	**Murray Darling Depression (Sites 1, 2, parts of 4 and 5)**	**Kanmantoo (Sites 3, parts of 4 and 5)**
Landform	Plains with variable dune cover, from dune formations with relatively small plains between to plains with isolated tracts of dunes. Claypans, saline soils, swamps, and intermittent lakes in low-lying areas.	Central Island; dissected tableland with moderate to very steep slopes. Coastal fringe & eastern area; coastal dune formations with small plains, swamps, lagoons, lunettes. Undulating old dune formations largely stripped of sands exposing dune limestone.
Geology	Exposed caliche & crusty loamy soils; colluvial sand, silt, clay & gravel along footslopes of Olay Spur. Evaporite deposits; gypsum & halite.	Small areas of sandy acidic yellow soils with a laterite layer on the tableland remnants. Ironstone gravels on tableland. Commercial gypsum mining.
Soil	Brown calcareous earths, Highly calcareous loamy earths, Cracking clays, yellow grey, Hard setting loamy soils with red clayey subsoils.	Calcareous sand soil of minimal development, Coherent sandy soils, Sand soils with mottled yellow clayey subsoils, Cracking clays.
Typical vegetation	Mallee Woodland and Shrubland.	Mallee Woodland and Shrubland.
Climate	Semi-arid climate that is too dry to support field crops. Soil moisture tends to be greatest in winter.	Classic Mediterranean climate with peaks of growth in winter and spring and moderate growth in winter.

Vegetation Overview

The vegetation in the area is predominately characterised by the presence of mallee woodlands and shrublands, as well as an area of *Callitris* woodland and *Eucalyptus leucoxylon* woodland. A total of nine vegetation associations were identified within the development area, with one association consisting of two distinct condition classes. The condition of the vegetation associations varies across the project area, from poor to good. All associations have undergone varying degrees of disturbance in the past, with some areas subject to ongoing disturbance from adjacent land use.

One Block (Block 4) also contained five scattered trees and three clumps of trees within the development area.

Landscape Context

The native vegetation remnancy in the area is relatively low at 8-13%. Vegetation within the project area is highly fragmented, with patches set amongst agricultural land, but there are some large patches of native vegetation in the region and much of the roadside vegetation provides connectivity between larger patches. Two conservation parks occur within the vicinity of the development area. The Kinchina Conservation Park occurs immediately adjacent to Site 2, and the Monarto Woodlands Conservation Park occurs within 3km to the south of the sites.

4.1.2 Summary of the vegetation associations proposed to be impacted

A total of nine vegetation associations and eight scattered trees/clumps were assessed for this SA Water development application. A summary of the vegetation associations and scattered trees/clumps identified per site (Block) are presented in Table 5 and discussed in detail below. A further three vegetation associations were assessed to assist in an options analysis, but these will not be affected by the final development envelope. They are also listed in Table 5 but are not assigned to Blocks, nor discussed in detail.

Table 5: Summary of vegetation associations and scattered trees and clumps, across the surveyed sites.

Site	Block #	Vegetation Association (VA) #	Description
1	Block 1	VA 1	Melaleuca shrubland with scattered *Eucalyptus leptophylla* and weedy understorey
2	Block 2	VA 1	Melaleuca shrubland with scattered *Eucalyptus leptophylla* and weedy understorey
		VA 2	*Callitris gracilis* + *Eucalyptus* mallee open woodland with open sclerophyll and weedy understorey.
		VA 3	*Eucalyptus incrassata* mallee open woodland with sclerophyll and weedy understorey
3	Block 3	VA 4	Introduced Grassland
4	Block 4	VA 4	Introduced Grassland
		VA 5	*Eucalyptus socialis + E. phenax mallee woodland + sclerophyll + weedy grass understorey*
		VA 6	*Eucalyptus socialis + E. porosa mallee woodland + shrub + weedy grass understorey*
		VA 7	*Eucalyptus porosa + E. gracilis* mallee woodland with open sclerophyll and weedy understorey
		VA 8	*Eucalyptus leptophylla + E. rugosa* mallee open woodland + very open shrubland + grasses
		Scattered Trees Clumps	5 x *Eucalyptus porosa* 3 x *Eucalyptus porosa*
5	Block 5	VA 9 condition a	*Eucalyptus leucoxylon + E. porosa* open woodland + open sclerophyll ± weedy understorey

Site	Block #	Vegetation Association (VA) #	Description
		VA 9 condition b	*Eucalyptus leucoxylon* + *E. porosa* open woodland + open sclerophyll ± weedy understorey
Additional vegetation associations assessed during options analysis			
-	-	VA10	*Eucalyptus leptophylla* + *E. porosa* + *E phenax Open mallee woodland with mid-dense shrub understorey*
-	-	VA 11	*Eucalyptus porosa open mallee woodland with grass and weedy understorey*
-	-	VA 12	*Eucalyptus socialis open woodland + open shrubland + Triodia*

4.1.3 Details of the vegetation associations proposed to be impacted

The following section presents detailed descriptions of the vegetation associations associated with the development envelope. For each association, details are given for which Blocks apply. For the majority of the development zone adjacent roadside vegetation, SA Water is confident that impacts will be restricted to pruning only. However, this cannot be confirmed until works commence. As such, a conservative approach has been taken and all scoresheets for bushland assessments are presented with a Loss Factor of 1.

Vegetation Association	**VA 1: Melaleuca shrubland with scattered *Eucalyptus leptophylla* and weedy understorey**
Block	**1 and 2**

Figure 3: Block 1 with potential impacts within 5m CFS clearance buffer. Extent of impact to VA1 from Block 2.

Figure 4: VA 1 vegetation association, dominated by Melaleuca uncinata *and a weedy understorey, including* Gazania sp, *a Declared Weed.*

General description	VA 1 is in poor condition, having been the subject a previous major disturbance. Evidence of planting is also evident within the impact zone. It is dominated by *Melaleuca uncinata*, with a

Vegetation Association	**VA 1: Melaleuca shrubland with scattered *Eucalyptus leptophylla* and weedy understorey**
Block	**1 and 2**
	very weedy understorey and scattered *Eucalyptus leptophylla.* The vegetation in the vicinity of the development site occurs in narrow strips but is adjacent to larger vegetation patches of better condition. The area has been disturbed by past construction activity in relation to the highway and SA Water infrastructure. It also contains a high number of weeds, include Declared Weeds such as Gazania (*Gazania sp*) and Bridal Creeper *(Asparagus asparagoides).*
Threatened species or community	Search Methods • Protected Matters search – 5km area around the whole project area, to identify threatened species or their habitat, and communities, listed under the *EPBC Act 1999* • NatureMaps search – 5km area around the whole project area, to identify threatened species listed under the *NPWS Act 1972,* as being recorded within the area since 1995. Ecological Communities **No** threatened ecological communities were present within this habitat. Threatened Fauna The Protected Matters search identified a one threatened fauna species: the Malleefowl (*Leipoa ocellata;* Vulnerable). A NatureMaps search found a further species protected under the *EPBC Act 1999*; the SA Bassian Thrush (*Zoothera lunalata halmaturina;* Endangered). The NatureMaps search also identified a further 18 threatened fauna species listed under the *NPW Act 1972,* three of which are listed as Vulnerable and 15 as Rare. All threatened species identified are listed in section 4.2.2. **No** threatened fauna were observed within VA1. Threatened Flora The Protected Matters search identified six threatened flora species (three Endangered, three Vulnerable). NatureMaps identified a further 13 flora species listed under the *NPW Act 1972*: (one Endangered, one Vulnerable and 12 Rare). All threatened species identified are listed in section 4.2.2. **No** threatened flora were observed within VA1.

Landscape context score	1.11	**Vegetation Condition Score**	17.72	**Conservation significance score**	1.1
Unit biodiversity Score	21.63	**Area (ha)**	Block 1: 0.009ha Block 2: 0.016	**Total biodiversity Score**	0.54

Vegetation Association	VA 2: *Callitris gracilis* + *Eucalyptus* mallee open woodland with open sclerophyll and weedy understorey
Block	2

Figure 5: Extent of impacts to VA2 within Block 2 (predominantly pruning). Kinchina CP boundary also shown.

Figure 6: VA 2 vegetation association, dominated by Calltris gracilis *plus* Eucalyptus leptophylla, *open shrub understorey and a mostly weedy groundcover. Fressia (pictured bottom left) was prominent amongst the weeds in the groundcover.*

General description	VA 2 is in moderate condition dominated by *Callitris gracilis* in the canopy, with occasional mallee species such as *Eucalyptus leptophylla and E. incrassata.* The understorey is comprised

Vegetation Association	**VA 2: *Callitris gracilis* + *Eucalyptus* mallee open woodland with open sclerophyll and weedy understorey**
Block	**2**
	of an open sclerophyll shrub layer with a mostly weedy groundcover of *Oxalis pes-capre* (Soursob) and other weeds such as *Fressia sp.* It also contains a number of declared weeds such as Gazania (*Gazania sp*), Bridal Creeper *(Asparagus asparagoides)*, Olive *(Olea europaea)* and African Boxthorn *(Lycium ferocissimum)*. This association borders the Kinchina Conservation Park. As such, a loading has been applied to the scoresheet for VA2. Impacts within this zone are likely to be predominantly pruning, however some full clearance may be required.
Threatened species or community	Search Methods • Protected Matters search – 5km area around the whole project area, to identify threatened species or their habitat, and communities, listed under the *EPBC Act 1999* • NatureMaps search – 5km area around the whole project area, to identify threatened species listed under the *NPWS Act 1972,* as being recorded within the area since 1995. Ecological Communities **No** threatened ecological communities were present within this habitat. Threatened Fauna The Protected Matters search identified a one threatened fauna species: the Malleefowl (*Leipoa ocellata;* Vulnerable). A NatureMaps search found a further species protected under the *EPBC Act 1999*; the SA Bassian Thrush (*Zoothera lunalata halmaturina;* Endangered). The NatureMaps search also identified a further 18 threatened fauna species listed under the *NPW Act 1972,* three of which are listed as Vulnerable and 15 as Rare. All threatened species identified are listed in section 4.2.2. **No** threatened fauna were observed within VA2. Threatened Flora The Protected Matters search identified six threatened flora species (three Endangered, three Vulnerable). NatureMaps identified a further 13 flora species listed under the *NPW Act 1972*: (one Endangered, one Vulnerable and 12 Rare). All threatened species identified are listed in section 4.2.2. **No** threatened flora were observed within VA2.

Landscape context score	1.14	**Vegetation Condition Score**	48.21	**Conservation significance score**	1.1
Unit biodiversity Score	60.46	**Area (ha)**	Block 2: 0.173ha	**Total biodiversity Score**	10.4

Vegetation Association	VA 3: *Eucalyptus incrassata* mallee open woodland with sclerophyll and weedy understorey
Block	2

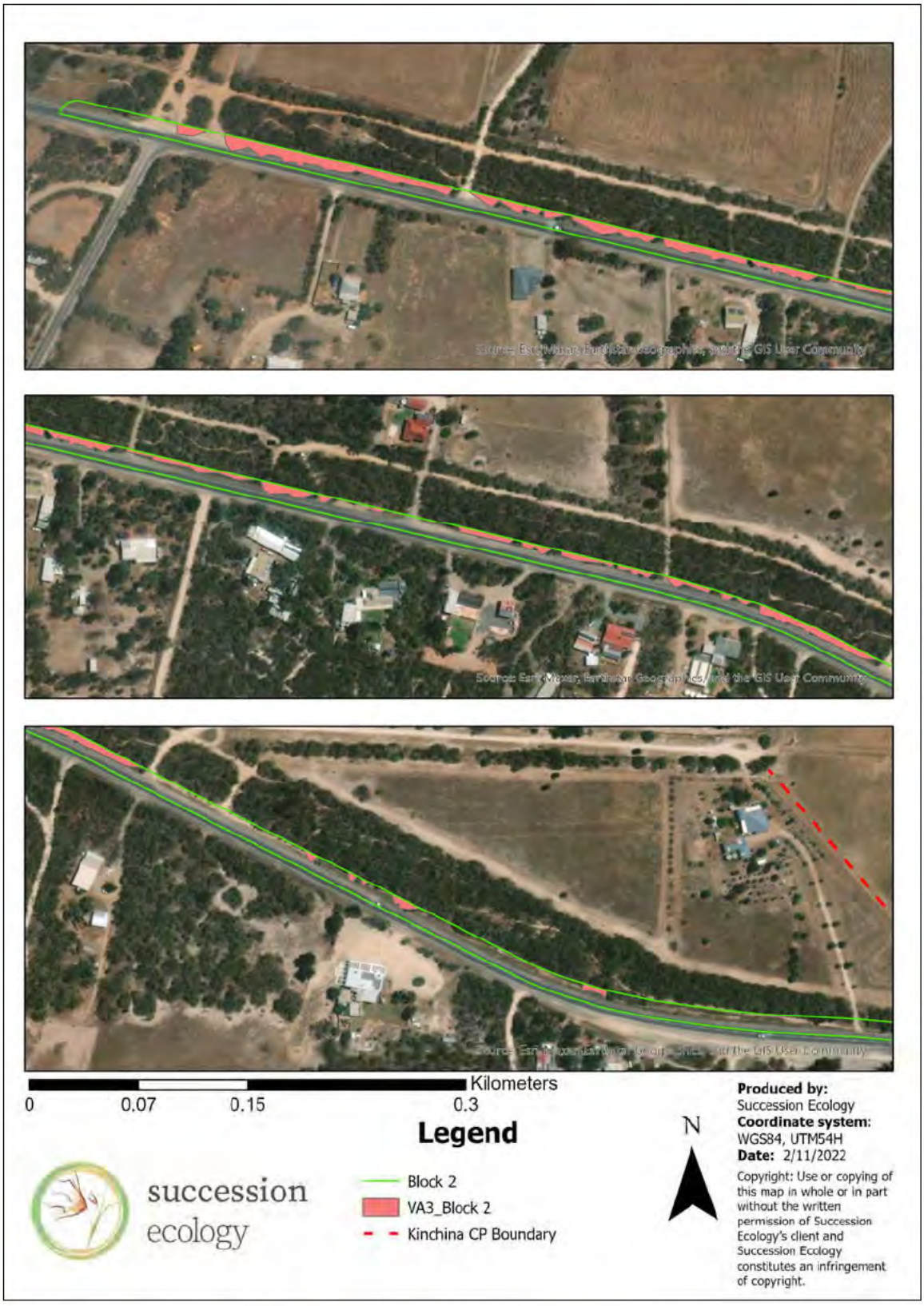

Figure 7: Extent of impacts to VA3 within Block 2 (likely pruning only). VA shown from west to east, top to bottom.

Vegetation Association	VA 3: *Eucalyptus incrassata* mallee open woodland with sclerophyll and weedy understorey
Block	2

Figure 8: VA 3 vegetation association, dominated by Eucalyptus incrassata*, with an shrub understorey and a mixed native and weedy groundcover.*

General description	VA 3 is in moderate condition, dominated by *Eucalyptus incrassata* and *E. phenax* in the canopy, with the occasional *Callitris gracilis*. The understorey is comprised of a sclerophyll shrub layer containing a number of *Hibbertia sp*, Quandong *(Santalum acuminaturm*) and *Melaleuca lanceolata*. A number of weed species were present in the understorey, including a number of declared weeds such as Gazania (*Gazania sp*), Bridal Creeper *(Asparagus asparagoides)* and Olive *(Olea europaea)*. This vegetation association is contained within a strip of roadside vegetation, 40-50m in width. Impacts within this zone are likely to be predominantly pruning.
Threatened species or community	<u>Search Methods</u> • Protected Matters search – 5km area around the project area, to identify threatened species or their habitat, and communities, listed under the *EPBC Act 1999* • NatureMaps search – 5km area around the project area, to identify threatened species listed under the *NPWS Act 1972*, as being recorded within the area since 1995. <u>Ecological Communities</u> **One** threatened ecological community (TEC) is present within this habitat – the *Mallee Bird Community of the Murray Darling Depression Bioregion*, condition A (the Mallee Bird Community TEC). This TEC is discussed further in section 4.2. <u>Threatened Fauna</u>

Vegetation Association	**VA 3: *Eucalyptus incrassata* mallee open woodland with sclerophyll and weedy understorey**				
Block	**2**				
	The Protected Matters search identified a one threatened fauna species: the Malleefowl (*Leipoa ocellata;* Vulnerable). A NatureMaps search found a further species protected under the *EPBC Act 1999*; the SA Bassian Thrush (*Zoothera lunalata halmaturina;* Endangered). The NatureMaps search also identified a further 18 threatened fauna species listed under the *NPW Act 1972*, three of which are listed as Vulnerable and 15 as Rare. All threatened species identified are listed in section 4.2.2. **No** threatened fauna were observed within VA3. <u>Threatened Flora</u> The Protected Matters search identified six threatened flora species (three Endangered, three Vulnerable). NatureMaps identified a further 13 flora species listed under the *NPW Act 1972*: (one Endangered, one Vulnerable and 12 Rare). All threatened species identified are listed in section 4.2.2. **No** threatened flora were observed within VA3.				
Landscape context score	1.11	**Vegetation Condition Score**	40.5	**Conservation significance score**	1.5
Unit biodiversity Score	67.43	**Area (ha)**	Block 2: 0.385ha	**Total biodiversity Score**	25.96

Vegetation Association	**VA 4: Introduced grassland**
Block	**3, 4**

Figure 9: Blocks 4 (left) and 3 (right) within introduced grasslands.

This association is dominated by introduced grasses, pasture species and/or crop species. There are no impacts to native vegetation within Block 3 or the northern section of Block 4.

Vegetation Association	VA 5: *Eucalyptus socialis* + *E. phenax* + *E. leptophylla* mallee open woodland with open sclerophyll and weedy understorey
Block	4

Figure 10: Extent of impacts to VA5 within Block 4 (likely pruning only).

Figure 11: VA 5 vegetation association, an open mallee community and very degraded, mostly weedy understory.

General description	VA 5 is located within a roadside section of the identified Mallee Bird Community TEC. Despite being located with a TEC, the section of VA5 within Block 4 is in poor condition, containing an open to very open *Eucalyptus leptophylla, E. socialis, E. phenax* open mallee woodland, with a

Vegetation Association	**VA 5: *Eucalyptus socialis* + *E. phenax* + *E. leptophylla* mallee open woodland with open sclerophyll and weedy understorey**				
Block	**4**				
	sparse native understorey dominated by introduced species. Such introduced species include the declared weed Bridal Creeper *(Asparagus asparagoides)*. The development footprint is within a previously disturbed section of the habitat, which remains predominantly open. It is likely that impacts within this area will be pruning only.				
Threatened species or community	Search Methods • Protected Matters search – 5km area around the whole project area, to identify threatened species or their habitat, and communities, listed under the *EPBC Act 1999* • NatureMaps search – 5km area around the whole project area, to identify threatened species listed under the *NPWS Act 1972,* as being recorded within the area since 1995. Ecological Communities **One** threatened ecological community (TEC) is present within this habitat (the *Mallee Bird Community of the Murray Darling Depression Bioregion*, condition A). This TEC is discussed further in section 4.2. Threatened Fauna The Protected Matters search identified a one threatened fauna species: the Malleefowl (*Leipoa ocellata;* Vulnerable). A NatureMaps search found a further species protected under the *EPBC Act 1999*; the SA Bassian Thrush (*Zoothera lunalata halmaturina;* Endangered). The NatureMaps search also identified a further 18 threatened fauna species listed under the *NPW Act 1972,* three of which are listed as Vulnerable and 15 as Rare. All threatened species identified are listed in section 4.2.2. **No** threatened fauna were observed within VA5. Threatened Flora The Protected Matters search identified six threatened flora species (three Endangered, three Vulnerable). NatureMaps identified a further 13 flora species listed under the *NPW Act 1972*: (one Endangered, one Vulnerable and 12 Rare). All threatened species identified are listed in section 4.2.2. **No** threatened flora were observed within VA5.				
Landscape context score	1.13	**Vegetation Condition Score**	36.25	**Conservation significance score**	1.5
Unit biodiversity Score	61.44	**Area (ha)**	Block 4: 0.012	**Total biodiversity Score**	0.74

Vegetation Association	VA 6: *Eucalyptus socialis* + *E. phenax* + *E. porosa* mallee open woodland with open sclerophyll and weedy understorey
Block	4

Figure 12: Extent of impacts to VA5 within Block 4. Note: Horizontal Directional Drilling (HDD) is planned under the rail corridor.

Figure 13: VA 6 vegetation association, dominated by mallee eucalypts with Callitris gracilis *in the canopy and very degraded, mostly weedy understory.*

Vegetation Association	**VA 6: *Eucalyptus socialis* + *E. phenax* + *E. porosa* mallee open woodland with open sclerophyll and weedy understorey**				
Block	**4**				
General description	VA 6 is in moderate to poor condition, containing an open to very open *Eucalyptus porosa, E. socialis, E. phenax* open mallee woodland, with the occasionally *Callitris gracilis.* The understorey is dominated by weedy grasses and other weedy groundcovers including the declared weed Bridal Creeper *(Asparagus asparagoides)* and Horehound (*Marrubium vulgare*). There is a lot of disturbance within this vegetation association, with infrastructure debris present. Impacts within this VA will include complete removal.				
Threatened species or community	Search Methods • Protected Matters search – 5km area around the whole project area, to identify threatened species or their habitat, and communities, listed under the *EPBC Act 1999* • NatureMaps search – 5km area around the whole project area, to identify threatened species listed under the *NPWS Act 1972,* as being recorded within the area since 1995. Ecological Communities **No** Threatened Ecological Communities occur within this association. Threatened Fauna The Protected Matters search identified a one threatened fauna species: the Malleefowl (*Leipoa ocellata;* Vulnerable). A NatureMaps search found a further species protected under the *EPBC Act 1999*; the SA Bassian Thrush (*Zoothera lunalata halmaturina;* Endangered). The NatureMaps search also identified a further 18 threatened fauna species listed under the *NPW Act 1972,* three of which are listed as Vulnerable and 15 as Rare. All threatened species identified are listed in section 4.2.2. **No** threatened fauna were observed within VA6. Threatened Flora The Protected Matters search identified six threatened flora species (three Endangered, three Vulnerable). NatureMaps identified a further 13 flora species listed under the *NPW Act 1972*: (one Endangered, one Vulnerable and 12 Rare). All threatened species identified are listed in section 4.2.2. **No** threatened flora were observed within VA6.				
Landscape context score	1.14	**Vegetation Condition Score**	28.13	**Conservation significance score**	1.1
Unit biodiversity Score	35.27	**rea (ha)**	Block 4: 0.1ha	**Total biodiversity Score**	3.53

Vegetation Association	**VA 7: *Eucalyptus porosa* + *E. gracilis* mallee woodland + sclerophyll + weedy understorey**
Block	**4**

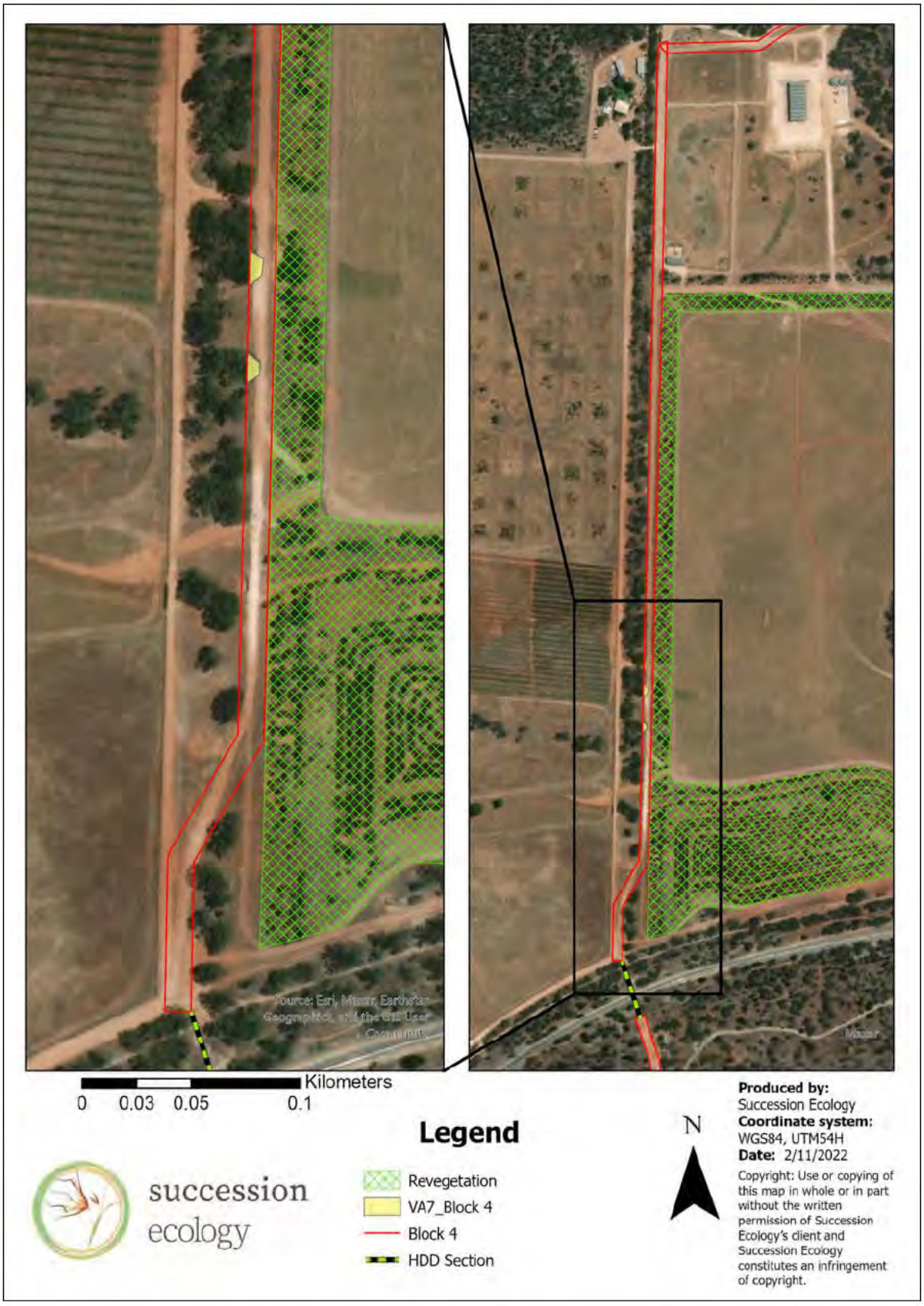

Figure 14: Extent of impacts to VA7 within Block 4 (left). Length of Block 4 adjacent VA7 (right).

Vegetation Association	VA 7: *Eucalyptus porosa* + *E. gracilis* mallee woodland + sclerophyll + weedy understorey
Block	4

Figure 15: VA 7 vegetation association, dominated by Eucalyptus porosa *open woodland with sparse sclerophyll understorey, dominated by introduced species. A threatened White-winged Chough was observed at this site.*

General description	VA 7 is in moderate to poor condition, containing an open to very open *Eucalyptus porosa* mallee woodland, with sparse sclerophyll shrubs. The understorey is dominated by weedy grasses and other weedy groundcovers including the declared weed Bridal Creeper *(Asparagus asparagoides)*, Horehound (*Marrubium vulgare*) and African Boxthorn *(Lycium ferocissimum)*. Despite the degradation of the site, the association provides habitat for the threatened White-winged Chough *(Corcorax melanorhamphos)*, observed flying and perching within the association, and the State listed *Acacia rhigiophylla*.
Threatened species or community	<u>Search Methods</u> • Protected Matters search – 5km area around the project area, to identify threatened species or their habitat, and communities, listed under the *EPBC Act 1999* • NatureMaps search – 5km area around the project area, to identify threatened species listed under the *NPWS Act 1972*, as being recorded within the area since 1995. <u>Ecological Communities</u> **No** Threatened Ecological Communities occur within this association. <u>Threatened Fauna</u>

Vegetation Association	**VA 7: *Eucalyptus porosa* + *E. gracilis* mallee woodland + sclerophyll + weedy understorey**				
Block	**4**				
	The Protected Matters search identified a one threatened fauna species: the Malleefowl (*Leipoa ocellata;* Vulnerable). A NatureMaps search found a further species protected under the *EPBC Act 1999*; the SA Bassian Thrush (*Zoothera lunalata halmaturina;* Endangered). The NatureMaps search also identified a further 18 threatened fauna species listed under the *NPW Act 1972*, three of which are listed as Vulnerable and 15 as Rare. All threatened species identified are listed in section 4.2.2. **One** threatened fauna species, the White-winged Chough (State Rare), was observed within VA7. <u>Threatened Flora</u> The Protected Matters search identified six threatened flora species (three Endangered, three Vulnerable). NatureMaps identified a further 13 flora species listed under the *NPW Act 1972*: (one Endangered, one Vulnerable and 12 Rare). All threatened species identified are listed in section 4.2.2. **One** threatened flora species, Dagger-leaf Watter *(Acacia rhigiophylla)* (State Rare) was observed within VA7.				
Landscape context score	1.13	**Vegetation Condition Score**	39.38	**Conservation significance score**	1.14
Unit biodiversity Score	50.72	**rea (ha)**	Block 4: 0.013ha	**Total biodiversity Score**	0.66

Vegetation Association	VA 8: *Eucalyptus leptophylla* + *E. rugosa* mallee open woodland + open shrubland + grasses
Block	4

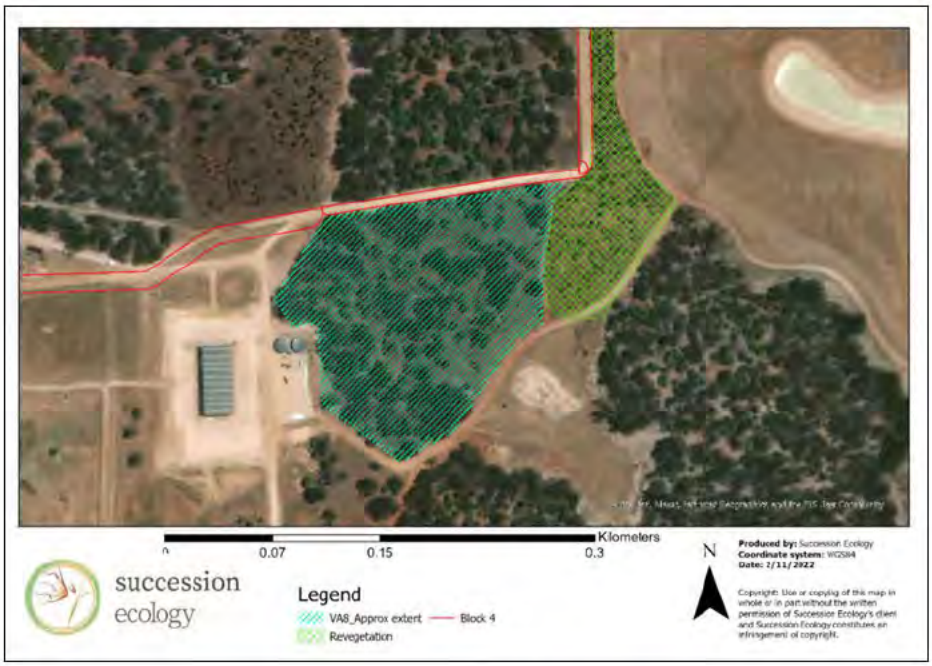

Figure 16: Showing the approximate extent of VA8 (TEC habitat) and the adjacent Block 4 development corridor. Vegetation north of VA8 is inaccessible. Note: the development corridor has been narrowed in this section to ensure the TEC is not impacted.

Figure 17: VA 8 vegetation association, an open mallee community with an understorey dominated by native grasses and herbs.

Vegetation Association	**VA 8: *Eucalyptus leptophylla* + *E. rugosa* mallee open woodland + open shrubland + grasses**				
Block	**4**				
General description	VA 8 is located within a patch of an identified Mallee Bird Community TEC. It is in moderate condition, containing an open to very open *Eucalyptus leptophylla* and *E. rugosa* mallee woodland, with an understorey dominated by native grasses and herbs. Introduced species are also present, including the declared weed Bridal Creeper *(Asparagus asparagoides)* and Horehound *(Marrubium vulgare)*. The development footprint is adjacent to a previously disturbed section of the habitat, which remains predominantly open. To ensure **no impacts** to the TEC, the construction corridor has been narrowed from 12m to 6m. This will mean modifying construction methodologies to be able to operate within the narrow corridor.				
Threatened species or community	Search Methods • Protected Matters search – 5km area around the whole project area, to identify threatened species or their habitat, and communities, listed under the *EPBC Act 1999* • NatureMaps search – 5km area around the whole project area, to identify threatened species listed under the *NPWS Act 1972*, as being recorded within the area since 1995. Ecological Communities **One** threatened ecological community (TEC) is present within this habitat (the *Mallee Bird Community of the Murray Darling Depression Bioregion*, condition A). This TEC is discussed further in section 4.2. This TEC will not be impacted by this section of the development. Threatened Fauna The Protected Matters search identified a one threatened fauna species: the Malleefowl (*Leipoa ocellata;* Vulnerable). A NatureMaps search found a further species protected under the *EPBC Act 1999*; the SA Bassian Thrush (*Zoothera lunalata halmaturina;* Endangered). The NatureMaps search also identified a further 18 threatened fauna species listed under the *NPW Act 1972*, three of which are listed as Vulnerable and 15 as Rare. All threatened species identified are listed in section 4.2.2. **No** threatened fauna were observed within VA8. Threatened Flora The Protected Matters search identified six threatened flora species (three Endangered, three Vulnerable). NatureMaps identified a further 13 flora species listed under the *NPW Act 1972*: (one Endangered, one Vulnerable and 12 Rare). All threatened species identified are listed in section 4.2.2. **No** threatened flora were observed within VA8.				
Landscape context score*	1.16	**Vegetation Condition Score**	36.3	**Conservation significance score**	1.5
Unit biodiversity Score*	63.16	**Area (ha)**	Block 4: 0ha	**Total biodiversity Score**	NA

* **NOTE**: The Landscape Context Score and Unit Biodiversity Score have been gained based on an arbitrary Area in order for the scoresheet to calculate these values, to inform this assessment.

Vegetation Association	**VA 9 condition A: *Eucalyptus leucoxylon* + *E.porosa* open woodland + sclerophyll understorey**
Block	**5**

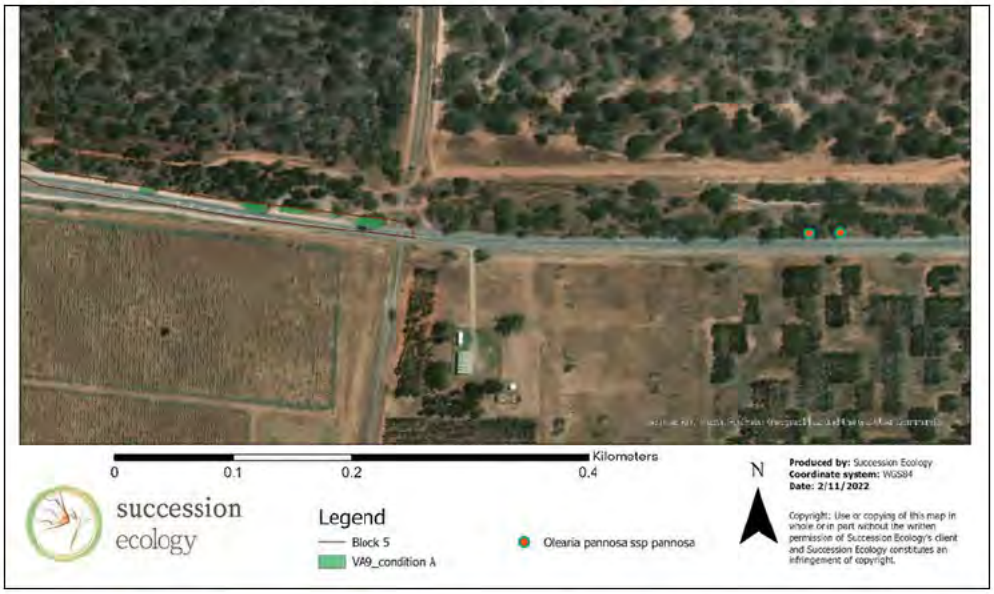

Figure 18: Extent of impacts within VA9 condition A (likely pruning only) from Block 5. Known occurrences of Olearia pannosa ssp. Pannosa *are also shown in relation to the Block 5.*

Figure 19: VA 9 condition A vegetation association, an open woodland community with a sclerophyll understory.

Vegetation Association	**VA 9 condition A: *Eucalyptus leucoxylon* + *E.porosa* open woodland + sclerophyll understorey**				
Block	**5**				
General description	VA 9 condition A is in moderate condition, containing an open *Eucalyptus leucoxylon and E. porosa* woodland, with a native sclerophyll understorey mixed with introduced species. Such introduced species include the declared weed African Boxthorn *(Lycium ferocissimum).*				
Threatened species or community	Search Methods • Protected Matters search – 5km area around the whole project area, to identify threatened species or their habitat, and communities, listed under the *EPBC Act 1999* • NatureMaps search – 5km area around the whole project area, to identify threatened species listed under the *NPWS Act 1972,* as being recorded within the area since 1995. Ecological Communities **No** Threatened Ecological Communities occur within this association. Threatened Fauna The Protected Matters search identified a one threatened fauna species: the Malleefowl (*Leipoa ocellata;* Vulnerable). A NatureMaps search found a further species protected under the *EPBC Act 1999*; the SA Bassian Thrush (*Zoothera lunalata halmaturina;* Endangered). The NatureMaps search also identified a further 18 threatened fauna species listed under the *NPW Act 1972,* three of which are listed as Vulnerable and 15 as Rare. All threatened species identified are listed in section 4.2.2. **No** threatened fauna were observed within VA9 condition A. Threatened Flora The Protected Matters search identified six threatened flora species (three Endangered, three Vulnerable). NatureMaps identified a further 13 flora species listed under the *NPW Act 1972*: (one Endangered, one Vulnerable and 12 Rare). All threatened species identified are listed in section 4.2.2. **No** threatened flora were observed within VA9 condition A.				
Landscape context score	1.11	**Vegetation Condition Score**	31.63	**Conservation significance score**	1.1
Unit biodiversity Score	38.61	**Area (ha)**	Block 5: 0.052	**Total biodiversity Score**	2.01

Vegetation Association	**VA 9 condition B: *Euclayptus leucoxylon* + *E. porosa* open woodland + open shrub + weedy understorey**
Block	**5**

Figure 20: Extent of impacts within VA9 condition B (likely pruning only) from Block 5.

Figure 21: VA 9 condition B vegetation association, an open woodland community with a sclerophyll understory.

Vegetation Association	**VA 9 condition B: *Euclayptus leucoxylon* + *E. porosa* open woodland + open shrub + weedy understorey**				
Block	**5**				
General description	VA 9 condition B is in poor condition, containing an open *Eucalyptus leucoxylon and E. porosa* woodland, with an almost entirely weedy understorey. Introduced species include the declared weeds African Boxthorn *(Lycium ferocissimum)* and Bridal Creeper *(Asparagus asparagoides f. asparagoides).*				
Threatened species or community	Search Methods • Protected Matters search – 5km area around the whole project area, to identify threatened species or their habitat, and communities, listed under the *EPBC Act 1999* • NatureMaps search – 5km area around the whole project area, to identify threatened species listed under the *NPWS Act 1972*, as being recorded within the area since 1995. Ecological Communities **No** Threatened Ecological Communities occur within this association. Threatened Fauna The Protected Matters search identified a one threatened fauna species: the Malleefowl (*Leipoa ocellata;* Vulnerable). A NatureMaps search found a further species protected under the *EPBC Act 1999*; the SA Bassian Thrush (*Zoothera lunalata halmaturina;* Endangered). The NatureMaps search also identified a further 18 threatened fauna species listed under the *NPW Act 1972,* three of which are listed as Vulnerable and 15 as Rare. All threatened species identified are listed in section 4.2.2. **No** threatened fauna were observed within VA9 condition B. Threatened Flora The Protected Matters search identified six threatened flora species (three Endangered, three Vulnerable). NatureMaps identified a further 13 flora species listed under the *NPW Act 1972*: (one Endangered, one Vulnerable and 12 Rare). All threatened species identified are listed in section 4.2.2. **No** threatened flora were observed within VA9 condition B.				
Landscape context score	1.14	**Vegetation Condition Score**	19.38	**Conservation significance score**	1.1
Unit biodiversity Score	24.3	**Area (ha)**	Block 5: 0.105ha	**Total biodiversity Score**	2.55

4.1.4 Details of the scattered trees proposed to be impacted

The following section presents detailed descriptions of the scattered trees associated with the development envelope. Figure 22 shows the distribution of the scattered trees within Block 4. Whilst all scattered trees are presented for some level of clearance, SA Water are confident that they will be able to avoid the complete clearance of trees 1-5 (pruning may be required) but may need to clear trees 6-8. This is reflected in the scoresheet.

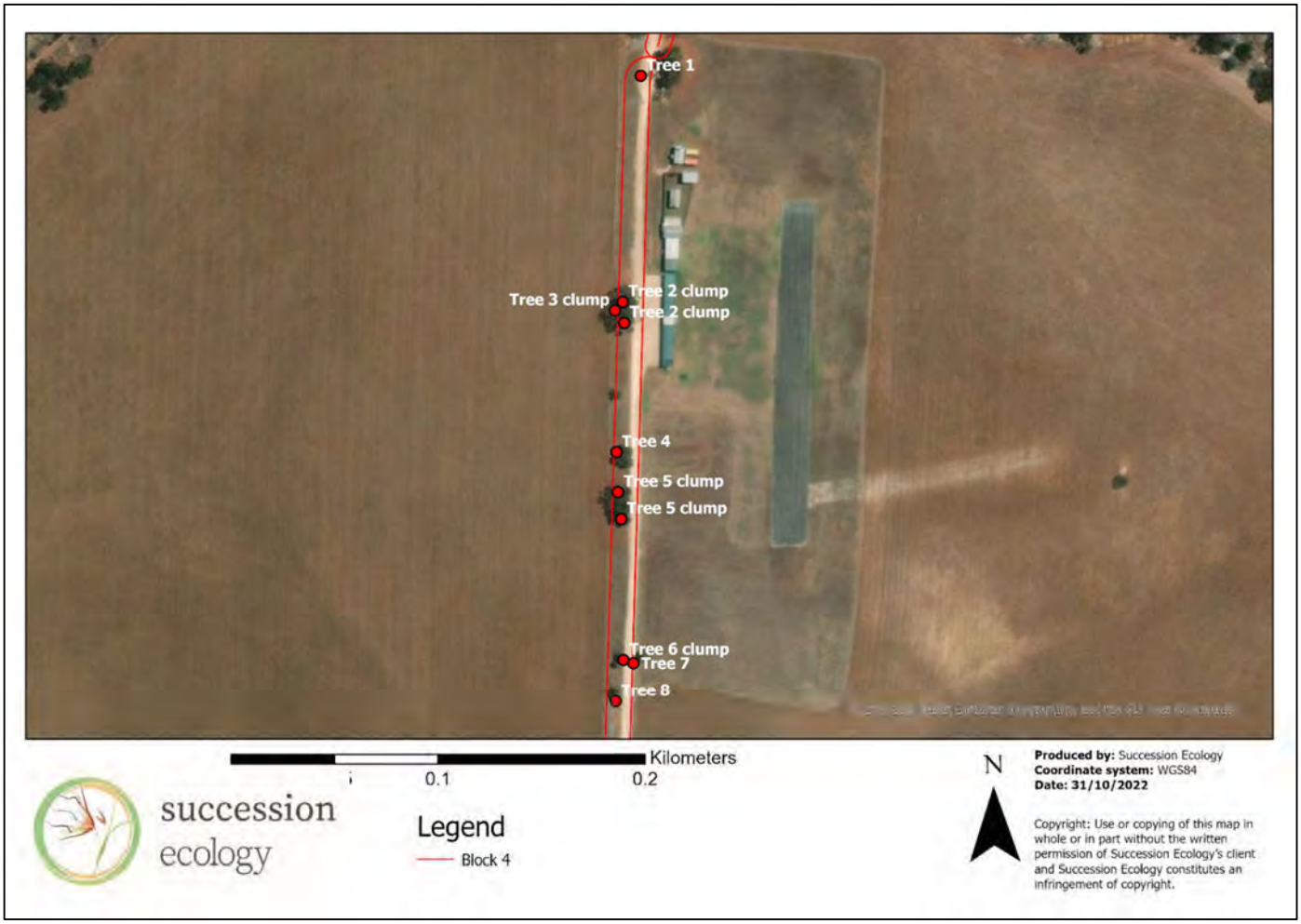

Figure 22: Distribution of scattered trees within Block 4.

Tree 1 (Block 4)	
Eucalyptus porosa	
Number of trees – 1	
Height (m) – 12m	
Hollows – 0	
Diameter (cm) – 34 (2 stems)	
Canopy dieback (%) – 0	
Total Biodiversity Score – 3.58	

Figure 23: Eucalyptus porosa

This tree is in good condition, occurring amongst planted vegetation (including WA species). Would provide habitat for small birds, small reptiles, bats and invertebrates, in the form of shelter, perching/roosting, feeding and nesting. One nest was observed in the tree. No hollows observed.

No pruning was evident. SA Water are confident they can avoid impacts to this tree, but it is assessed as having major pruning (ie 50%) in the event that impacts occur.

No Threatened ecological communities or species were present at the site.

Tree 2 (Block 4)
Eucalyptus porosa
Number of trees – 2
Height (m) – 10m
Hollows – 0
Diameter (cm) – 37 (5-6 stems)
Canopy dieback (%) – 35
Total Biodiversity Score – 4.76

Figure 24: Eucalyptus porosa

This clump of trees is in moderate-poor condition, with moderate to major pruning observed. Moderate dieback and 5% mistletoe present. Distant from other scattered trees by at least 50m. Would provide habitat for small birds, small reptiles, bats and invertebrates, in the form of shelter, perching/roosting, feeding and nesting.

SA Water are confident they can avoid impacts to this tree, but it is assessed as having major pruning (ie 50%) in the event that impacts occur.

No Threatened ecological communities or species were present at the site.

Tree 3 (Block 4)	
Eucalyptus porosa	*Figure 25: Eucalyptus porosa (small trees highlighted)*
Number of trees – 2	
Height (m) – 3m	
Hollows – 0	
Diameter (cm) – 15.5 (1-2 stems)	
Canopy dieback (%) – 50	
Total Biodiversity Score – 0.43	

This clump of trees is located amongst the Tree 2 clump, but is assessed separately as it presents a different age class. It is in poor condition, with some pruning observed and major dieback present. Would provide limited habitat for small birds, small reptiles, bats and invertebrates.

SA Water are confident they can avoid impacts to this tree, but it is assessed as having major pruning (ie 50%) in the event that impacts occur.

No Threatened ecological communities or species were present at the site.

Tree 4 (Block 4)	
Eucalyptus porosa	*Figure 26: Eucalyptus porosa*
Number of trees – 1	
Height (m) – 6m	
Hollows – 0	
Diameter (cm) – 25 (4 stems)	
Canopy dieback (%) – 0	
Total Biodiversity Score – 1.19	

This tree is in moderate condition, within 10m from another scattered tree. Evidence of past pruning is present. Would provide some habitat for small birds, small reptiles, bats and invertebrates.

SA Water are confident they can avoid impacts to this tree, but it is assessed as having major pruning (ie 50%) in the event that impacts occur.

No Threatened ecological communities or species were present at the site.

Tree 5 (Block 4)	
Eucalyptus porosa	
Number of trees – 4	
Height (m) – 7m	
Hollows – 0	
Diameter (cm) – 21 (5-6 stems)	
Canopy dieback (%) – 0	
Total Biodiversity Score – 5.08	*Figure 27: Eucalyptus porosa*

This clump of trees is in moderate condition and would provide habitat for small birds, small reptiles, bats and invertebrates, in the form of shelter, perching/roosting, feeding and nesting. A nest was observed in one of the trees.

No pruning was evident, but an African Boxthorn *(Lycium ferocissimum)* was observed adjacent the clump. SA Water are confident they can avoid impacts to this tree, but it is assessed as having major pruning (ie 50%) in the event that impacts occur.

No Threatened ecological communities or species were present at the site.

Tree 6 (Block 4)	
Eucalyptus porosa	
Number of trees – 3	
Height (m) – 4m	
Hollows – 0	
Diameter (cm) – 9 (coppiced growth form)	
Canopy dieback (%) – 0	
Total Biodiversity Score – 1.16	*Figure 28: Eucalyptus porosa*

This clump of trees is in poor condition, having been cut at the stump in the past, and growth being in coppice form. Likely to provide limited habitat to birds and bats, due to the dense nature of the stems. Would provide habitat for lizards and invertebrates.

SA Water predict that works should be clear of the dripline, however it is assessed as being removed in the event that impacts occur.

No Threatened ecological communities or species were present at the site.

Tree 7 (Block 4)	
Eucalyptus porosa	
Number of trees – 1	
Height (m) – 4m	
Hollows – 0	
Diameter (cm) – 12 (coppiced growth form)	
Canopy dieback (%) – 0	
Total Biodiversity Score – 0.42	

Figure 29: Eucalyptus porosa

This tree is in poor condition, having been cut at the stump in the past, and growth being in coppice form. Likely to provide limited habitat to birds and bats, due to the dense nature of the stems. Would provide habitat for lizards and invertebrates.

SA Water predict that works should be clear of the dripline, however it is assessed as being removed in the event that impacts occur.

No Threatened ecological communities or species were present at the site.

Tree 8 (Block 4)	
Eucalyptus porosa	
Number of trees – 1	
Height (m) – 4m	
Hollows – 0	
Diameter (cm) – 8 (coppiced growth form)	
Canopy dieback (%) – 0	
Total Biodiversity Score – 0.38	

Figure 30: Eucalyptus porosa

This tree is in poor condition, having been cut at the stump in the past, and growth being in coppice form. Likely to provide limited habitat to birds and bats, due to the dense nature of the stems. Would provide habitat for lizards and invertebrates.

SA Water predict that works should be clear of the dripline, however it is assessed as being removed in the event that impacts occur.

No Threatened ecological communities or species were present at the site.

Photo log

Photos of the vegetation community and scattered trees are provided in the descriptions above.

4.2 Threatened species assessment

4.2.1 Threatened ecological communities.

A Protected Matters Search found four Threatened Ecological Communities that were considered Likely to be within the development area. They are:

- *Peppermint Box (Eucalyptus odorata) Grassy Woodland of South Australia* (Critically Endangered)
- *Iron-grass Natural Temperate Grassland of South Australia* (Critically Endangered)
- *Plains Mallee Box Woodlands of the Murray Darling Depression, Riverina and Naracoorte Coastal Plain Bioregions* (Critically Endangered)
- *Mallee Bird Community of the Murray Darling Depression Bioregion* (Endangered)

Of these, the *Mallee Bird Community of the Murray Darling Depression Bioregion* (Mallee Bird Community TEC), listed as Endangered, was the only TEC identified within the development area, after a detailed assessment of the vegetation and desktop assessment of the bird assemblage at the development sites. The Mallee Bird Community TEC is characterized by the presence of mallee habitat and a bird assemblage of up to 20 species of mallee specialists and/or mallee dependents (DAWE, 2021). Due to the presence of mallee habitat within most Blocks the presence of this community was investigated via a desktop assessment.

According to conservation advice provided by the Department of Agriculture Water and Environment (2021), it has been identified that the Mallee Bird Community TEC is present within the SA Water Development area. Key factors considered include:

- *Location* - The Mallee Bird Community TEC is known to occur or has the potential to occur within all seven subregions of the Murray Darling Depression IBRA region. All Blocks are either within or adjacent to this Region.
- *Connection patch size* - Some Blocks are within a patch of native vegetation of at least 10 ha, with at least 5 ha dominated by mallee habitat.
- *Suitable mallee habitat* - The vegetation present in VA3, VA5 and VA8 represents one of the broad types of mallee that are present within this TEC – Shrubby Mallee (as described in DAWE, 2021).
- *Bird assemblage* - A desktop analysis of previous records of birds found within a 20 km search area of the site within the last 10 years (DAWE, 2021) found three of the 8 Mallee Specialist species recorded and eight of the 12 Mallee Dependent species recorded. This places the site within the threshold number of species that may indicate the presence of the Mallee Bird Community TEC (Table 6).

Table 6: Previously recorded bird species within 20 km of the site that are included in the bird assemblage for the Mallee Bird Community TEC.

Mallee Bird Community TEC Assemblage		Previously Recorded	Conservation Status	
Common name	**Species name**	**20 km, 10 years**	**EPBC**	**NPWS**
Mallee specialists				
Black-eared Miner	*Manorina melanotis*		E	E
Chestnut Quail-thrush	*Cinclosoma castanotum*	✓ (1 record)		R
Mallee Emu-wren	*Stipiturus mallee*		E	E
Malleefowl	*Leipoa ocellata*	✓	V	V
Red-lored Whistler	*Pachycephala rufogularis*		V	R
Scarlet-chested Parrot	*Neophema splendida*	✓ (1 record)		R
Striated Grasswren	*Amytornis striatus*			R
Mallee Western Whipbird	*Psophodes nigrogularis*		V	E

Mallee Bird Community TEC Assemblage		Previously Recorded	Conservation Status	
Common name	**Species name**	**20 km, 10 years**	**EPBC**	**NPWS**
Mallee dependents				
Crested Bellbird	*Oreoica gutturalis*	✓(2 records)		
Grey-fronted Honeyeater	*Ptilotula plumula*			
Jacky Winter	*Microeca fascinans*	✓		
Purple-gaped Honeyeater	*Lichenostomus cratitius*	✓		
Regent Parrot	*Polytelis anthopeplus*		V	E
Shy Heathwren	*Calamanthus cautus*			R
Southern Scrub-robin	*Drymodes brunneopygia*	✓		
Splendid Fairy-wren	*Malurus splendens*			
Spotted Pardalote	*Pardalotus punctatus*	✓		
White-eared Honeyeater	*Nesoptilotis leucotis*	✓		
White-fronted Honeyeater	*Purnella albifrons*	✓(3 records)		
Yellow-plumed Honeyeater	*Ptilotula ornata*	✓		

Table 7 presents results of the analysis against key factors. It shows that the Mallee Bird Community TEC is present within Blocks 2 and 4. Figure 31 presents the distribution of the development Blocks in relation to the mapped TEC.

In response to identifying the presence of the Mallee Bird Community TEC, SA Water has undergone a Self-assessment regarding the requirement for a referral under the *EPBC Act*. Due to the adjustments made to site design and modification to construction methods (discussed below), SA Water has been able to restrict impacts to the TEC to non-significant levels (as defined by the Significant Impact Guidelines (Department of Environment, 2013)). As such, a referral will not be required.

Table 7: Results of analysis of the presence of the Mallee Bird Community TEC amongst the Blocks within the SA Water Development.

Criteria	**Site 1**	**Site 2**	**Site 3**	**Site 4**	**Site 5**
Location	Yes	Yes	Adjacent	Yes/Adjacent	Yes
Connecting patch size	No	Yes	No	Yes	Yes
Suitable mallee habitat	-	Yes	-	Yes	No
Bird assemblage	-	Yes	-	Yes	-
TEC present	**-**	**Yes**	**-**	**Yes**	**-**
Category	**-**	**A**	**-**	**A**	**-**

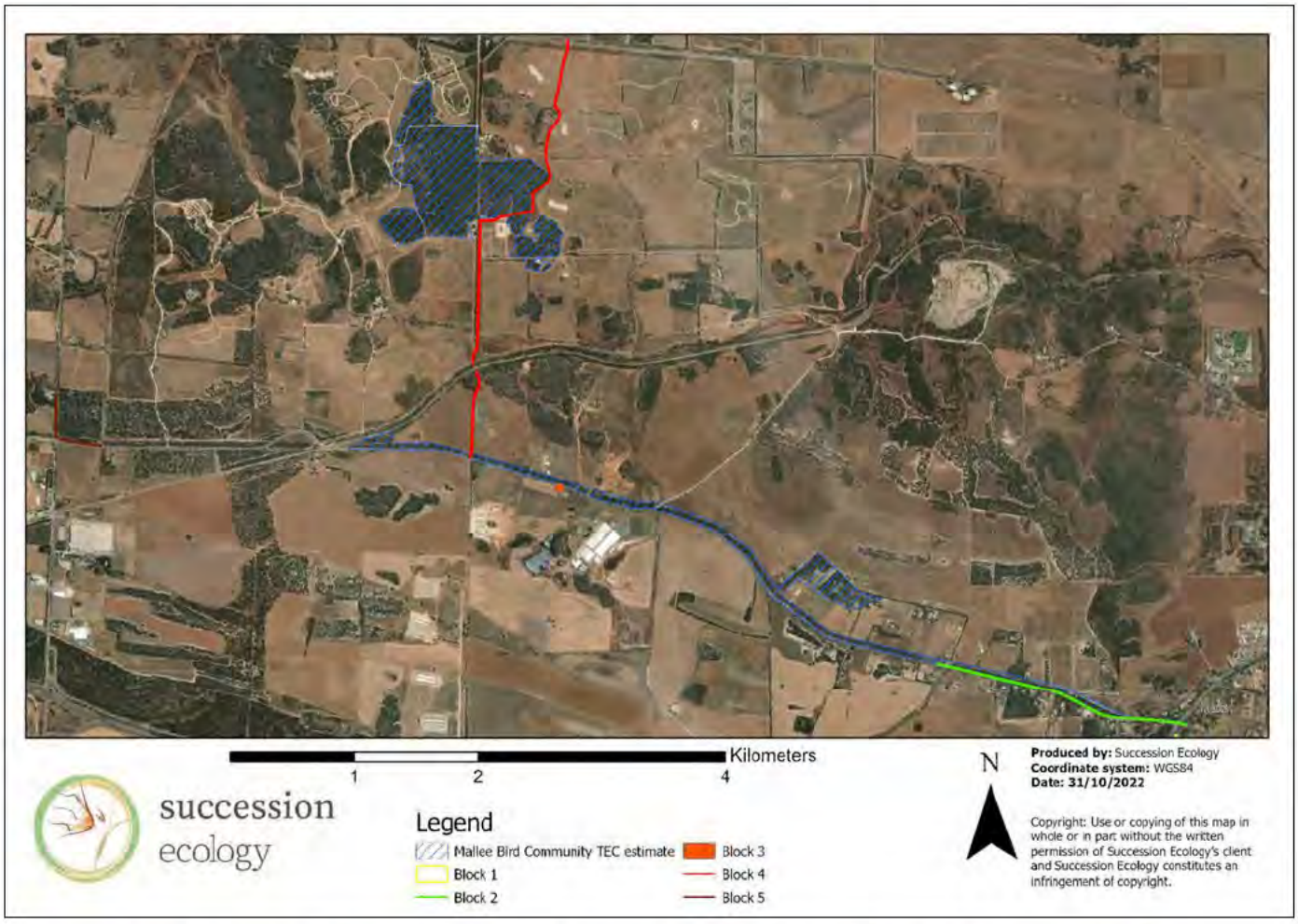

Figure 31: Location of Blocks in relation to the estimated local distribution of the Mallee Bird Community TEC.

4.2.2 Threatened fauna

A Protected Matters search found that one threatened fauna species listed under the *EPBC Act 1999* as Known, or have habitat Known to occur within a 5km radius of all Sites within the last 25 years. A NatureMaps search identified one further fauna species listed as threatened under the *EPBC Act 1999*, and 18 further species listed as threatened under the *NPW Act 1972*, that has been recorded within a 5km radius of all Sites within the last 25 years (Table 1). One of these species (White-winged chough) was recorded on the site (VA7) during the field surveys. Table 8 provides a summary of the likelihood of these species using the site following the metric described in Table 9.

Table 8: A summary of the fauna species observed on site or recorded within 5km of the application area since 1996.

Species (common name)	NPW Act	EPBC Act	Data source	Date of last record	Species known habitat preferences	Likelihood of use for habitat – Comments	Block
AVES							
Leipoa ocellata (Malleefowl)	V	VU	3, 5	2009	Semi-arid to arid shrublands and woodlands but are found mainly in mallee woodland habitat that has not recently been burnt. (DEH, 2021)	Unlikely – The northern section of Block 4 is the only area which contains suitable habitat and local knowledge can confirm that no malleefowl are present (Briony Horner, pers comm.). Further, no impacts to this mallee habitat will occur.	4

Species (common name)	NPW Act	EPBC Act	Data source	Date of last record	Species known habitat preferences	Likelihood of use for habitat – Comments	Block
Zoothera lunulata halmaturina (South Australian Bassian Thrush)	-	EN	3	2012	Found on Kangaroo Island, the adjacent mainland, Mt Lofty Ranges, and southern Flinders Ranges. They are known to occur along the damper gullies of the western half of KI. There are around 300 to 500 birds throughout the Fleurieu Peninsula and Mt Lofty Ranges, with a north to south decline in density. (DAWE, 2022)	Possible – limited habitat available within the Blocks	2, 4, 5
Lichenostomus cratitius occidentalis (Purple-gaped Honeyeater)	R	-	3	2019	Inhabits mallee heathlands and less commonly in associated mallee with a more open understorey (such as Spinifex associations). Is also occasionally recorded in River Red Gums bordering waterways (NSW Office of Environment and Heritage, 2022).	Likely – records known from the area. Some suitable habitat available.	2, 4
Melanodryas cucullata cucullata (Hooded Robin)	R	-	3	2022	Eucalyptus woodland and mallee and Acacia shrubland Nomadic, inhabits a wide range of habitats from dry sclerophyll forests, to forested wetlands, grassy woodlands and heathlands (DEH, 2014; DPIE, 2017)	Likely – records known from the area. Suitable habitat available.	2, 4, 5
Melithreptus gularis gularis (Black-chinned Honeyeater)	R	-	3	2016	Occupy dry Eucalypt woodland with an annual rainfall range of 400-700 mm, particularly associations containing ironbark and box. Mainly occur in isolated areas along the foothills of the ranges In the AMLR (DEH, 2008).	Possible – recorded within the past 20 years, but well outside its current known distribution.	2, 4, 5
Microeca fascinans fascinans (Jacky Winter)	R	-	3	2018	Prefers open woodland with open shrub layer and bare ground. Seen in farmland (Birdlife Australia, 2021).	Likely – Suitable habitat available amongst Blocks.	1, 2, 4, 5

Species (common name)	NPW Act	EPBC Act	Data source	Date of last record	Species known habitat preferences	Likelihood of use for habitat – Comments	Block
Hieraaetus morphnoides (Little Eagle)	V	-	3	2017	Seen over woodland, forested land and open country. Avoids heavy forest (Birdlife Australia, 2021).	Likely – Suitable habitat available amongst Blocks	1, 2, 4, 5
Stagonopleura guttata (Diamond Firetail)	V	-	3	2022	Occurs in a wide range of Eucalypt dominated habitat with a grassy understorey (DEW, 2019)	Possible – recent record, however very limited habitat available	4
Zanda funerea whiteae (Yellow-tailed Black Cockatoo)	V	-	3	2021	Inhabits a variety of habitats, favours eucalypt woodland and pine plantations. (Birdlife Australia, 2021)	Likely – recent records and suitable habitat available	2, 4, 5
Stagonopleura bella samueli (Beautiful Firetail)	R	-	3	2012	Swampy grasslands in coastal belts of dry forest, shrubby heath, tea-tree scrub and casuarinas, in close proximity to water (Birdlife Australia, 2020)	Unlikely – no suitable habitat available.	
Corcorax melanorhamphos (White-winged Chough)	R	-	3	2021	Woodland and tall mallee, with a preference for wetter areas with leaf-litter for feeding and mud for building nests (DEH, 2014).	Known – observed within Block 4.	2, 4, 5
Falco peregrinus macropus (Peregrine Falcon)	R	-	3	2010	Use a broad range of habitats from rainforest to arid. Need abundant prey and secure nest sites (DEH, 2009).	Possible – no recent records, but suitable habitat available	1, 2, 3, 4, 5
Falco subniger (Black Falcon)	R	-	3	2006	Nomadic, preferring sparse woodlands, scrubby grasslands and farmlands (Birds SA, 2021).	Possible – no recent records, but suitable habitat available	3, 4
Myiagra inquieta (Restless Flycatcher)	R	-	3	2018	Open forests, woodlands and mallee, associated with species such as *Eucalyptus camaldulensis, E. leucoxylon, E. oleosa* and *E. gracilis* (DEH, 2021).	Likely – suitable habitat available	4, 5
Neophema elegans elegans (Elegant Parrot)	R	-	3	2018	Wide range of open habitats, including grasslands, shrublands, mallee, woodlands and thickets, bluebush plains,	Possible – some suitable habitat available	4, 5

Species (common name)	NPW Act	EPBC Act	Data source	Date of last record	Species known habitat preferences	Likelihood of use for habitat – Comments	Block
					heathlands, saltmarsh and farmland (Birdlife Australia, 2021).		
Petroica boodang boodang (Scarlet Robin)	R	-	3	2016	Eucalypt forests and woodlands (DEW, 2019).	Likely – suitable habitat available	2, 4, 5
Plectorhyncha lanceolata (Striped Honeyeater)	R	-	3	2004	Found in forests and woodlands often along rivers (Birdlife Australia, 2021).	Unlikely – no recent records and no suitable habitat available	
Turnix varius varius (Painted Buttonquail)	R	-	3	2009	Various Eucalypt habitats, with a preference for areas with leaf litter (DEW, 2019).	Possible – limited suitable habitat available	4
MAMMALIA							
Trichosurus vulpecula (Common Brushtail Possum)	R	-	3	2020	Inhabits woodland, forests, heath and urban areas using trees with hollows for nesting (Australian Museum, 2020).	Possible – limited suitable habitat available; few hollows observed.	2, 4, 5
Source; 1- BDBSA, 2 - AoLA, 3 – NatueMaps, 4 – Observed/recorded in the field, 5 - Protected matters search tool, 6 – others NP&W Act; E= Endangered, V = Vulnerable, R= Rare EPBC Act; Ex = Extinct, CR = Critically endangered, EN = Endangered; VU = Vulnerable							

Table 9: Criteria for the likelihood of occurrence of species within the survey area.

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

4.2.3 Threatened flora

A Protected Matters search found that six threatened flora species listed under the *EPBC Act 1999* as Known, or have habitat Known to occur within a 5km radius of all Blocks. A NatureMaps search did not identified any further flora species listed as threatened under the *EPBC Act 1999,* but identified 13 further species listed as threatened under the *NPW Act 1972*, that has been observed within a 5km radius of all Sites within the last 25 years (Table 10). One of these species (*Acacia rhigiophylla*) was recorded within Block 4 during the field surveys.

Table 10: A summary of the flora species observed on site or recorded within 5km of the application area since 1996.

Species (common name)	NPW Act	EPBC Act	Data source	Date of last record	Species known habitat preferences	Likelihood of use for habitat – Comments (Table 2)	Block
Caladenia tensa (Inland Green-comb Spider-orchid)	E	EN	3,5	1992	Grows on red-brown sandy loams, on rises in open woodland, mallee woodland and mallee/heath sites (DAWE, 2022)	Possible – suitable habitat available. However, no recent records in the region.	2,4,5
Thelymitra epipactoides (Metallic Sun-orchid)	E	EN	3,5	1912	Found in open woodland and mallee habitat (Landscape SA, 2021).	Unlikely – has not been detected in the region for more than 100 years.	
Prostanthera eurybioides (Monarto Mintbush)	E	EN	3,5	2021	Prefers granite outcrops on sandy loams within Eucalyptus mallee woodlands and in associate with *Melaleuca uncinata* and *Acacia spp* (Landscape SA, 2021)	Possible – granite outcrops not present within development Blocks.	2,4,5
Acacia menzelii (Menzel's Wattle)	V	VU	3,5	2021	Endemic to Monarto and the Flinders Ranges, in areas of open scrub often in association with *Eucalyptus socialis* and *E. incrassata*. Soil type often grey-brown calcareous loamy soil (Electronic Flora of SA, 2021).	Likely – occurrence is possible within Blocks 2 and 4. Recent records in the region.	2,4
Acacia rhetinocarpa (Resin Wattle)	V	VU	3,5	2012	Usually found in open scrub, associated with *Eucalyptus socialis* and other *Eucalyptus sp.* Restricted to Monarto area (Flora of SA, 2021).	Possible - occurrence is possible within Blocks 2 and 4 however, no recent records in the region.	2,4
Olearia pannosa ssp. Pannosa (Silver Daisy-bush)	V	VU	3,5	2022	Grows in flat, sandy terrain and areas with rocky soils. Often occur in narrow roadside remnants (Landscape SA, 2014).	Likely – observed in flower within 500m of Block 5. However, detailed surveys did not identify the species	2,4,5

Species (common name)	NPW Act	EPBC Act	Data source	Date of last record	Species known habitat preferences	Likelihood of use for habitat – Comments (Table 2)	Block
						within the development zone.	
Acacia pendula (Weeping Myall)	V		3	2017	Grows mainly on floodplains in fertile alluvial clay, sometimes dominant in woodland and open woodland (Flora of Australia, 2021).	Unlikely – no suitable habitat in the development area.	
Acacia iteaphylla (Flinders Ranges Wattle)	R		3	2012	Found in hills on rocky outcrops or in valleys along rocky creeks (Flora of Australia, 2021).	Unlikely – no suitable habitat in the development area.	
Acacia montana (Mallee Wattle)	R		3	2014	In open scrub associated with *Eucalyptus gracilis* and *E. socialis* (Electronic Flora of SA, 2021).	Likely - occurrence is possible within Blocks 2 and 4.	2, 4
Acacia rhigiophylla (Dagger-leaf Wattle)	R		3	2022	Critically endangered within the Murray Mallee Region, occurring in open scrub associated with *Eucalyptus socialis* and *E. gracilis,* in hard alkaline red duplex or grey-brown calcareous loam (Seeds of SA, 2021)	Known – observed within VA 7, Block 4, during field surveys.	4
Acacia trineura (Three-nerve Wattle)	R		3	2014	Sometimes near inland water, growing in red earths and clay, often in mallee communities (Atlas of Living Australia, 2021)	Likely – suitable habitat within Blocks 2 and 4.	2, 4
Austrostipa densiflora (Fox-tail Spear-grass)	R		3	2014	Found in grassy woodland, sclerophyll forest and rocky outcrops. Generally in low fertility soils (Grasses of Australia, 2022).	Likely – some suitable habitat within Blocks 2 and 4.	2, 4
Daviesia benthamii ssp. humilis (NC) (Mallee Bitter-pea)	R		3	2004	Southern Flinders Ranges and the Mid-north in South Australia, growing in drier sites dominated by mallee	Possible – some suitable habitat available, however no recent records in the region.	2, 4

Species (common name)	NPW Act	EPBC Act	Data source	Date of last record	Species known habitat preferences	Likelihood of use for habitat – Comments (Table 2)	Block
					eucalyptus on clay soils (Seeds of SA, 2022).		
Eucalyptus fasciculosa (Pink Gum)	R		3	2014	Found in woodlands, low shrublands, in well-drained sandy soils (Seeds of SA, 2018).	Unlikely – species not detected during surveys which targeted identification of canopy sp.	
Eucalyptus leucoxylon ssp. Megalocarpa (Large-fruit Blue Gum)	R		3	2017	Found in the lower South-east in South Australia, growing in coastal shrubland or low woodland on shallow sandy-loam to reddish clay-loam soils over limestone, often in slight depression (Seeds of SA, 2022).	Possible – species known in region, but not detected during surveys which targeted identification of canopy sp.	5
Maireana rohrlachii (Rohrlach's Bluebush)	R		3	2014	Found on heavy soils or in seasonally wet areas (Royal Botanical Gardens of Victoria, 2022).	Unlikely – no suitable habitat available.	
Olearia passerinoides ssp. Glutescens (Sticky Daisy-bush)	R		3	2019	In Mallee and forest communities (Flora of Victoria, 2022).	Likely – may occur within Blocks 2, 4 or 5	2,4,5
Olearia picridifolia (Rasp Daisy-bush)	R		3	2013	Mainly in mallee and heath on alkaline soils derived from limestone or dunes (Landscape SA, 2015)	Likely – possible particularly with Block 4.	4
Podolepis jaceoides (Showy Copper-wire Daisy)	R		3	2017	Occurs in woodland, mallee and grassland on heavy clay to sandy soils (Australian Botanic Gardens, 2021).	Likely – possible within Blocks 2, 4 and 5.	2,4,5

Source; 1- BDBSA, 2 - AoLA, 3 – NatueMaps 4 – Observed/recorded in the field, 5 - Protected matters search tool, 6 – others
NP&W Act; E= Endangered, V = Vulnerable, R= Rare
EPBC Act; Ex = Extinct, CR = Critically endangered, EN = Endangered; VU = Vulnerable

4.3 Cumulative impact

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

Clearance associated with the SA Water development comprises the whole of the impacts to native vegetation. The development activities will not increase access or cause any indirect disturbances to adjacent areas. SA Water construction management plans will ensure dust generation are kept to acceptable levels, and the development is very unlikely to cause any permanent or significant hydrological changes.

The clearance will include complete removal for the pumping stations. Clearance areas in this application have also considered the potential 5m clearance buffer that may be implemented for fire management. Clearance within pipeline routes will predominately involve partial pruning, however some areas may require complete clearance. As such, a Loss Factor of 1 has been set for all VA's within pipeline routes. Because the pipelines will be buried all vegetation affected for the pipeline routes will have the ability to regenerate, and there may also be an opportunity to revegetate the cleared areas (SAW to investigate options).

4.4 Address the mitigation hierarchy

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

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

Although this development is required to manage the water pressure issues in the region, SA Water has worked extensively on the analysis of various options to avoid environmental impacts as much as possible, within required technical and administrative constraints. A description of this is outlined below:

- Block 1 – Pumping station footprint at White Hill was purposely designed for the open area already present on site. Other options included a higher level of vegetation clearance.
- Block 3 – Four different site options were considered for this pumping station. Those readily available for SA Water included three site options which occurred in the vegetation strip along Old Princes Highway; each within an 'open' area of habitat. However, when it was determined that the habitat qualified as a TEC, SA Water sought to change the location to a cleared site on a mushroom farm, which would result in no impacts to native vegetation. Negotiations for this site continue.
- Block 4 – Many different options have been considered for this section of pipeline (Appendix 1). Challenges have included the constraints applied by the landowner, the presence of the TEC within the Block, cost effectiveness and the technical constraints regarding building the pipeline within the terrain and constraints present. SA Water has managed to find a solution which avoids impacts to all sections of TEC within the northern part of the Block, and only minor impacts to the south. This includes reducing the construction corridor from 16m to 6m adjacent TEC habitat and to 9m adjacent revegetation works. These changes, which will add time and complexity to the construction process, but it has saved the project approximately 60-100 biodiversity score points (when compared to other options considered).

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

SA Water has also worked extensively on the analysis of various options to minimise any unavoidable environmental impacts as much as possible. A description of this is outlined below:

- Block 2 – SA Water will be ustilising half of the road corridor within their construction work zone in order to minimize impacts to the native vegetation (including TEC) along the Old Princes Highway. They have also reduced the construction zone from 16m to 12m. This should result in only pruning impacts to most of the Block, however, some complete clearance may be required where the road corridor narrows. The scoresheets for this block will assume complete clearance.
- Block 4 – SA Water has opted for an option that avoids vegetation disturbance within a large proportion of this block, although it adds technical complexity to the project (Appendix 1).
- Block 5 - SA Water will be ustilising either half of the road corridor or the entire road corridor within their construction work zone in order to minimize impacts to adjacent native vegetation. They have also reduced the construction zone from 16m to 12m. This should result in only pruning impacts to most of the Block, however, some complete clearance may be required where the road corridor narrows. The scoresheets for this block will assume complete clearance.

Overall, the minimization efforts have saved the project approximately 150 biodiversity points.

c) Rehabilitation or restoration – outline measures taken to rehabilitate ecosystems that have been degraded, and to restore ecosystems that have been degraded, or destroyed by the impact of clearance that cannot be avoided or further minimized, such as allowing for the re-establishment of the vegetation.

All areas of pipeline will have the opportunity for natural regeneration (particularly the pruned areas) or may undergo revegetation with local species. Given SA Water has operated along these routes in the past, and the vegetation has regenerated to a functional level, it is expected that such successful regeneration will occur again. Areas impacted by pumping stations will need to remain clear.

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

SA Water will pay into the SEB fund for this development.

The NVC will only consider an offset once avoidance, minimization and restoration have been documented and fulfilled. The SEB Policy explains the biodiversity offsetting principles that must be met.

4.5 Principles of clearance (*Schedule 1, Native Vegetation Act 1991*)

<table>
<tr><th>Principle of clearance</th><th>Considerations</th></tr>
<tr><td rowspan="3">Principle 1a - it comprises a high level of diversity of plant species</td><td>Relevant information
The numbers of native and introduced plant species recorded for each vegetation association are listed below as well as the Plant Diversity Score:

<table>
<tr><th>VA</th><th>#Native</th><th>#Introduced</th><th>Plant Diversity Score</th></tr>
<tr><td>1</td><td>14</td><td>21</td><td>16</td></tr>
<tr><td>2</td><td>33</td><td>24</td><td>24</td></tr>
<tr><td>3</td><td>23</td><td>14</td><td>24</td></tr>
<tr><td>4</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>5</td><td>17</td><td>10</td><td>20</td></tr>
<tr><td>6</td><td>17</td><td>14</td><td>20</td></tr>
<tr><td>7</td><td>26</td><td>17</td><td>26</td></tr>
<tr><td>8</td><td>23</td><td>13</td><td>22</td></tr>
<tr><td>9a</td><td>25</td><td>13</td><td>20</td></tr>
<tr><td>9b</td><td>20</td><td>13</td><td>16</td></tr>
</table></td></tr>
<tr><td>Assessment against the principles
Seriously at Variance
- VA2, VA3, VA7

At Variance
- VA1, VA5, VA6, VA9a, VA9b

Note: VA8 not impacted by the development</td></tr>
<tr><td>Moderating factors that may be considered by the NVC

Within all vegetation associations, the total amount of predicted (worst case) clearance is 0.865ha. This would be well under 0.25% of the total native vegetation located in a 5km radius of the site. As such, all levels of variance could be scaled down which would leave three vegetation associations At Variance (VA2, VA3, VA7).</td></tr>
<tr><td>Principle 1b - significance as a habitat for wildlife</td><td>Relevant information
Habitat provided by the vegetation associations vary in their value to fauna:
VA1 – Limited value. None of the 19 threatened species recorded in the area were considered Likely or Possible to use VA1.
VA2 & 3– 11 out of 19 threatened species recorded in the area were considered Likely or Possible to occur within VA2.
VA5 & 6 - 17 out of 20 threatened species recorded in the area were considered Likely or Possible to use VA2. These VA's provide some connectivity between local patches. VA5 is assessed as a Mallee Bird Community TEC.
VA7 – 17 out of 20 threatened species recorded in the area were considered Likely or Possible to use VA2. VA7 provides some connectivity between local patches and is known to support a State rare bird species (White-winged Chough).
VA8 – not impacted</td></tr>
</table>

VA9a and VA9b – 12 out of 20 threatened species recorded in the area were considered Likely or Possible to use VA9. The width of habitat in VA9b is relatively narrow and considered of limited value.

Patches:

VA	Threatened Fauna Score	Unit Biodiversity Score
1	0.1	21.63
2	0.1	60.46
3	0.1	67.43
4	-	-
5	0.1	61.44
6	0.1	35.27
7	0.1	50.72
8	0.1	63.16
9a	0.1	38.61
9b	0.1	24.3

Trees:

Tree	Fauna Habitat Score	Biodiversity Score
1	1.4	3.28
2	1.4	2.38
3	1.4	0.21
4	1.4	1.19
5	1.4	1.27
6	1.4	0.39
7	1.4	0.42
8	1.4	0.38

Assessment against the principles

Seriously at Variance

- VA1, VA2, VA3, VA5, VA6, VA7, VA9a, VA9b

- Trees 1, 2, 3, 4, 5, 6, 7, 8

Note: VA8 not impacted

Moderating factors that may be considered by the NVC

The clearance proposed will be minimized as much as possible. It will not result in further fragmentation of habitat areas. Strips of remnant vegetation (such as roadside strips) will likely only have vegetation pruned, with small areas of total clearance.

The total area of worse case impact will be 0.865ha.

VA7 which is known to support a threatened species will only have a very small area impacted (0.013ha) out of the total association (~3ha), with impacts likely to be pruning only.

With regards to scattered trees, although the fauna habitat score puts all trees at Serious Variance, the Biodiversity Score puts all trees as 'Not at Variance'.

Principle 1c - plants of a rare, vulnerable or endangered species

Relevant information

Habitat provided by the vegetation associations vary in their value to flora. Surveys were conducted during early spring where most species were easily identified and some orchids were still present.

VA1 – Limited value. Three out of the 20 threatened species recorded in the area were considered Likely or Possible to occur within VA1.

VA2 & 3– 11 out of 19 threatened species recorded in the area were considered Likely or Possible to occur within VA2. Provides some connectivity between local patches. VA3 is assessed as a Mallee Bird Community TEC.

VA5 & 6 - 13 out of 19 threatened species recorded in the area were considered Likely or Possible to occur within VA2. Provides some connectivity between local patches. VA5 is assessed as a Mallee Bird Community TEC.

VA7 – 13 out of 19 threatened species recorded in the area were considered Likely or Possible to occur within VA2. Is known to support a State rare plant species (*Acacia rhigiophylla*), however the impact areas were not in the vicinity of the identified plant and impacts will likely be limited to pruning only.

VA8 – not impacted

VA9a and VA9b – 6 out of 19 threatened species recorded in the area were considered Likely or Possible to occur within VA9. One national threatened species *(Olearia pannosa ssp pannosa)* was found (in flower) 500m from the eastern end of VA9a. As such, a thorough search of the potential impact zone was conducted, without further identification of this species.

Threatened Flora Score(s) - Patches

VA	Threatened Flora Score
1	0
2	0
3	0
4	-
5	0
6	0
7	0.04
8	0
9a	0
9b	0

Threatened Flora Score(s) – Scattered Trees

Tree	Threatened Flora Score
1	0
2	0
3	0
4	0
5	0
6	0
7	0
8	0

Assessment against the principles

Not at variance

Moderating factors that may be considered by the NVC

VA7 – The State rare plant species (*Acacia rhigiophylla*) was not in the vicinity of the likely impact zone. Impacts within this VA will likely be limited to pruning.

VA9a – One national threatened species *(Olearia pannosa ssp pannosa)* was found 500m from the eastern end of VA9, and a thorough search of the potential impact zone was conducted without further identification of this species.

Principle 1d - the vegetation comprises the whole or part of a plant community that is Rare, Vulnerable or endangered:	Relevant information One national Threatened Ecological Community (TEC) was identified within the project area – Mallee Bird Community TEC. This was identified within VA3, VA5 and VA8. **Threatened Ecological Community Score** **VA** / **Threatened Flora Score** **1**: 1 **2**: 1 **3**: 1.4 **4**: - **5**: 1.4 **6**: 1 **7**: 1 **8**: 1.4 **9a**: 1 **9b**: 1
	Assessment against the principles **Seriously at Variance** - VA3, VA5 Note: VA8 not impacted
	Moderating factors that may be considered by the NVC The extent of impact to the TEC is expected to be minimal. The project design as been greatly modified to avoid and minimize impacts to the TEC as far as practicable. This includes introducing technical changes to construction methodology to allow a narrow construction corridor adjacent a TEC area in Block 4 (VA8), and utilizing the road corridor adjacent Block 2 to restrict impacts to as little as possible. It is predicted that only intermittent pruning may be needed in Block 2. Impacts will not cause fragmentation of the TEC, whilst a detailed EPBC Self-assessment (Succession Ecology, 2022) has found that predicted impacts will not cause a 'significant impact' to the TEC as defined by the Significant Impact Guidelines (Department of Environment, 2013).
Principle 1e - it is significant as a remnant of vegetation in an area which has been extensively cleared.	Relevant information The SA Water development is located within the Murray Darling Depression and Kanmantoo IBRA Regions, Murray Mallee and Fleurieu Subregions, and Loydella and Sandergrove Associations (respectively). Remnancy throughout the development area varies from 8-13%, with the majority of the development (Blocks 1, 2 and 5) between 8 and 10%. Block 4 recorded remnancy of 10-11%. Block 3 recorded 13% remnancy. However, the development within Block 3 will not be impacting native vegetation. **Total Biodiversity Score –** **Total Biodiversity Score** **VA's**: 46.39 **Trees 1-8**: 16.78 **Total**: **63.17**
	Assessment against the principles **At Variance** The development area is assessed as At Variance for Block 4.
	Moderating factors that may be considered by the NVC The vegetation associations to be impacted are well represented within the region. Further, impacts on good quality vegetation within the project area have been avoided altogether. All remaining impacts that may occur will be in areas of moderate to poor quality vegetation.

Principle 1f - it is growing in, or in association with, a wetland environment.	Relevant information NA
	Assessment against the principles NA
	Moderating factors that may be considered by the NVC NA
Principle 1g - it contributes significantly to the amenity of the area in which it is growing or is situated.	Relevant information Most vegetation areas that may be subject to complete removal do not provide key amenity function in the areas they are located. The exception may be the small area within VA1 (Blocks 1 and 2) that provides partial screening for the water tank infrastructure at White Hill. Clearance impacts will be minimal, mainly restricted to pruning and avoiding all areas of good quality vegetation.
	N/A
	Moderating factors that may be considered by the NVC Where complete clearance is required for pipeline installation, the area may either be revegetated or allowed to regenerate naturally, eventually restoring cover.

4.6 Risk assessment

Determine the level of risk associated with the application

Total clearance	No. of trees	8
	Area (ha)	0.865
	Total biodiversity Score	63.17
Seriously at variance with principle 1(b), 1(c) or 1 (d)		1(b), 1(d)
Risk assessment outcome		Level 4

4.6 NVC guidelines

Provide any other information that demonstrates that the clearance complies with any relevant NVC guidelines related to the activity.

NA

5. Clearance summary

Clearance area(s) summary table

Block	VA	Species diversity score	Threatened Ecological community Score	Threatened plant score	Threatened fauna score	UBS	Area (ha)	Total Biodiversity score	Loss factor	Loadings	Reductions	SEB Points required	SEB payment	Admin Fee
1, 2	1	16	1	0	0.1	21.63	0.025	0.54	1			0.57	$287.11	$15.79
2	2	24	1	0	0.1	60.46	0.173	10.4	1	1		21.84	$11,624.16	$639.33
2	3	24	1.4	0	0.1	67.43	0.385	25.96	1			27.26	$14,145.70	$778.01
3,4	4	-	-	-	-	-	-	-	-					
4	5	20	1.4	0	0.1	61.44	0.012	0.74	1			0.77	$402.78	$22.15
4	6	20	1	0	0.1	35.27	0.1	3.53	1			3.7	$1,926.65	$105.97
4	7	26	1	0.04	0.1	50.72	0.013	0.66	1			0.69	$344.47	$18.95
4	8	22	1.4	0	0.1	63.16	0	NA	0			NA	NA	NA
5	9a	20	1	0	0.1	38.61	0.052	2.01	1			2.11	$1,102.53	$60.64
5	9b	16	1	0	0.1	24.3	0.105	2.55	1			2.68	$1,407.94	$77.44
						Total	**0.865**	**46.39**				**59.62**	**$31,241.34**	**$1,718.28**

Scattered trees summary table

Tree or Cluster ID	Number of trees	Fauna Habitat score	Threatened flora score	Total Biodiversity score	Loss factor	SEB Points required	SEB Payment	Admin Fee
1	1	1.4	0	3.58	0.6	2.26	$1,232.51	
2	2	1.4	0	4.76	0.6	3.00	$1,638.95	
3	2	1.4	0	0.43	0.6	0.27	$146.80	
4	1	1.4	0	1.19	0.6	0.75	$410.69	
5	4	1.4	0	5.08	0.6	3.20	$1,747.38	
6	3	1.4	0	1.16	1	1.22	$664.64	
7	1	1.4	0	0.42	1	0.44	$240.28	
8	1	1.4	0	0.38	1	0.39	$215.53	
				16.99		**11.52**	**$6,296.78**	**$346.32**

Total summary table

	Total Biodiversity score	Total SEB points required	SEB Payment	Admin Fee	Total Payment
Application	63.17	76.61	$37,538.12	$2,064.60	$39,602.72

Economies of Scale Factor	0.5
Rainfall (mm)	372-398

NOTE: *The minimum payment for this clearance will be $500.*

6. Significant Environmental Benefit

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

ACHIEVING AN SEB

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

☐ Establish a new SEB Area on land owned by the proponent.

☐ Use SEB Credit that the proponent has established. Provide the SEB Credit Ref. No. _____

☐ Apply to have SEB Credit assigned from another person or body. The application form needs to be submitted with this Data Report.

☐ Apply to have an SEB to be delivered by a Third Party. The application form needs to be submitted with this Data Report.

☒ Pay into the Native Vegetation Fund.

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8. Appendices

Appendix 1: Design options within Block 4 (northern section)

Appendix 2: Bushland and scattered tree assessment scoresheets associated with the proposed clearance (attached)

Appendix 3: Shapefiles of Blocks 1-5 and VA impact zones for VA1-VA9 (attached)

Appendix 1

Layout options assessed for Block 4

The figure below presents the alignment and construction method options that were investigated for the northern section of Block 4. Options included:

- Alignment Option 1 – following the existing SAW easement, which would have had significant impacts on high quality vegetation within the TEC
- Alignment Option 2 Site 4 – following the outside of the TEC vegetated area, which could avoid most of the TEC vegetation but provided technical difficulties
- Horizontal Direct Drilling (HDD) – below the area of highest quality vegetation, but this proved cost prohibitive

The final alignment (Block 4) lengthens the overall alignment but achieves very low vegetation impacts and avoids technically difficult terrain.