

Targeted Vegetation Survey
of
Threatened and Priority Ecological Communities
Hutton Road to Sabina River, Capel



Prepared for Main Roads Western Australia
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Statement of Limitations

Reliance on Data

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

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Executive Summary

Ecoedge was engaged by Main Roads Western Australia (Main Roads) in October 2020 to undertake a targeted vegetation survey to ascertain the Threatened Ecological Community/Priority Ecological Community (TEC/PEC) status of road reserve vegetation within the proposed Bussell Highway Duplication Proposal area between Hutton Road in Capel and the Sabina River (32.10 – 43.92 SLK) (the 'survey area'). This survey followed previous flora and vegetation surveys conducted in 2013, 2016, 2018 and 2020. Several TECs have been listed since the original surveys hence the requirement for a Targeted Vegetation assessment.

The desktop assessment highlighted that there could potentially be ten different TECs or PECs within the survey area. Of these, four were considered likely to be in the survey area. These along with their conservation status (Commonwealth/state), are listed below:

1. 'Tuart (*Eucalyptus gomphocephala*) Woodlands and Forests of the Swan Coastal Plain' (TEC/Priority three PEC) (Tuart Woodland TEC/PEC)
2. 'Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region' (TEC/Priority three PEC) (Banksia Woodland TEC/PEC).
3. '*Eucalyptus cornuta*, *Agonis flexuosa* and *Eucalyptus decipiens* forest on deep yellow-brown siliceous sands over limestone' (NA/Priority one PEC) (Busselton Yate community).
4. SCP08: Herb rich shrublands in clay pans (TEC/TEC) (Claypan TEC).

The survey area was examined for Tuart trees, with 24 patches of Tuart Woodland identified. Three of these patches met the size and condition thresholds and qualified as TEC/PEC. The total area of the three patches was 29.02 ha, including areas outside the road reserve.

Although there were banksia species found within the survey area, there were no areas that met the patch size and condition thresholds, and therefore it was determined no Banksia Woodland TEC/PEC was present in the survey area.

One occurrence of the Busselton Yate community PEC (0.8 ha) in Completely Degraded condition was recorded within the survey area. This included 14 *E. cornuta* trees that appear to have been planted in an area of roadside revegetation. Although these trees appear to be plantings, this stand of Yate is regarded as natural by DBCA (part SB Remnant 78/1-1) (Webb et al. 2009).

Ground truthing of the Claypan TEC within the survey area showed no areas that were comparable to SCP08 occurring in the survey area. MVA analysis of both 2018 and 2020 quadrat data derived from quadrats installed within potential claypan wetland communities indicated that they were not representative of any claypan community defined within the Gibson et al. (1994) Swan Coastal Plain report. These include communities FCT07, FCT08, FCT09 and FCT10a which are all State and Federally listed TECs.

Further potential occurrences of TEC and PEC were identified by DBCA in their review of vegetation mapping for the survey area as follows:

- However, DBCA suggested, based on a visual assessment of the survey area, that vegetation unit F (described in Ecoedge (2019, 2020)) resembled a sandy, sedge-dominated occurrence of FCT09 (Claypan TEC). However, this is in contrast to the 2018 survey outcomes, which assigned the unit to FCT17 '*Melaleuca raphiophylla-Gahnia trifida* seasonal wetlands' based on an MVA (Ecoedge 2018, 2020). This FCT17 is considered well reserved with a low-risk conservation status.
- DBCA also suggested, that Marri dominated communities within the survey area could represent FCT01b Southern *Eucalyptus calophylla* woodlands on heavy soils (state TEC). Ecoedge reviewed the occurrences of Marri within the survey area and based on a visual assessment determined that a portion of understorey vegetation potentially resembling FCT01b was overlooked in the survey area during previous surveys (Ecoedge 2014, 2017, 2019, 2020). This occurrence is estimated to be approximately 0.23 ha in size.

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1 Introduction

Ecoedge was engaged by Main Roads Western Australia (Main Roads) in October 2020 to undertake a targeted vegetation survey to ascertain the Threatened Ecological Community/Priority Ecological Community (TEC/PEC) status of road reserve vegetation along Bussell Highway between Hutton Road in Capel and the Sabina River (32.10 – 43.92 SLK) (survey area, **Figure 1**).

Main Roads requires this survey to ensure that all potential occurrences of the 'Tuart (*Eucalyptus gomphocephala*) Woodlands and Forests of the Swan Coastal Plain' (Tuart TEC/PEC) that may be present within the survey area are investigated and reported. Main Roads also require all other potential occurrences of State and Federally listed TECs and PECs within the survey area to be investigated to ensure that these have been adequately investigated and reported on.

Previous surveys did not specifically identify vegetation containing Tuart as previous surveys were conducted prior to the listing of the Tuart TEC under the *Environment Protection and Biodiversity Conservation Act 1999* (BC Act) in 2019.

This survey is required to inform the environmental assessment and approvals processes associated with the project.

The survey methodology was aligned with State and Commonwealth requirements for the bioregion and species and communities present and was consistent with State and Commonwealth guidelines and Technical Guides including, Environmental Protection Authority (EPA) Technical Guidance (2016) and the Approved Conservation Advice for the Banksia Woodlands (TSSC 2016), Clay Pans (TSSC 2012) and Tuart Woodlands and Forests (TSSC 2019) TECs of the Swan Coastal Plain.

This report compiles the findings of the desktop assessment (including previous survey reports) and latest field surveys, and provides a complete record of TECs and PECs identified within the assessment area.

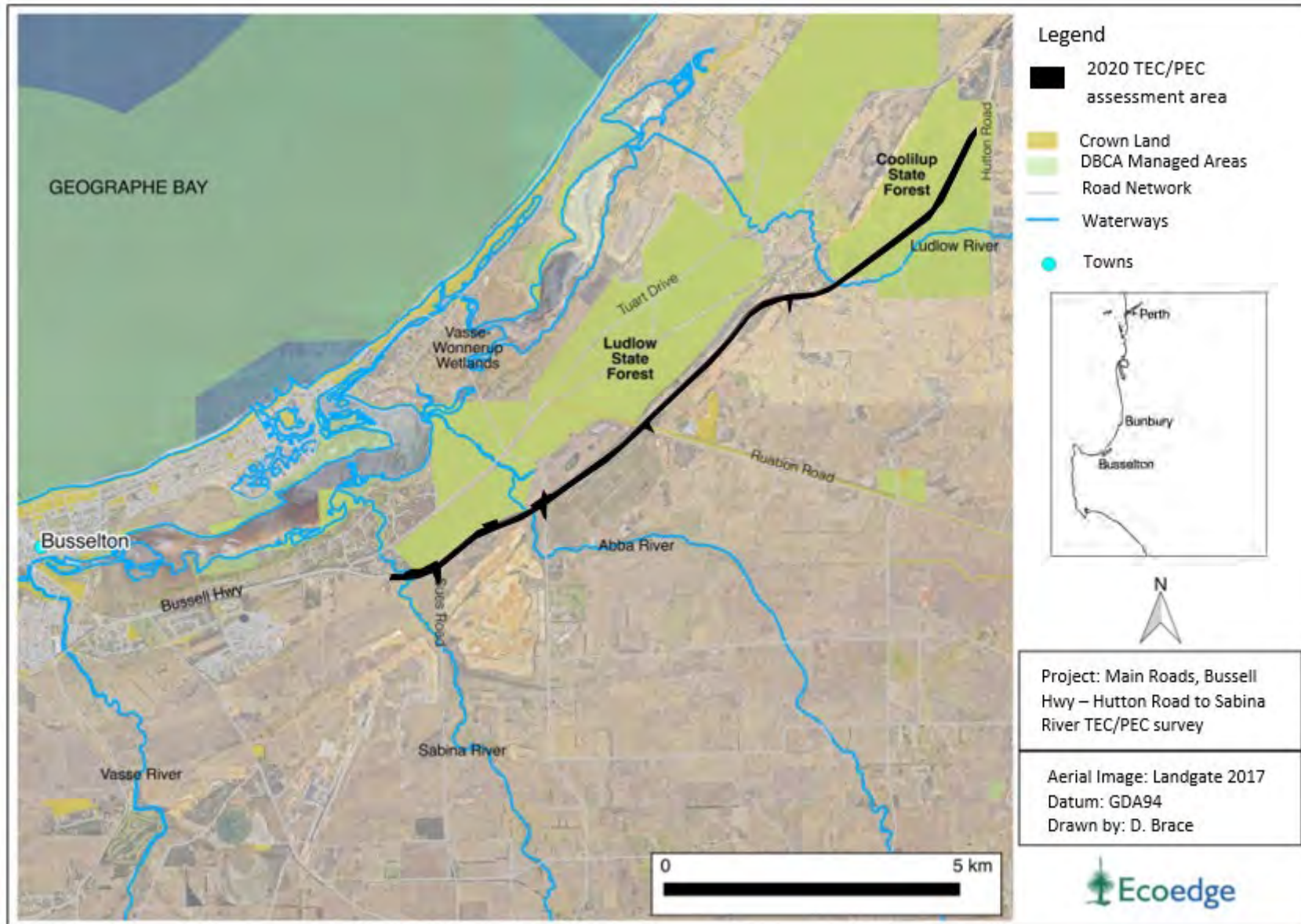


Figure 1. Aerial photograph showing the location of the survey area.

2 Method

2.1 Desktop Method

Prior to the survey, a desktop assessment was undertaken to identify all known and potential occurrences of State and Federally listed TECs and PECs within the survey area. The review included: application of local knowledge of the area; an assessment of previous survey reports; and consideration of the Main Roads supplied extract of DBCA TEC/PEC buffers within a 5 km radius of the survey area and Protected Matters Search Tool data search.

2.2 Field Survey Method

The ground-truthing survey of potential TEC and PEC occurrences that were identified in the desktop assessment was conducted by Russell Smith (senior botanist) (flora permit FB2000192) and Colin Spencer (botanist) (flora permit FB62000169) on 17 and 18 November and 12 and 17 December 2020 and utilised floristic data conducted from previous surveys by Ecoedge (2014, 2017, 2019, 2020).

The specific methods used to target each of the potential TEC and PEC occurrences within the survey area is provided below. These methods were all consistent with the EPA (2016) Technical Guidance Flora and Vegetation Surveys for Environmental Impact.

2.2.1 Tuart Woodlands TEC/PEC

The entire survey area was investigated for occurrences of tuart > 15 cm DBH. Where tuart were found, the patch was assessed in accordance with sampling protocols and advice outlined in the EPBC Act Approved Conservation Advice for the Tuart Woodlands (TSSC 2019) and Main Road Technical Guidance Fact Sheet (Main Roads 2020).

2.2.2 Banksia Woodland TEC/PEC

Data collected from previous surveys (Ecoedge 2014, 2017, 2019, 2020) was utilised in addition to new areas being surveyed for occurrences of Banksia species representative of the Banksia Woodland TEC/PEC. Where key Banksia species (*B. attenuata*, *B. ilicifolia*, *B. menziesii* and or *B. prionotes*) were found they were investigated and sampled in accordance with the Banksia TEC Approved Conservation Advice for the community (TSSC 2016).

2.2.3 Busselton Yate PEC

Data collected from previous surveys (Ecoedge 2014, 2017, 2019, 2020) was utilised in addition to new areas being surveyed for occurrences of *Eucalyptus cornuta* representative of the Busselton Yate Community. Where *E. cornuta* was found, all occurrences were marked with a GPS receiver in order to determine the extent of the community, noting that all occurrences of *Eucalyptus cornuta* on the SCP are considered part of the '*Eucalyptus cornuta*, *Agonis flexuosa* and *Eucalyptus decipiens* forest on deep yellow-brown siliceous sands over limestone (Busselton Yate community)' Priority 1 PEC by DBCA.

2.2.4 SCP08 Claypan TEC

Prior to ground truthing the survey area, a site was chosen that visually matched SCP08 (Claypan TEC) within a DBCA managed nature reserve northwest of Ruabon Road. This provided an indication of the vegetation structure, flora composition, soil type and topographical position of the local expression of this FCT which could be used as a point of comparison for the targeted survey. A quadrat (RUA01) was installed at this site.

The targeted search for SCP08 TEC included all patches of vegetation within and adjacent to the buffered occurrence of this community from database searches within the survey area. Aerial imagery and contour maps were used to delineate the perceived boundary of the SCP08 occurrence mapped by DBCA to the north west of the survey area.

The survey area was traversed and three quadrats (RUA02, RUA03 and RUA04) and 21 relevés were installed in vegetation having some similarity to the Claypan TEC in order to determine its floristic community type and conservation status. Notes on soil type were also taken.

Multivariate analysis

The floristic quadrat data from the potential Claypan TEC quadrats (RUA02, RUA03, RUA04) and the reference quadrat RUA01 were subjected to multivariate analysis MVA using the software PATN (Belbin, 2003) to determine the relationship of the vegetation sampled by the quadrats to the floristic community types derived for the SCP by Gibson et al. (1994).

The MVA used two-way classification (Agglomerative Hierarchical Fusion) of the presence/absence data for each quadrat. The flexible UPGMA classification strategy was used ($\beta = -0.1$), together with the Bray-Curtis site similarity measure. The default settings for number of groups to be produced by the classification (i.e., the “cut-off level”) was accepted in each case. The primary output of the classification were dendrograms and a two-way table of taxa and quadrats. Two separate MVAs were carried out. The matrix used in this MVA was 1,099 sites (quadrats) by 1,738 taxa. For the quadrats from the Gibson et al. (1994) report, the assigned FCT code was affixed to the quadrat name to facilitate understanding the MVA outputs.

2.3 Survey Limitations

Potential limitations with regard to the assessment are addressed in **Table 1**.

Table 1. Limitations of the field survey with regard to assessment adequacy and accuracy.

Aspect	Constraint	Comment
Scope	No	The survey scope was supplied by Main Roads and was designed to meet survey requirements of the state and federally listed TEC and PEC communities potentially occurring within the survey area.
Proportion of flora identified	Minor	This was a targeted vegetation survey which did not require the preparation of a comprehensive flora species list. This survey required enough species to be identified in order to competently identify the TEC and PEC vegetation being targeted.
Climatic and seasonal effects	Minor	The survey area recorded about average rainfall and temperatures in the lead up to the survey and ongoing rain in spring provided a sustained flowering of many species. This enabled identification of sufficient species for identification of TEC within the survey including the clay pan TEC as soil was still damp and water was still present meaning that most species were able to be confidently identified.
Availability of contextual information	Minor	Comprehensive regional surveys of remnant vegetation, as well as more localised surveys, have been carried out on the southern Swan Coastal Plain.
Completeness of the survey	Minor	Almost all of the search area was able to be investigated on foot. However, there were two areas on private property that could not be physically accessed. These were surveyed from behind the boundary fence. All these areas were open and easily observed. Assessment of vegetation, vegetation condition and dominant flora species and general soil type could easily be evaluated. They were both in a Completely Degraded condition and therefore not considered to be occurrences of TEC/PEC.
Skill and knowledge of the botanists	No	The senior botanist, Russell Smith has extensive experience in botanical surveys in south-west Australia over a period of 25 years. Colin Spencer has over 5 years' experience conducting botanical surveys in the SCP IBRA region.

3 Results

3.1 Desktop Assessment

The desktop assessment showed the occurrence of seven state listed PECs and five state listed TECs within the survey area. Six of these communities are also listed as federal TEC. These are shown in **Table 2** and **Figure 2**.

Table 2. TECs and PECs occurring within 5 km of the survey area (DBCA 2020; DAWE 2020).

No	Community Name	Community Description	State Status (WA)*	Federal Status (EPBC Act)
1	'Claypans of the Swan Coastal Plain' – a federally listed TEC consisting of several State-listed communities, 3 of which occur in the study area:	1. SCP07: Herb rich saline shrublands in clay pans 2. SCP08: Herb rich shrublands in clay pans 3. SCP10a: Shrublands on dry clay flats	1. T (VU) 2. T (VU) 3. T (EN)	T (CR)
2	Tuart (<i>Eucalyptus gomphocephala</i>) woodlands of the Swan Coastal Plain		P3 PEC	T (CR)
3	SCP 10b: Shrublands on southern Swan Coastal Plain Ironstones (Busselton area) Rapidly drying clay flats that occur on small areas of ironstone with thin skeletal soils in the Busselton Area.		T (CR)	T (EN)
4	'Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region' consisting of a number of different state listed priority ecological communities.		P3 PEC	T (EN)
5	SCP 21b Southern Banksia attenuata woodlands		P3 PEC	T (EN)
6	Coastal Saltmarsh	Subtropical and Temperate Coastal Saltmarsh	P3 PEC	T (VU)
7	SCP1b	Corymbia calophylla woodlands on heavy soils of the southern Swan Coastal Plain	T (VU)	
8	*Busselton Yate community	<i>Eucalyptus cornuta</i> , <i>Agonis flexuosa</i> and <i>Eucalyptus decipiens</i> forest on deep yellow-brown siliceous sands over limestone.	P1 PEC	

No	Community Name	Community Description	State Status (WA)*	Federal Status (EPBC Act)
9	Eucalyptus rudis, Marri and Peppermint Forest	Eucalyptus rudis (flooded gum), Corymbia calophylla, Agonis flexuosa Closed Low Forest (near Busselton)	P1 PEC	
10	Wooded waterbird wetlands	Wooded wetlands which support colonial waterbird nesting areas	P2 PEC	

T - Threatened, CR - Critically Endangered, EN - Endangered, VU – Vulnerable

P1 - Priority 1, P2 - Priority 2, P3 - Priority 3.

*Note only TECs are listed by the Minister for Environment in WA under the BC Act. PECs are listed by DBCA and do not have any statutory protection.

Of the above listed communities, four were recorded with buffers over the survey area (**Figure 2**) and formed the focus of the targeted TEC and PEC search, due to their likelihood of being present within the survey area. These are:

1. 'Tuart (*Eucalyptus gomphocephala*) Woodlands and Forests of the Swan Coastal Plain' [TEC/ Priority three PEC] (Tuart Woodland TEC/PEC).
2. 'Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region' [TEC/Priority three PEC] (Banksia Woodland TEC/PEC).
3. '*Eucalyptus cornuta*, *Agonis flexuosa* and *Eucalyptus decipiens* forest on deep yellow-brown siliceous sands over limestone' [NA/Priority one PEC] (Busselton Yate community).
4. SCP08: Herb rich shrublands in clay pans [TEC/PEC] (Claypan TEC). **Figure 3** shows the location where SCP08 may be found.

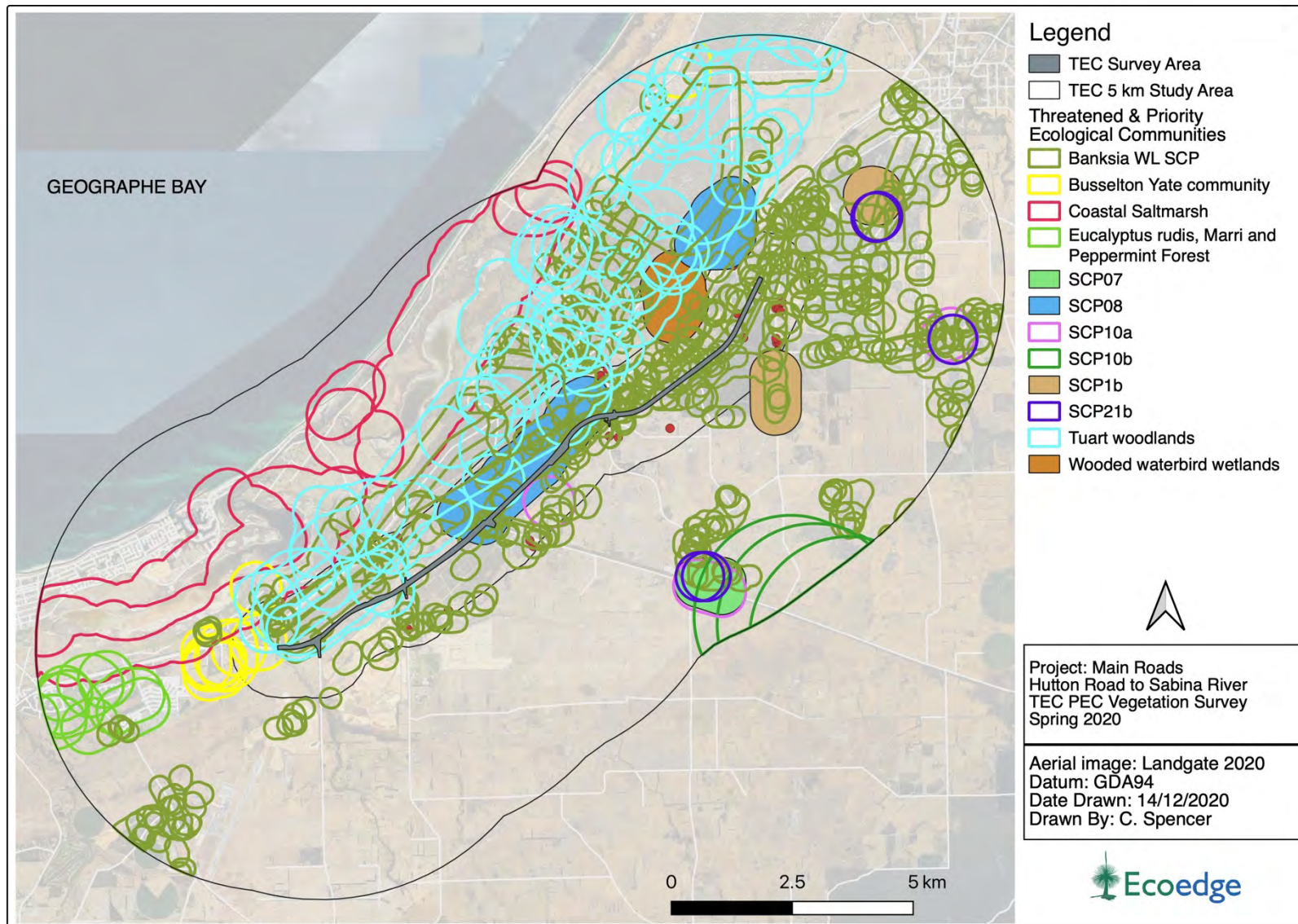


Figure 2. The location of TEC and PEC buffered communities within 5km of the survey area.

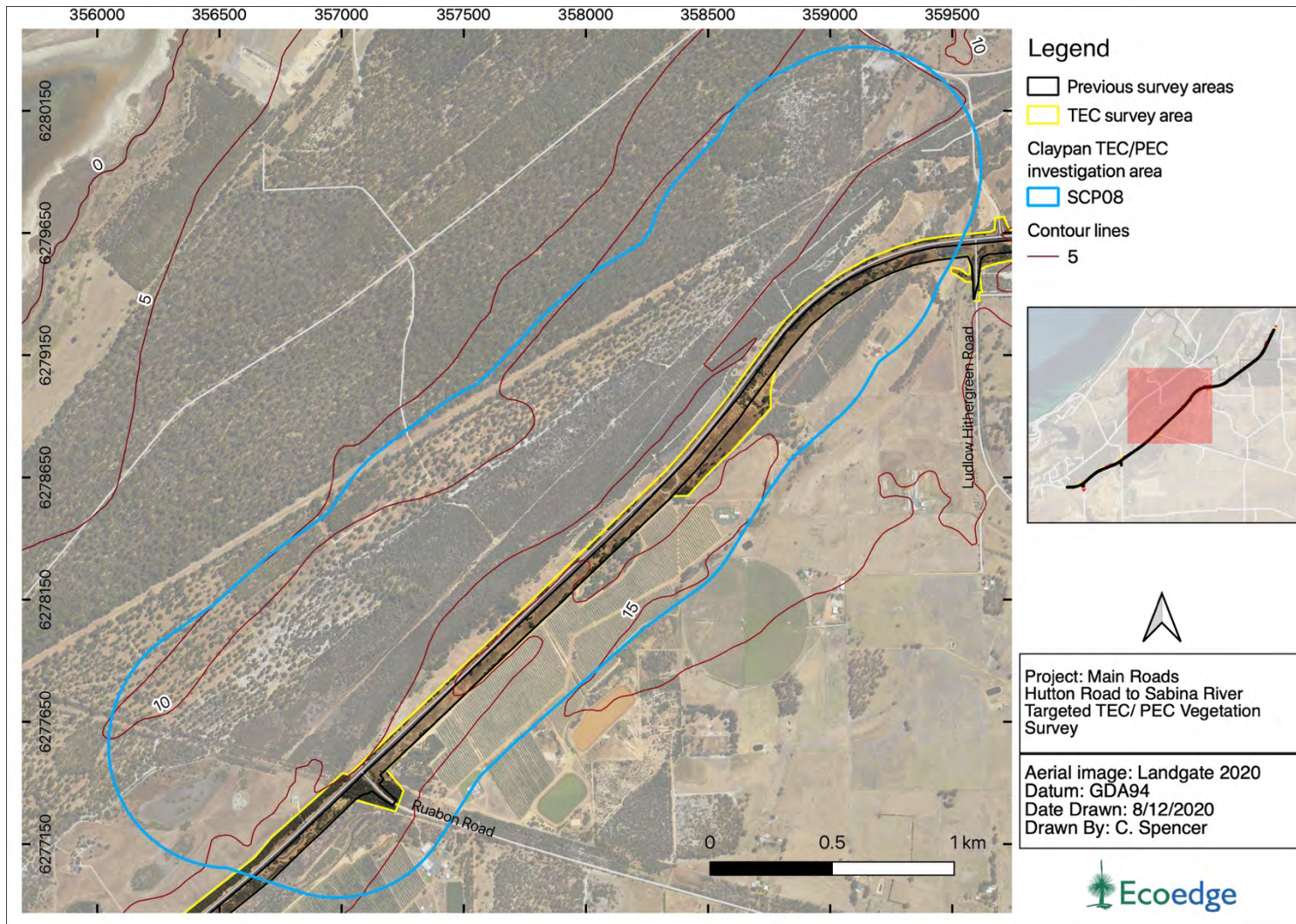


Figure 3. Location of SCP08 investigation area within the survey area.

3.1.1 Previous Surveys

Ecoedge has undertaken four surveys for Main Roads, that have characterised the majority of the survey area vegetation and its values¹:

1. Ecoedge, (2014). Level 1 Flora and Vegetation Survey – Bussell Highway, Hutton Rd to Sabina River (32.10 – 43.92 SLK).
2. Ecoedge, (2019). Detailed and Targeted Flora and Vegetation Survey along Bussell Highway, Hutton Road to Sabina River (32.10 – 43.92 SLK).
3. Ecoedge, (2020a). Targeted Vegetation Survey of Threatened and Priority Ecological Community Hutton Road to Sabrina River, Capel.
4. Ecoedge (2020b). Supplementary Targeted Flora and Vegetation Survey along Bussell Highway, Hutton Road to Sabina River (32.10 – 43.92 SLK).

Ecoedge (2014) and (2019)² identified the Busselton Yate P1 PEC and the Tuart Woodland TEC/PEC within the survey area consistent with the DBCA mapped occurrences of these communities. No other TEC or PEC communities were recorded in these surveys.

Ecoedge (2020b) investigated the two potential patches of Tuart Woodland TEC/PEC identified in the 2019 report, however these occurrences were confirmed not to qualify as the TEC/PEC as they did not meet the minimum area and condition thresholds as stated in the Conservation Advice (DoTEE 2019) and Main Roads factsheet (Main Roads 2020).

¹ These surveys also included flora components, but these components are not considered in this report. A further survey Ecoedge 2017 only targeted flora and again this was not considered in this report.

² The 2019 report consolidated the results of the 2014 report into it along with a targeted survey report Ecoedge 2017.

3.2 Field Survey

3.2.1 Tuart Woodland TEC

Twenty four (24) patches of Tuart Woodland were recorded across the survey as detailed in **Table 3**.

Table 3. Comparison of key diagnostic characteristics of the Tuart Woodland TEC/PEC.

Key diagnostic characteristics	Assessment outcome
Patches occurs in the Swan Coastal Plain bioregion.	Yes.
Primarily occurs on the Spearwood and Quindalup dune systems, but can also occur on the Bassendean dunes and Pinjarra Plain. It can also occur on the banks of rivers and wetlands.	Yes, occurs in the edge of Spearwood dune system.
The presence of at least two living established <i>Eucalyptus gomphocephala</i> (Tuart) trees in the uppermost canopy layer, although they may co-occur with trees of other species.	Yes, all patches had at least two living established Tuart trees with a diameter at breast height greater than 15 cm.
There is a gap of no more than 60 m between the outer edges of the canopies of adjacent Tuart trees.	Yes, gaps were less than 60 m.

When assessed against the criteria to define patches of TEC, three of the 24 patches were regarded as occurrences of the Tuart Woodland TEC/PEC, being patches 22, 23 and 24. These patches exceeded the minimum area threshold of five hectares to be considered an occurrence of the TEC regardless of condition. All remaining patches did not meet the minimum area and condition thresholds and are therefore not occurrences of the TEC/PEC. The total area of all three patches of TEC/PEC is 29.02ha, including areas outside the survey area.

The distribution of tuart within each of the patches is shown in **Figure 4** to **Figure 8**. The distance between each of the mapped tuarts is less than 60 m from their canopy boundaries.

Summaries of the assessments of each of the patches is provided in **Table 4** with full assessments provided in **Appendix 1**.

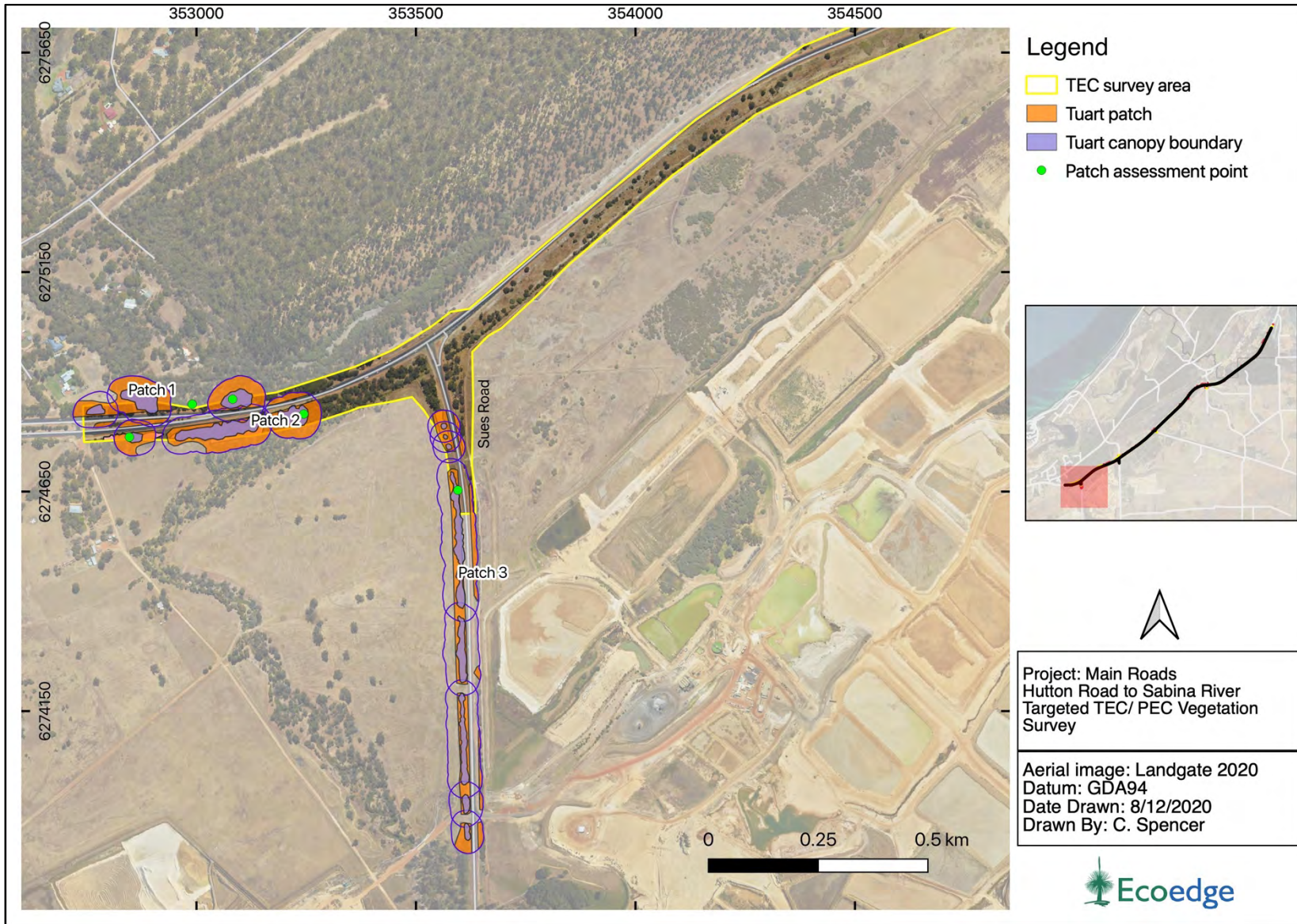


Figure 4. Location of Tuart patches within the survey area.

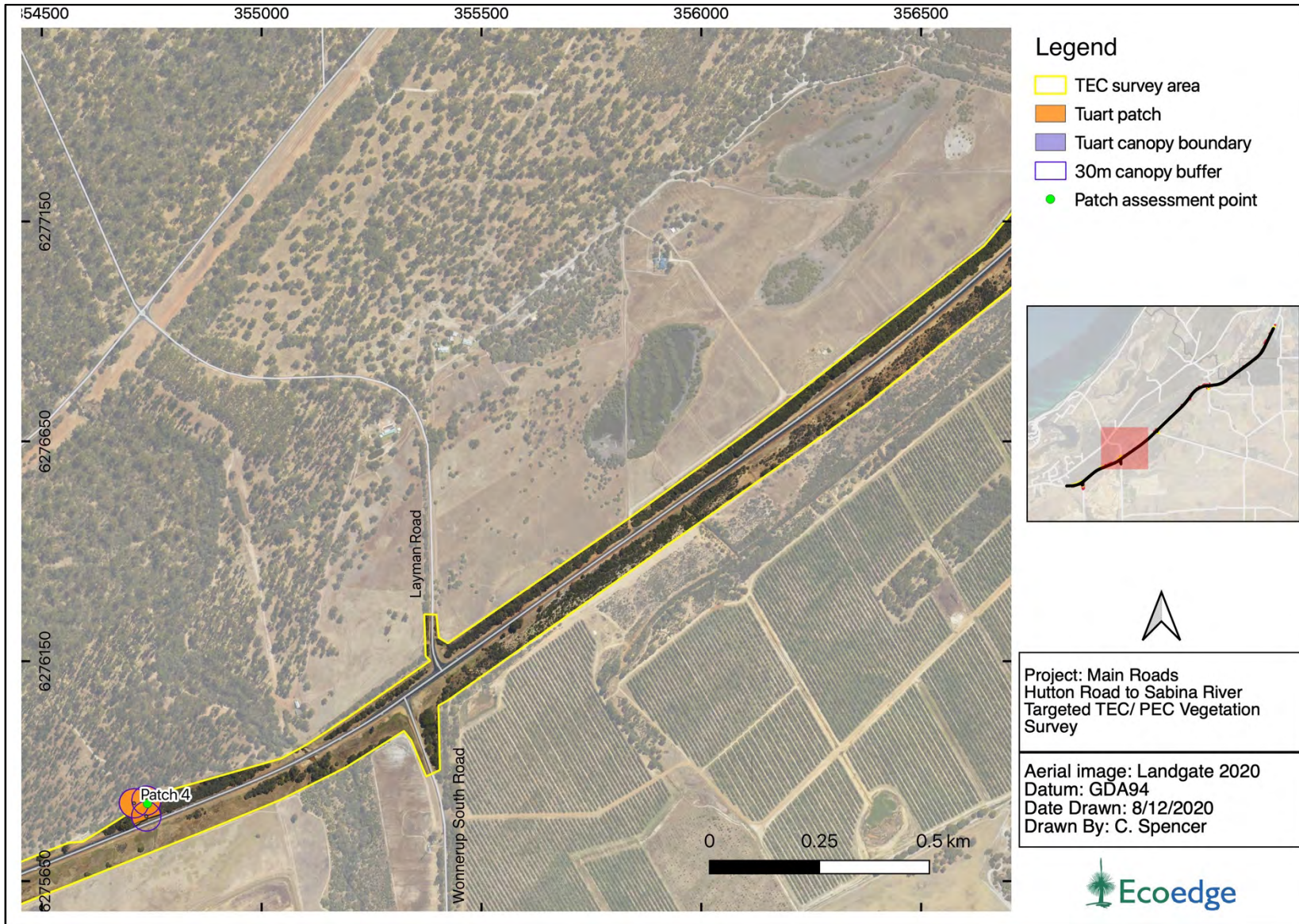


Figure 5. Location of Tuart patches within the survey area.

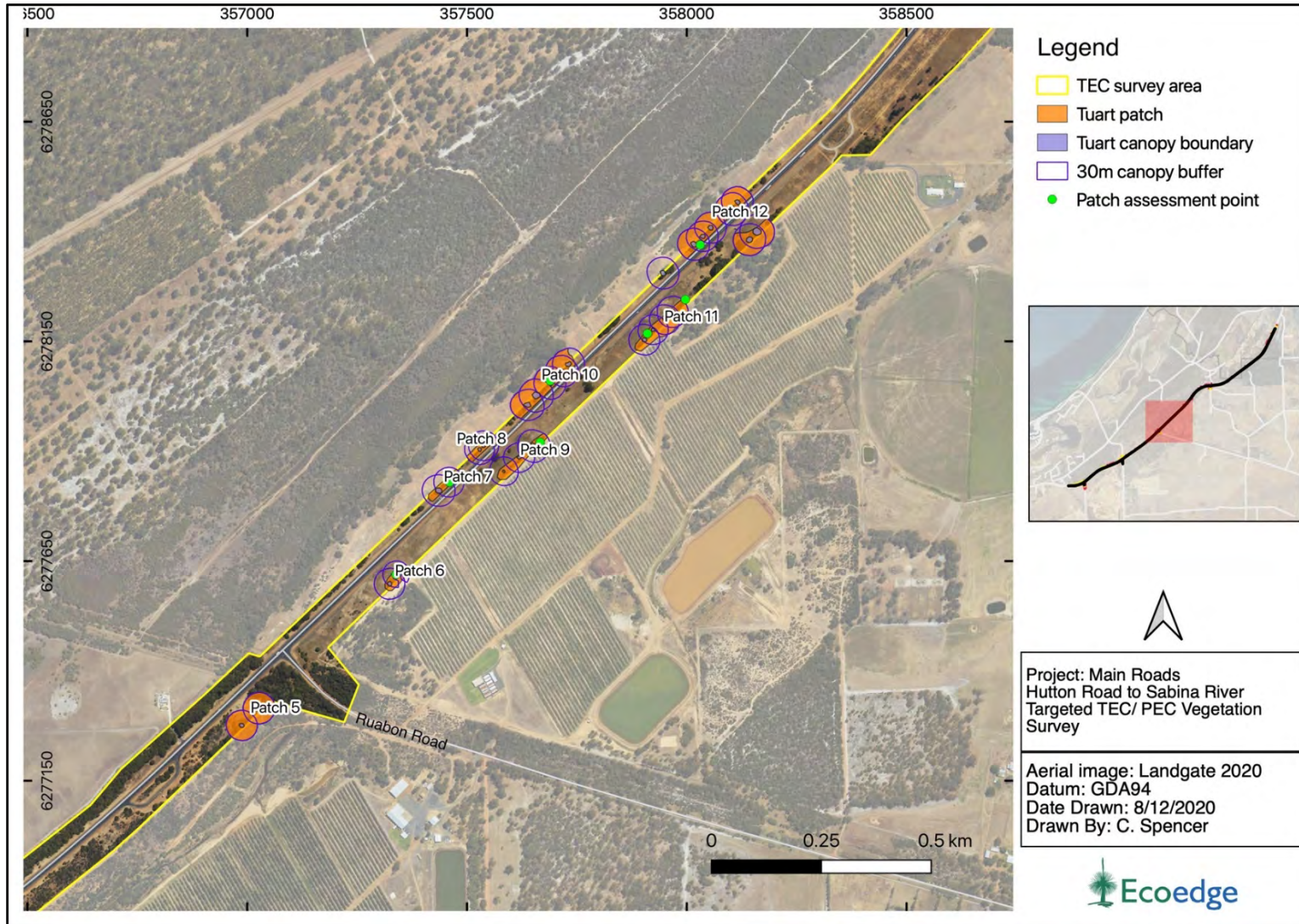


Figure 6. Location of Tuart patches within the survey area.

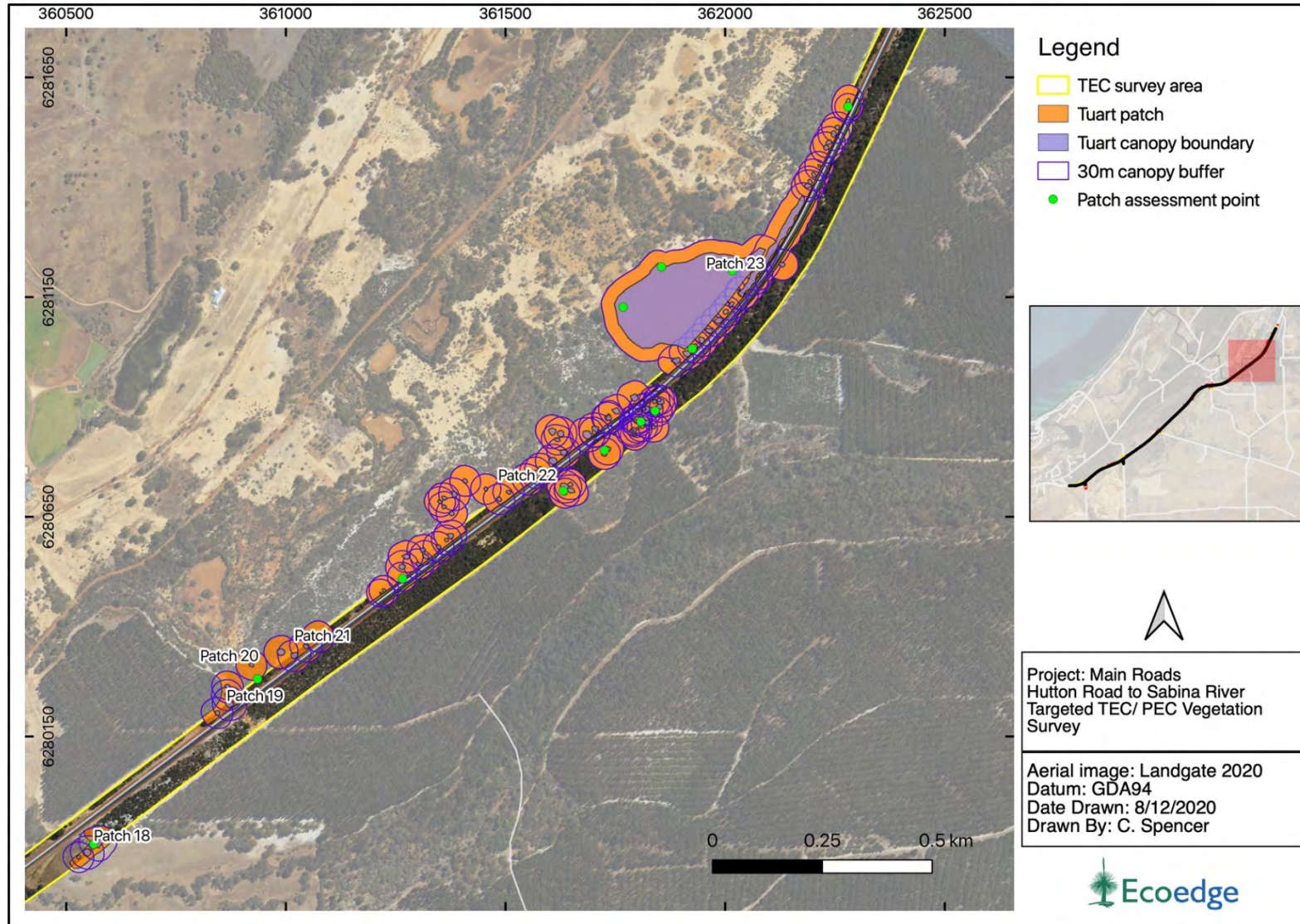


Figure 7. Location of Tuart patches within the survey area.

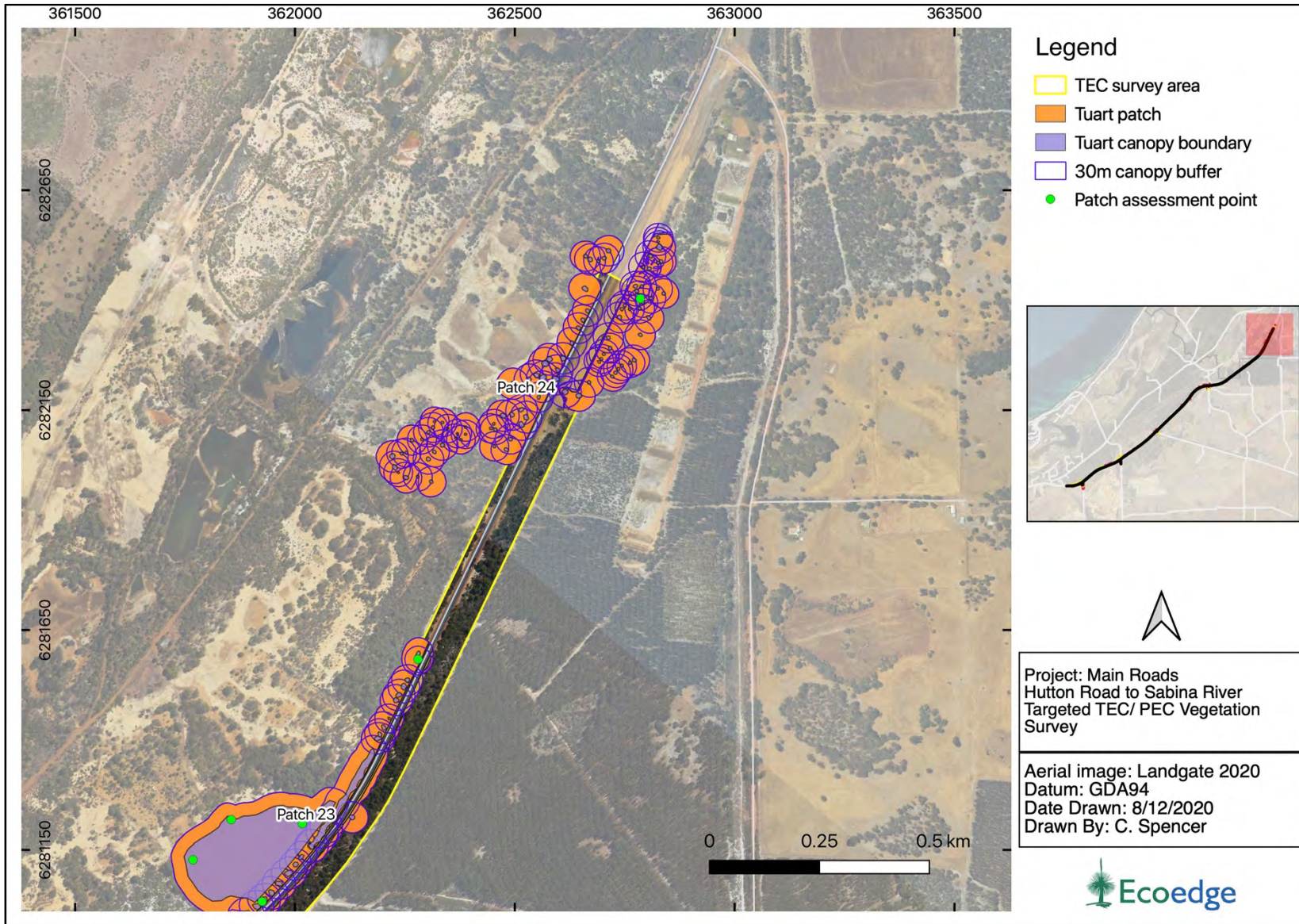


Figure 8. Location of Tuart patches within the survey area.

Table 4. Summary of Tuart patch assessments within the survey area.

Patch	Total estimated patch size (ha)	Condition	No. patch assessment sites	Patch assessment code	Does it meet the TEC criteria	Summary
1	1.72	Poor	2	CS24, CS25	No	The patch is between 2 and 5 ha but the patch is in a Poor condition, so it does not qualify as the TEC/PEC.
2	2.972	Poor	2	CS27, CS28	No	The patch is between 2 and 5 ha but the patch is in a Poor condition, so it does not qualify as the TEC/PEC.
3	2.714	Poor	2	CS26, CS29	No	The patch is between 0.5 and 2 ha but the patch is in a Poor condition, so it does not qualify as the TEC/PEC.
4	0.595	Poor	1	CS30	No	The patch is between 0.5 and 2 ha but the patch is in a Poor condition, so it does not qualify as the TEC/PEC.
5	0.743	Poor	1	CS18	No	The patch is between 0.5 and 2 ha but the patch is in a Poor condition, so it does not qualify as the TEC/PEC.
6	0.135	Poor	1	CS14	No	The patch is less than 0.5 ha which is less than the minimum area for a patch to be considered the TEC/PEC.
7	0.153	Poor	1	CS19	No	The patch is less than 0.5 ha which is less than the minimum area for a patch to be considered the TEC/PEC.
8	0.144	Poor		Nil	No	The patch is less than 0.5 ha which is less than the minimum area for a patch to be considered the TEC/PEC.
9	0.281	Poor	1	CS13	No	The patch is less than 0.5 ha which is less than the minimum area for a patch to be considered the TEC/PEC.
10	0.867	Poor	1	CS12	No	The patch is between 0.5 and 2 ha, but the patch is in a Poor condition, so it does not qualify as the TEC/PEC.
11	0.498	Poor	2	CS11, CS09	No	The patch is less than 0.5 ha which is less than the minimum area for a patch to be considered the TEC/PEC.
12	1.373	Moderate	1	CS10	No	The patch is between 0.5 and 2 ha, but the patch is in a Moderate condition, so it does not qualify as the TEC/PEC.
13	0.859	Poor	2	CS31, CS17	No	The patch is between 0.5 and 2 ha, but the patch is in a Poor condition, so it does not qualify as the TEC/PEC.

Patch	Total estimated patch size (ha)	Condition	No. patch assessment sites	Patch assessment code	Does it meet the TEC criteria	Summary
14	0.292	Poor	1	CS16	No	The patch is less than 0.5 ha which is less than the minimum area for a patch to be considered the TEC/PEC.
15	0.246	Poor	1	CS15	No	The patch is less than 0.5 ha which is less than the minimum area for a patch to be considered the TEC/PEC.
16	0.379	Poor	1	CS14a	No	The patch is less than 0.5 ha which is less than the minimum area for a patch to be considered the TEC/PEC.
17	0.379	Poor	1	CS08	No	The patch is less than 0.5 ha which is less than the minimum area for a patch to be considered the TEC/PEC.
18	0.446	Poor	1	CS07	No	The patch is less than 0.5 ha which is less than the minimum area for a patch to be considered the TEC/PEC.
19	0.512	Moderate	1	CS06	No	The patch is between 0.5 and 2 ha, but the patch is only in a Moderate condition, so it does not qualify as the TEC/PEC.
20	0.385	Not a patch		nil	No	Not a patch – only one Tuart tree
21	0.87	Moderate	1	CS06	No	The patch is between 2 and 5 ha, but the patch is in a Moderate condition, so it does not qualify as the TEC/PEC.
22	7.742	Moderate	5	CS01, CS02, CS23, CS22, CS34	Yes	Patch is greater than 5 ha, so it automatically qualifies as the TEC/PEC.
23	9.979	Poor, Moderate	5	CS03, CS04, CS05, CS32, CS33	Yes	Patch is greater than 5 ha, so it automatically qualifies as the TEC/PEC.
24	11.3	Poor	2	CS20, CS21	Yes	Patch is greater than 5 ha, so it automatically qualifies as the TEC/PEC.

3.2.2 Banksia Woodland TEC/PEC

No occurrences of the Banksia woodland TEC/PEC were recorded within the survey area. Several small pockets of *Banksia attenuata* were observed, however these occurred in areas of degraded bushland and the patches were less than 2 ha in size, so they did not meet the minimum area and condition thresholds for this community.

3.2.3 Busselton Yate PEC

Only one occurrence of the Busselton Yate community was recorded within the survey area. This occurrence was recorded as vegetation unit A2 in previous surveys (Ecoedge 2014, Ecoedge 2019) with 14 *E. cornuta* trees recorded in the occurrence. Its distribution is shown in **Figure 9**.

This vegetation unit is approximately 0.8 ha in size and is in Completely Degraded condition. The *E. cornuta* is in an area of roadside revegetation and appears to have been planted, and the area is virtually devoid of native understory taxa. Nevertheless, the stand of Yate is regarded as natural by DBCA, and as such it has conservation value, being considered to be a remnant of a once much more widespread community on this part of the SCP (Andrew Webb, pers. comm). All occurrences of *E. cornuta* on the SCP are considered part of the Busselton Yate PEC (P1) by DBCA.

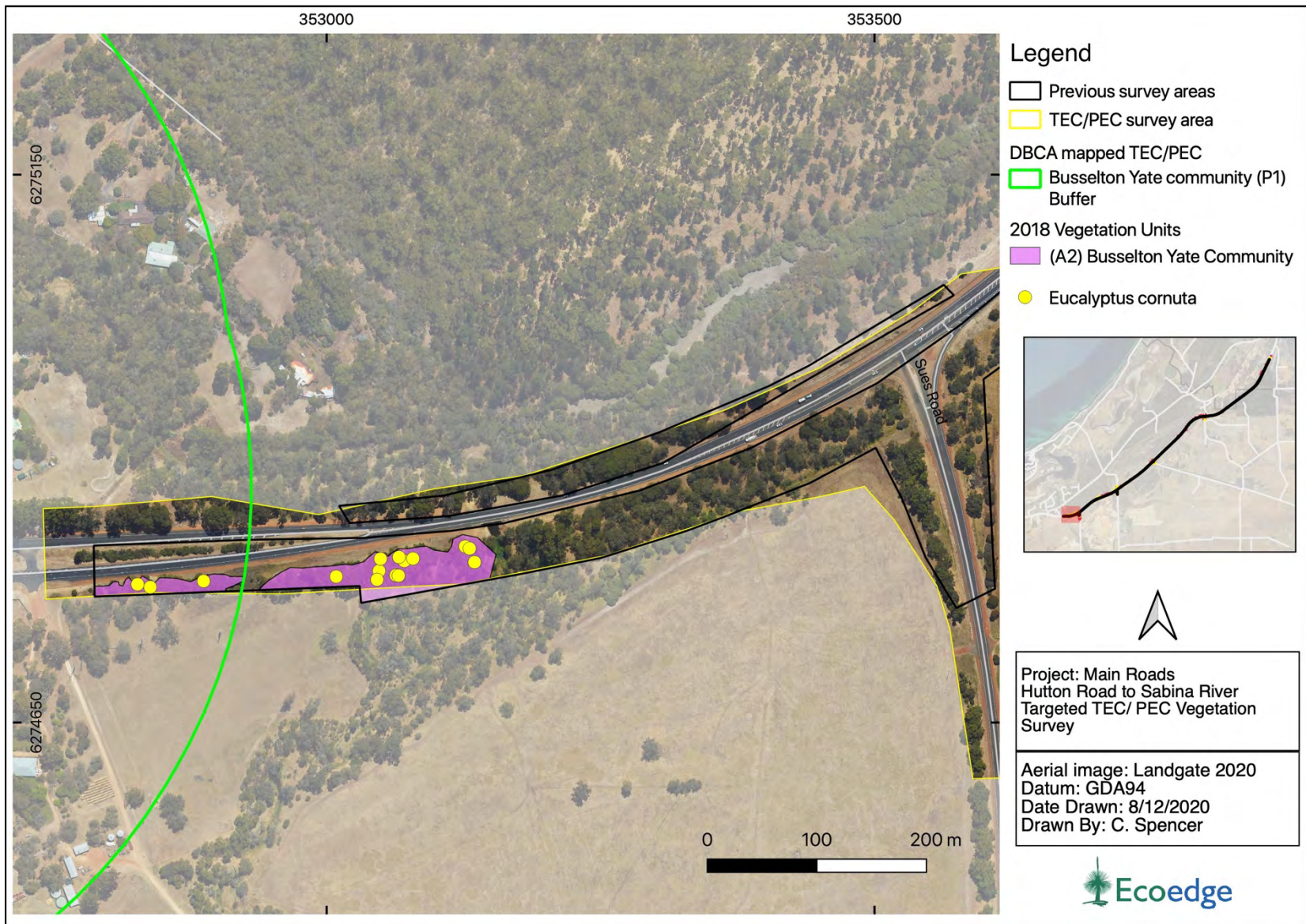


Figure 9. Location of *Eucalyptus cornuta* within the survey area.

3.2.4 SCP08 Claypan TEC

Areas on higher ground were considered not likely to be Claypan TEC (see contours in **Figure 3**). Vegetation in these areas show no similarities with Claypan species, instead featuring upland species such as tuart.

The ground truthed vegetation along Bussell Hwy comprised predominantly of a low woodland of *Melaleuca raphiophylla*, *Agonis flexuosa*, *M. preissiana* over a tall open shrubland to shrubland of *Kunzea glabrescens*, *M. viminea*, *M. osullivanii* over a mid-height shrubland to open mid-height shrubland of *Regelia ciliata*, *M. incana*, *Astartea scoparia* over an open sedgeland to sedgeland of *Ghania trifida* with *Lepidosperma longitudinale*, *Baumea vaginalis*, *Baumea preissii* and *Leptocarpus decipiens* in low swales and a grassland of introduced grasses and introduced herbs over grey brown sand and orange brown loamy sand (**Figure 10**).



Figure 10. Typical vegetation investigated for claypan TEC.

Four quadrats (RUA01-reference site, RUA02, RUA03, and RUA04) were installed in the potential Claypan TEC occurrences. According to the results of the MVA, none of these were similar to Claypan TEC. The location of quadrats and relevés are shown in **Figure 11**.

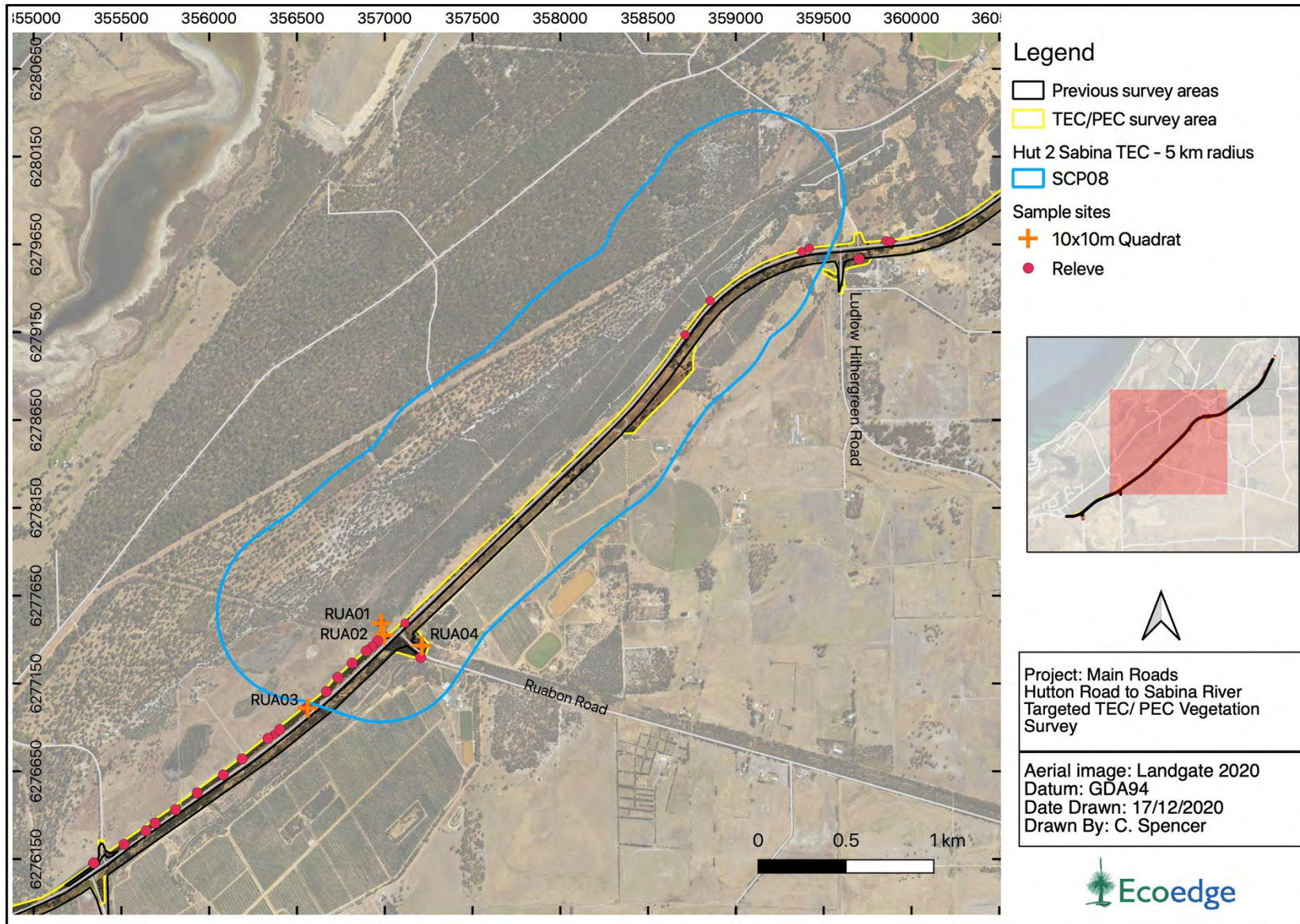


Figure 11. Relevés and quadrat locations within the survey area.

When the MVA of quadrat RUA01 was run without the other current quadrats, it clustered with FCT08 quadrats (**Figure 12**). However, when all four quadrats were subjected to the MVA analysis, quadrats RUA01, RUA02 and RUA03 all clustered with FCT11 ('Wet forest and woodlands'), which is regarded as well reserved and not a TEC or PEC. **Figure 13** is a snapshot of this MVA cluster. Quadrat (RUA04), which was sited in vegetation with structural similarities to RUA01 at the Ruabon Road intersection, clustered with FCT13 'Deeper wetlands on heavy soils' which is regarded as well reserved and not a TEC or PEC (**Figure 14**). The full MVA is available on request. Details and photos of the four potential Claypan TEC quadrats are provided in **Appendix 2**.

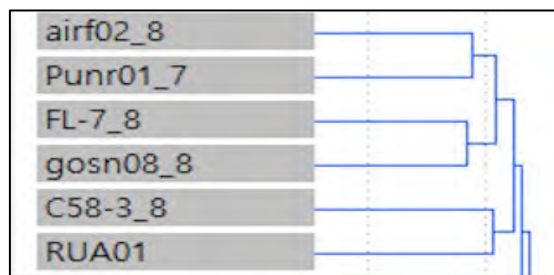


Figure 12. RUA01 clustering with FCT08.

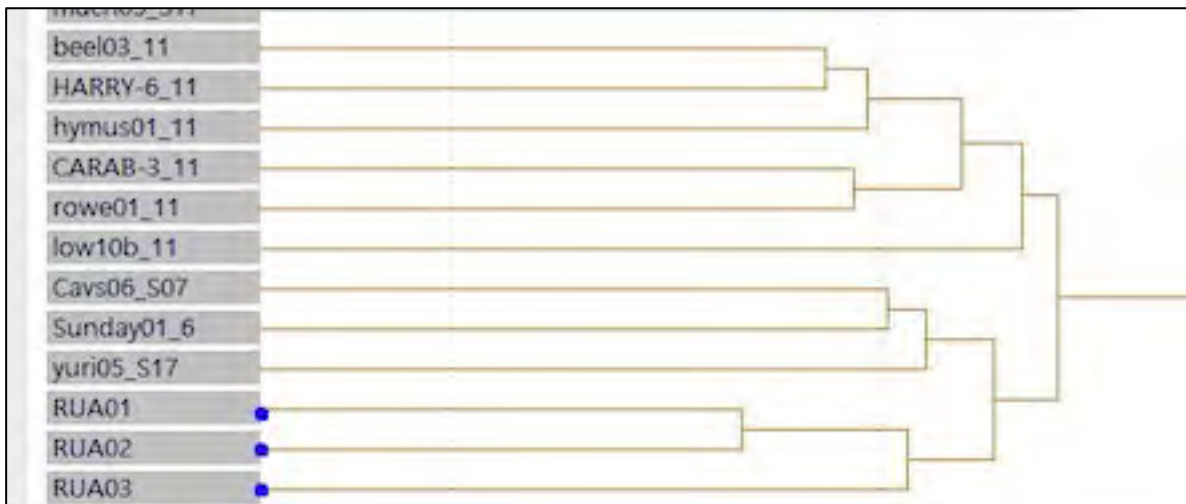


Figure 13. RUA01, RUA02, RUA03 clustering with FCT11.

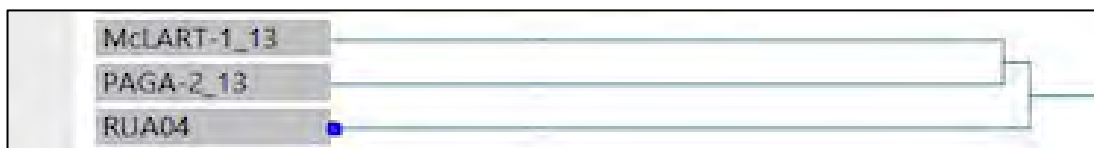


Figure 14. RUA04 clustering with FCT13.

4 Discussion and conclusions

Across the survey area, 24 tuart patches were identified. Of these, three patches were considered to be occurrences of the TEC/PEC. There is a total of 29.02ha of Tuart Woodland TEC/PEC extending over the three patches, including areas outside the survey area.

Although *Banksia attenuata* was recorded within the survey area there were no areas that met the patch size and condition thresholds and therefore it was determined that no Banksia Woodland TEC/PEC was present in the survey area.

Fourteen *Eucalyptus cornuta* trees that appear to be planted were recorded within the survey area, within 0.8ha of vegetation in Completely Degraded condition. These trees represent Busselton Yate P1 PEC and are regarded by DBCA as having conservation value as they were once part of a more widespread community on the SCP.

Ground truthing of potential Claypan vegetation found no areas that were comparable to SCP08. MVA analysis was also used to determine whether the quadrats were similar to any known occurrences of Claypan TEC. The assessment concluded that no areas within the survey area are classified as the Claypan TEC. The MVA results indicated that RUA01 = FTC08 (Claypan TEC but not in the Main Roads clearing envelope), RUA02 & RUA03 = FCT11 (not a TEC) and RUA04 = FCT13 (not a TEC).

4.1 Feedback from DBCA

The following section has been added to the discussion in light of feedback provided by the DBCA SW office on the post survey outcomes of the survey. It is included as it was considered important that these matters be adequately considered as part of a thorough investigation of TEC and PEC occurrences within the survey area.

4.1.1 FCT01b Southern *Eucalyptus calophylla* woodlands on heavy soils

Following a review of the draft survey report, DBCA advised that, given the areas of Good or better condition Marri dominated vegetation within the survey area, FCT01b Southern *Eucalyptus calophylla* woodlands on heavy soils (state TEC) is likely to be present, and may have been overlooked. DBCA acknowledged that most of the survey area had been historically highly disturbed from mining activities, but that areas with less disturbance may resemble the community.

Following consideration of this advice, Ecoedge reviewed occurrences of Marri dominated vegetation within the survey area. Based on a visual assessment, it was considered that a portion of understorey vegetation potentially resembling FCT01b was overlooked in the 2020 TEC PEC survey. The area is located on largely undisturbed soils north west of the Ruabon Road intersection. To be conservative with a lack of further detailed survey, this occurrence is estimated to be approximately 0.23 ha in size as shown in **Figure 15**. No other potential occurrences of FCT01b were identified in the Ecoedge review of the survey area.

4.1.2 FCT09 Dense shrublands on Clay flats

The DBCA advised, based on a visual assessment of the survey area in April 2021, that vegetation unit F located near the northern boundary of the survey area resembled a sandy, sedge-dominated occurrence of FCT09. FCT09 is a State (VU) and Federally listed TEC (CR). DBCA further advised that with the exception of the Highway fringing extent in Very Good condition the rest is of a Good to Degraded condition and that it would not be considered a particularly high conservation value occurrence. The occurrence of vegetation unit F (as mapped in (Ecoedge 2020b) covers 0.89 ha and is shown in **Figure 16**.

This visual assessment by DBCA is in contrast to the FCT assigned by MVA for this unit in 2018: FCT 17 (*Melaleuca raphiophylla* – *Gahnia trifida* seasonal wetlands) which is well reserved with a low-risk conservation status. Two quadrats were installed within representative vegetation in unit F in 2018. The quadrats were assessed in August and October 2018 and the results subjected to an MVA in which they were compared to a subset of the Gibson et al. 1994 dataset.³ The resulting MVA grouped the quadrats with six quadrats; three quadrats from FCT17, two with FCT16 ('Highly seasonal saline wetlands') and a single quadrat designated as FCT06 ('Weed dominated wetlands on heavy soils'). The outcomes of the MVA are reported in Ecoedge 2019 and Ecoedge 2020b survey reports.

Unit F was tentatively assigned to FCT17 because it did not have the characteristic salinity-adapted taxa of FCT16 (such as *Atriplex cinerea* or *Samolus repens*). FCT06 is a poorly defined community, characterised by weeds and occurring on heavy soils of the Pinjarra Plain.

The group, or cluster in which the unit F quadrats was placed was in turn placed in a 'super-group' with quadrats from FCT13 ('Deeper wetlands on heavy soils') and other FCT17 quadrats (Ecoedge, 2020b⁴). None of the quadrats within this 'super-group' are 'claypan' quadrats. The claypan community quadrats (FCT07, FCT08, FCT09 and FCT10a), all part of the Claypans of the Swan Coastal Plain TEC, were placed in a separate and distinct super-group (along with quadrats from other wetland FCTs) separated at a high level from the super-group in which the unit F quadrats were placed. The MVA very distinctly separated the cohort of quadrats in which the two-unit F quadrats were placed away from any 'claypan' quadrats.

No quadrat data for this 'sedge-dominated' form of FCT09 is available at the time of writing, so it is not possible to evaluate the relation of the unit F quadrats to it.

There is a large amount of floristic variation in both FCT09 and FCT17 which are likely not fully represented by the relatively poor representation of these communities in the Gibson *et al.* (1994) Swan Coastal Plain survey data set. Each of these FCTs was represented by only eight quadrats in the survey. Given the diversity of the FCTs and their relative lack of representation within the data set it is possible that the vegetation present in unit F does not satisfactorily fit into either of these SCP floristic community types, but when subjected to MVA the quadrats

³ This subset of the SCP data comprised 149 quadrats occurring south of Bagieau Road in Myalup, about 45 km north of Bunbury.

⁴ The full dendrogram is available as an appendix to the Ecoedge (2020b) report.

placed within it clustered with FCT17 quadrats rather than the FCT09 quadrats in the dataset. The vegetation is therefore not considered to be a TEC based on this.

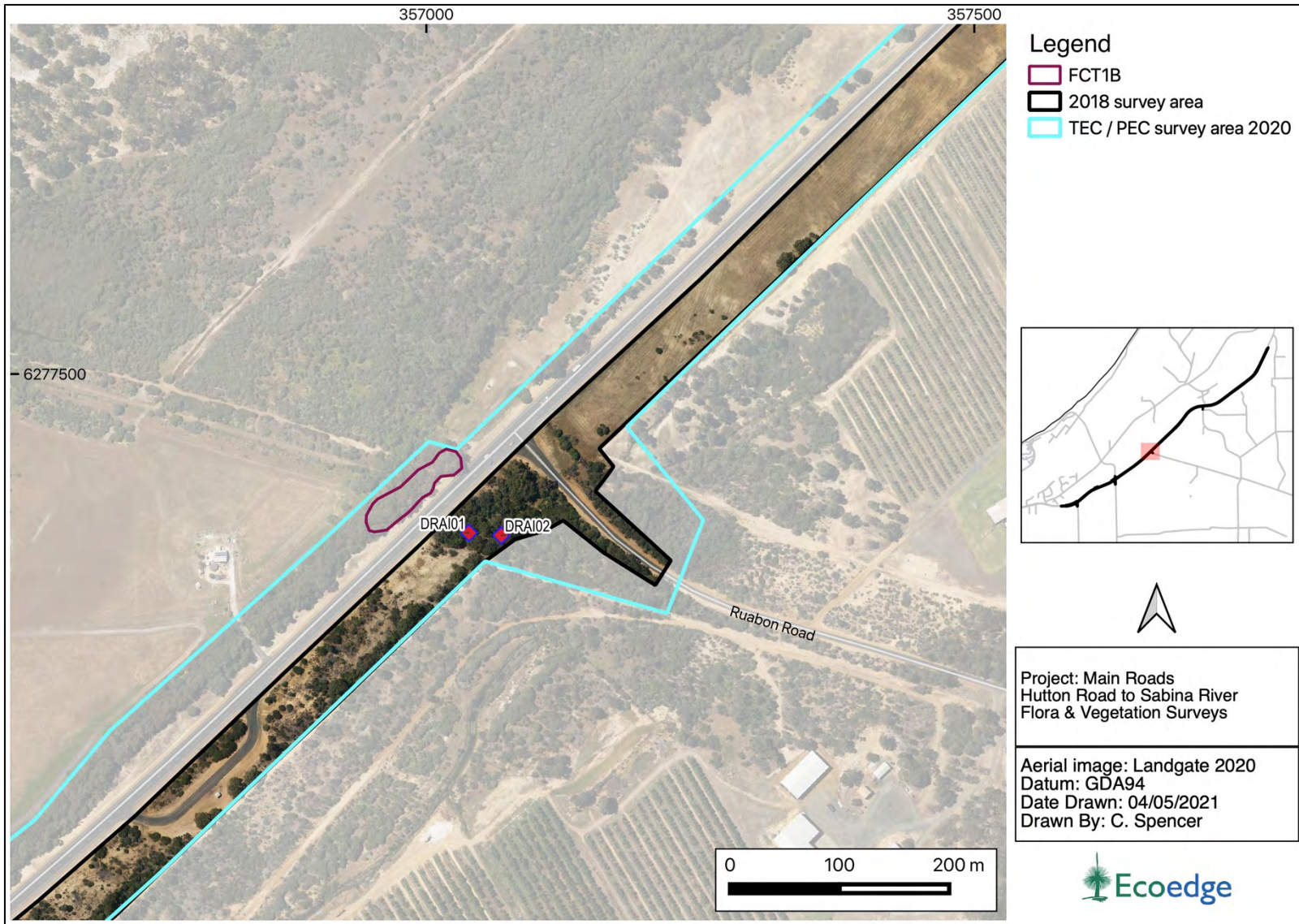


Figure 15. Location of occurrence of FCT1b within the survey area.

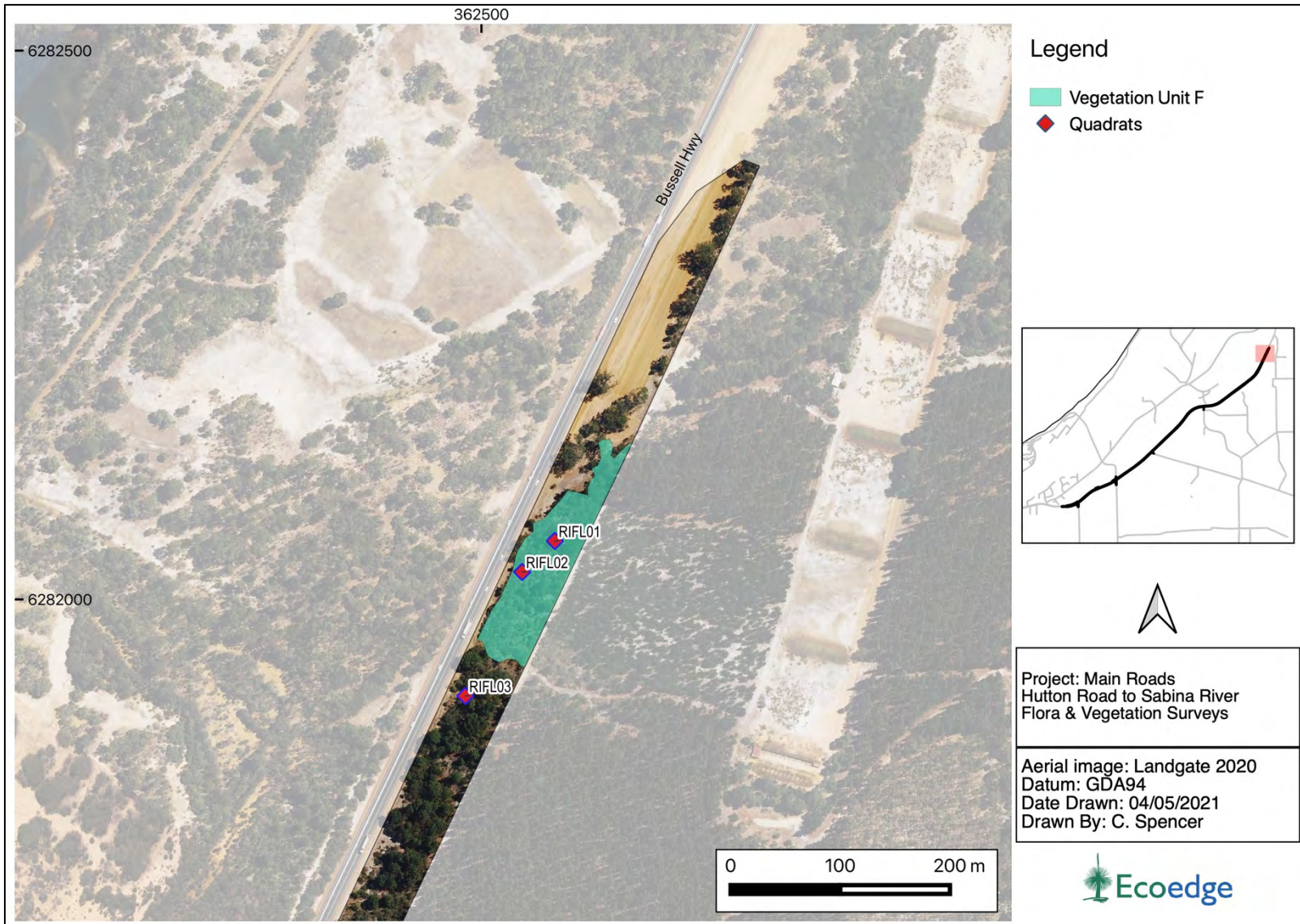


Figure 16. Location of Unit F within the survey area.

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Appendix 1. Tuart Patch Assessment



Patch name: 1	CS24
Latitude:	-33.3342122
Longitude:	115.6464051
Date:	2020-08-12
Estimated size of patch:	2-5 ha
Site photo:	611c9451-4b7d-4781-b2d3-026f33de3038
Photo direction:	North East
Landform system:	Spearwood
Topographic position:	Dry flat
Condition:	Completely degraded
Soil colour	Grey-brown
Soil type:	Loamy sand
Dominant trees 10 - 30m:	<i>Eucalyptus gomphocephala</i>
Structural form of tuart:	Single Stem
Estimated number of Tuarts in patch:	100
Diameter at breast height:	>50 cm
% Cover native understory cover:	<50%
Disturbances:	
Weed cover:	>70%
Evidence of fire:	no
Time since fire:	
Evidence of tuart dieback:	no
Level of dieback impact	
Indicators of important landscape, habitat or regeneration features:	
Patch is less than 100 m from bushland > 1ha in at least good condition with >=50% native species:	no
Patch contains a mean of >= 2 trees >=50 cm DBH per half ha of any native tree:	yes
The patch displays evidence of natural regeneration of at least a mean of 15 eucalypts seedling / saplings (<15 cm DBH) per half ha:	no
Other comments:	

List of understorey species

Taxon Name	Naturalised
<i>Briza maxima</i>	x
<i>Bromus diandrus</i>	x
<i>Crassula colorata</i>	
<i>Ehrharta calycinus</i>	x
<i>Ehrharta longiflora</i>	x
<i>Euphorbia peplus</i>	x
<i>Hypochaeris glabra</i>	x



Patch assessment number: 1	CS25
Latitude:	-33.65673373
Longitude:	115.4129704
Date:	2020-08-12
Estimated size of patch:	<0.5 ha
Site photo:	59275a51-9c87-4480-ad9a-dd3d47653d08
Photo direction:	South
Landform system:	Pinjarra plain
Topographic position:	Dry flat
Condition:	Completely degraded
Soil colour	Grey-brown
Soil type:	Sandy loam
Dominant trees 10 - 30m:	<i>Eucalyptus cornuta</i> , <i>Eucalyptus gomphocephala</i> , <i>Corymbia calophylla</i>
Structural form of tuart:	Single Stem
Estimated number of Tuarts in patch:	3
Diameter at breast height:	>50 cm
% Cover native understory cover:	<50%
Disturbances:	
Weed cover:	>70%
Evidence of fire:	
Time since fire:	
Evidence of tuart dieback:	
Level of dieback impact	
Indicators of important landscape, habitat or regeneration features:	
Patch is less than 100 m from bushland > 1ha in at least good condition with \geq 50% native species:	no
Patch contains a mean of \geq 2 trees \geq 50 cm DBH per half ha of any native tree:	no
The patch displays evidence of natural regeneration of at least a mean of 15 eucalypts seedling / saplings (<15 cm DBH) per half ha:	no
Other comments:	Not a patch, separated from other patches by greater than 60 m. Less than .5 in CD conditions

List of understorey species

Taxon Name	Naturalised
Avena barbata	x
Briza maxima	x
Ehrharta calycina	x
Hibbertia racemosa	
Sonchus oleraceus	x
Trifolium hirtum	x



Patch assessment number: 2	CS28
Latitude:	-33.65598774
Longitude:	115.415521
Date:	2020-08-12
Estimated size of patch:	2-5 ha
Site photo:	ae58eee3-70de-4a0f-be28-ae967ebe3aa5
Photo direction:	North East
Landform system:	Spearwood
Topographic position:	Dry flat
Condition:	Completely degraded
Soil colour	Grey-brown
Soil type:	Sandy loam
Dominant trees 10 - 30m:	<i>Eucalyptus gomphocephala</i>
Structural form of tuart:	Single Stem
Estimated number of Tuarts in patch:	10
Diameter at breast height:	>50 cm
% Cover native understory cover:	<50%
Disturbances:	
Weed cover:	>70%
Evidence of fire:	no
Time since fire:	
Evidence of tuart dieback:	no
Level of dieback impact	
Indicators of important landscape, habitat or regeneration features:	
Patch is less than 100 m from bushland > 1ha in at least good condition with >=50% native species:	no
Patch contains a mean of >= 2 trees >=50 cm DBH per half ha of any native tree:	yes
The patch displays evidence of natural regeneration of at least a mean of 15 eucalypts seedling / saplings (<15 cm DBH) per half ha:	no
Other comments:	

List of understorey species

Taxon Name	Naturalised
<i>Allocasuarina humilis</i>	
<i>Brachyloma preissii</i>	
<i>Briza maxima</i>	x
<i>Conostylis aculeata</i>	
<i>Corymbia calophylla</i>	
<i>Desmocladius flexuosa</i>	
<i>Hardenbergia comptoniana</i>	
<i>Hakea prostrata</i>	
<i>Hardenbergia comptoniana</i>	
<i>Hibbertia hypericoides</i>	
<i>Hibbertia racemosa</i>	
<i>Leucopogon propinquus</i>	
<i>Melaleuca thymoides</i>	
<i>Oxalis pes-caprae</i>	x
<i>Regelia squarrosa</i>	
<i>Xanthorrhoea brunonis</i>	



Patch assessment number: 2	CS27
Latitude:	-33.65631534
Longitude:	115.4172618
Date:	2020-08-12
Estimated size of patch:	<0.5 ha
Site photo:	e5b11d87-7a46-4e29-8cf1-6f77dc935332
Photo direction:	West
Landform system:	Spearwood
Topographic position:	Dry flat
Condition:	Completely degraded
Soil colour	Grey-brown
Soil type:	Loamy sand
Dominant trees 10 - 30m:	<i>Eucalyptus gomphocephala</i>
Structural form of tuart:	Single Stem
Estimated number of Tuarts in patch:	10
Diameter at breast height:	>50 cm
% Cover native understory cover:	<50%
Disturbances:	
Weed cover:	>70%
Evidence of fire:	no
Time since fire:	
Evidence of tuart dieback:	no
Level of dieback impact	
Indicators of important landscape, habitat or regeneration features:	
Patch is less than 100 m from bushland > 1ha in at least good condition with >=50% native species:	no
Patch contains a mean of >= 2 trees >=50 cm DBH per half ha of any native tree:	yes
The patch displays evidence of natural regeneration of at least a mean of 15 eucalypts seedling / saplings (<15 cm DBH) per half ha:	no
Other comments:	

List of understorey species

Taxon Name	Naturalised
<i>Brachyloma preissii</i>	
<i>Briza maxima</i>	x
<i>Bromus diandrus</i>	x
<i>Ehrharta calycina</i>	x
<i>Ehrharta calycinus</i>	x
<i>Ehrharta longiflora</i>	x
<i>Hakea prostrata</i>	
<i>Kunzea glabrescens</i>	
<i>Lomandra micrantha</i>	



Patch assessment number: 3	CS26
Latitude:	-33.65607746
Longitude:	115.4145261
Date:	2020-08-12
Estimated size of patch:	<0.5 ha
Site photo:	608efdc7-7e3b-4843-b51f-91230a175883
Photo direction:	East
Landform system:	Pinjarra plain
Topographic position:	wet flat
Condition:	Completely degraded
Soil colour	Grey-brown
Soil type:	Sandy loam
Dominant trees 10 - 30m:	<i>Eucalyptus rudis</i> , <i>Corymbia calophylla</i>
Structural form of tuart:	Single Stem
Estimated number of Tuarts in patch:	0
Diameter at breast height:	
% Cover native understory cover:	<50%
Disturbances:	
Weed cover:	>70%
Evidence of fire:	no
Time since fire:	
Evidence of tuart dieback:	no
Level of dieback impact	
Indicators of important landscape, habitat or regeneration features:	
Patch is less than 100 m from bushland > 1ha in at least good condition with >=50% native species:	no
Patch contains a mean of >= 2 trees >=50 cm DBH per half ha of any native tree:	yes
The patch displays evidence of natural regeneration of at least a mean of 15 eucalypts seedling / saplings (<15 cm DBH) per half ha:	no
Other comments:	Not a patch, no tuart and greater than 60m from adjacent tuart canopies.

List of understorey species

Taxon Name	Naturalised
<i>Acacia extensa</i>	
<i>Acacia pulchella</i>	
<i>Austrostipa flavescens</i>	
<i>Banksia grandis</i>	
<i>Briza maxima</i>	x
<i>Kunzea glabrescens</i>	
<i>Leucopogon conostephioides</i>	
<i>Melaleuca thymoides</i>	



Patch assessment number: 3	CS29
Latitude:	-33.65792739
Longitude:	115.4210192
Date:	16/10/20
Estimated size of patch:	0.5 - 2 ha
Site photo:	1b4537a9-9edd-4e79-9bd7-0f3e41d750dd
Photo direction:	South
Landform system:	Abba plain
Topographic position:	Dry flat
Condition:	Degraded
Soil colour	Grey-brown
Soil type:	Loamy clay
Dominant trees 10 - 30m:	<i>Eucalyptus gomphocephala</i>
Structural form of tuart:	Single Stem
Estimated number of Tuarts in patch:	100
Diameter at breast height:	>50 cm
% Cover native understory cover:	<50%
Disturbances:	
Weed cover:	>70%
Evidence of fire:	no
Time since fire:	
Evidence of tuart dieback:	no
Level of dieback impact:	
Indicators of important landscape, habitat or regeneration features:	
Patch is less than 100 m from bushland > 1ha in at least good condition with >=50% native species:	no
Patch contains a mean of >= 2 trees >=50 cm DBH per half ha of any native tree:	yes
The patch displays evidence of natural regeneration of at least a mean of 15 eucalypts seedling / saplings (<15 cm DBH) per half ha:	no
Other comments:	Planted avenue of trees

List of understorey species

Species	Naturalised
<i>Avena barbata</i>	x
<i>Cynodon dactylon</i>	x
<i>Ehrharta longiflora</i>	x
<i>Trifolium sp.</i>	X



Patch assessment number: 4	CS30
Latitude:	-33.64750814
Longitude:	115.4335541
Date:	16/10/20
Estimated size of patch:	<0.5 ha
Site photo:	f72be85b-220c-4539-ad83-77295a080836
Photo direction:	South West
Landform system:	Bassendean
Topographic position:	Dry flat
Condition:	Degraded
Soil colour	Grey-brown
Soil type:	Sand
Dominant trees 10 – 30m:	<i>Eucalyptus gomphocephala, Corymbia calophylla, Eucalyptus rudis</i>
Structural form of tuart:	Single Stem
Estimated number of Tuarts in patch:	10
Diameter at breast height:	>50 cm
% Cover native understory cover:	<50%
Disturbances:	
Weed cover:	>70%
Evidence of fire:	no
Time since fire:	
Evidence of tuart dieback:	no
Level of dieback impact:	
Indicators of important landscape, habitat or regeneration features:	
Patch is less than 100 m from bushland > 1ha in at least good condition with >=50% native species:	no
Patch contains a mean of >= 2 trees >=50 cm DBH per half ha of any native tree:	yes
The patch displays evidence of natural regeneration of at least a mean of 15 eucalypts seedling / saplings (<15 cm DBH) per half ha:	no
Other comments:	

List of understorey species

Species	Naturalised
<i>Briza maxima</i>	x
<i>Bromus diandrus</i>	x
<i>Crassula colorata</i>	
<i>Ehrharta calycinus</i>	x
<i>Ehrharta longiflora</i>	x
<i>Euphorbia peplus</i>	x
<i>Hypochaeris glabra</i>	x



Patch assessment number: 5	CS18
Latitude:	-33.634373
Longitude:	115.45844
Date:	18/11/20
Estimated size of patch:	<0.5 ha
Site photo:	d0b8e19d-bac2-4990-b920-75c0a3fbf0c4
Photo direction:	South
Landform system:	Spearwood
Topographic position:	Dry flat
Condition:	Completely degraded
Soil colour	Yellow-brown
Soil type:	Loamy sand
Dominant trees 10 – 30m:	Eucalyptus rudis, Eucalyptus gomphocephala
Structural form of tuart:	Single Stem
Estimated number of Tuarts in patch:	2
Diameter at breast height:	>50 cm
% Cover native understory cover:	<50%
Disturbances:	
Weed cover:	>70%
Evidence of fire:	No
Time since fire:	
Evidence of tuart dieback:	No
Level of dieback impact:	
Indicators of important landscape, habitat or regeneration features:	
Patch is less than 100 m from bushland > 1ha in at least good condition with >=50% native species:	yes
Patch contains a mean of >= 2 trees >=50 cm DBH per half ha of any native tree:	yes
The patch displays evidence of natural regeneration of at least a mean of 15 eucalypts seedling / saplings (<15 cm DBH) per half ha:	no
Other comments:	

List of understorey species

Species	Naturalised
<i>Avena barbata</i>	x
<i>Calothamnus quadrifidus</i> subsp. <i>teretifolius</i>	
<i>Ehrharta calycina</i>	x
<i>Kunzea glabrescens</i>	



Patch assessment number: 6	CS14
Latitude:	-33.63169447
Longitude:	115.4618513
Date:	2020-11-17
Estimated size of patch:	<0.5 ha
Site photo:	f1f9b151-f1bc-4275-b3cb-b3707b93872f
Photo direction:	South East
Landform system:	Spearwood
Topographic position:	Dry flat
Condition:	Completely degraded
Soil colour	Orange-brown
Soil type:	Loamy sand
Dominant trees 10 - 30m:	<i>Eucalyptus gomphocephala</i>
Structural form of tuart:	Single Stem
Estimated number of Tuarts in patch:	10
Diameter at breast height:	>50 cm
% Cover native understory cover:	<50%
Disturbances:	
Weed cover:	>70%
Evidence of fire:	no
Time since fire:	
Evidence of tuart dieback:	no
Level of dieback impact:	
Indicators of important landscape, habitat or regeneration features:	
Patch is less than 100 m from bushland > 1ha in at least good condition with >=50% native species:	yes
Patch contains a mean of >= 2 trees >=50 cm DBH per half ha of any native tree:	yes
The patch displays evidence of natural regeneration of at least a mean of 15 eucalypts seedling / saplings (<15 cm DBH) per half ha:	no
Other comments:	Mine site regeneration

List of understorey species

Species	Naturalised
<i>Asparagus asparagoides</i>	x
<i>Avena barbata</i>	x
<i>Briza maxima</i>	x
<i>Calothamnus quadrifidus</i> subsp. <i>teretifolius</i>	
<i>Ehrharta calycina</i>	x
<i>Lagurus ovatus</i>	x



Patch assessment number: 7	CS19
Latitude:	-33.62981365
Longitude:	115.4631983
Date:	18/11/20
Estimated size of patch:	<0.5 ha
Site photo:	c3f5db0e-9712-4f27-a584-e49dd0a102fd
Photo direction:	West
Landform system:	Spearwood
Topographic position:	Dry flat
Condition:	Degraded
Soil colour	Yellow-brown
Soil type:	Loamy sand
Dominant trees 10 - 30m:	Eucalyptus gomphocephala
Structural form of tuart:	Single Stem
Estimated number of Tuarts in patch:	3
Diameter at breast height:	>50 cm
% Cover native understory cover:	<50%
Disturbances:	
Weed cover:	>70%
Evidence of fire:	No
Time since fire:	
Evidence of tuart dieback:	No
Level of dieback impact:	
Indicators of important landscape, habitat or regeneration features:	
Patch is less than 100 m from bushland > 1ha in at least good condition with $\geq 50\%$ native species:	yes
Patch contains a mean of ≥ 2 trees ≥ 50 cm DBH per half ha of any native tree:	yes
The patch displays evidence of natural regeneration of at least a mean of 15 eucalypts seedling / saplings (<15 cm DBH) per half ha:	no
Other comments:	

List of understorey species

Species	Naturalised
<i>Acacia extensa</i>	
<i>Acacia pulchella</i>	
<i>Avena barbata</i>	x
<i>Brachyloma preissii</i>	
<i>Briza maxima</i>	x
<i>Calothamnus quadrifidus</i> subsp. <i>teretifolius</i>	
<i>Ehrharta calycina</i>	x
<i>Hakea lissocarpha</i>	
<i>Hibbertia cuneiformis</i>	
<i>Hypochaeris glabra</i>	x
<i>Kunzea glabrescens</i>	
<i>Monadenia bracteata</i>	

No patch 8 – too small



Patch assessment number: 9	CS13
Latitude:	-33.62902382
Longitude:	115.4654354
Date:	2020-11-17
Estimated size of patch:	<0.5 ha
Site photo:	66f7026b-5600-40db-8382-f7f64d16ed59
Photo direction:	South East
Landform system:	Spearwood
Topographic position:	Dry flat
Condition:	Degraded
Soil colour	Orange-brown
Soil type:	Loamy sand
Dominant trees 10 - 30m:	<i>Eucalyptus gomphocephala</i>
Structural form of tuart:	Single Stem
Estimated number of Tuarts in patch:	10
Diameter at breast height:	>50 cm
% Cover native understory cover:	<50%
Disturbances:	
Weed cover:	>70%
Evidence of fire:	no
Time since fire:	
Evidence of tuart dieback:	no
Level of dieback impact:	
Indicators of important landscape, habitat or regeneration features:	
Patch is less than 100 m from bushland > 1ha in at least good condition with >=50% native species:	yes
Patch contains a mean of >= 2 trees >=50 cm DBH per half ha of any native tree:	yes
The patch displays evidence of natural regeneration of at least a mean of 15 eucalypts seedling / saplings (<15 cm DBH) per half ha:	no
Other comments:	Mine site regeneration

List of understorey species

Species	Naturalised
<i>Avena barbata</i>	x
<i>Briza maxima</i>	x
<i>Calothamnus quadrifidus</i> subsp. <i>teretifolius</i>	
<i>Ehrharta calycina</i>	x
<i>Grevillea thelemanniana</i>	
<i>Lagarus ovatus</i>	x
<i>Melaleuca osullivanii</i>	



Patch assessment number: 10	CS12
Latitude:	-33.62776394
Longitude:	115.4657042
Date:	2020-11-17
Estimated size of patch:	<0.5 ha
Site photo:	adbe12dc-5bfd-46fc-be77-40dfc95f792e
Photo direction:	North
Landform system:	Spearwood
Topographic position:	Dry flat
Condition:	Degraded
Soil colour	Orange-brown
Soil type:	Loamy sand
Dominant trees 10 - 30m:	<i>Eucalyptus gomphocephala</i> , <i>Corymbia calophylla</i>
Structural form of tuart:	Single Stem
Estimated number of Tuarts in patch:	10
Diameter at breast height:	>50 cm
% Cover native understory cover:	<50%
Disturbances:	
Weed cover:	>70%
Evidence of fire:	no
Time since fire:	
Evidence of tuart dieback:	no
Level of dieback impact:	
Indicators of important landscape, habitat or regeneration features:	
Patch is less than 100 m from bushland > 1ha in at least good condition with >=50% native species:	yes
Patch contains a mean of >= 2 trees >=50 cm DBH per half ha of any native tree:	yes
The patch displays evidence of natural regeneration of at least a mean of 15 eucalypts seedling / saplings (<15 cm DBH) per half ha:	no
Other comments:	Mine site regeneration

List of understorey species

Species	Naturalised
<i>Avena barbata</i>	x
<i>Briza maxima</i>	x
<i>Calothamnus quadrifidus</i> subsp. <i>teretifolius</i>	
<i>Ehrharta calycina</i>	x
<i>Grevillea thelemanniana</i>	x planted
<i>Hibbertia cuneiformis</i>	
<i>Lagarus ovatus</i>	x
<i>Zantedeschia aethiopica</i>	x



Patch assessment number: 13	CS31
Latitude:	-33.61861467
Longitude:	115.4768274
Date:	16/10/20
Estimated size of patch:	<0.5 ha
Site photo:	461abc5-4da9-4696-b156-018dd1f50c89
Photo direction:	North East
Landform system:	Bassendean
Topographic position:	Dry flat
Condition:	Completely degraded
Soil colour	Yellow-brown
Soil type:	Sand
Dominant trees 10 - 30m:	<i>Eucalyptus gomphocephala</i> , <i>Eucalyptus rudis</i>
Structural form of tuart:	Single Stem
Estimated number of Tuarts in patch:	6
Diameter at breast height:	>50 cm
% Cover native understory cover:	<50%
Disturbances:	
Weed cover:	>70%
Evidence of fire:	no
Time since fire:	
Evidence of tuart dieback:	no
Level of dieback impact:	
Indicators of important landscape, habitat or regeneration features:	
Patch is less than 100 m from bushland > 1ha in at least good condition with >=50% native species:	no
Patch contains a mean of >= 2 trees >=50 cm DBH per half ha of any native tree:	no
The patch displays evidence of natural regeneration of at least a mean of 15 eucalypts seedling / saplings (<15 cm DBH) per half ha:	no
Other comments:	

List of understorey species

Species	Naturalised
<i>Avena barbata</i>	x
<i>Briza maxima</i>	x
<i>Ehrharta calycina</i>	x
<i>Hibbertia cuneiformis</i>	
<i>Sonchus oleraceus</i>	x
<i>Trifolium hirtum</i>	x



Patch assessment number: 23	CS32
Latitude:	-33.60615653
Longitude:	115.5046282
Date:	16/10/20
Estimated size of patch:	0.5 - 2 ha
Site photo:	4b9ca156-6991-49c1-a77e-79e497d04459
Photo direction:	North East
Landform system:	Bassendean
Topographic position:	Dry flat
Condition:	Very good
Soil colour	Yellow-brown
Soil type:	Sand
Dominant trees 10 - 30m:	<i>Corymbia calophylla</i> , <i>Eucalyptus gomphocephala</i>
Structural form of tuart:	Single Stem
Estimated number of Tuarts in patch:	25
Diameter at breast height:	>50 cm
% Cover native understory cover:	<50%
Disturbances:	
Weed cover:	<10%
Evidence of fire:	no
Time since fire:	
Evidence of tuart dieback:	no
Level of dieback impact:	
Indicators of important landscape, habitat or regeneration features:	
Patch is less than 100 m from bushland > 1ha in at least good condition with >=50% native species:	yes
Patch contains a mean of >= 2 trees >=50 cm DBH per half ha of any native tree:	yes
The patch displays evidence of natural regeneration of at least a mean of 15 eucalypts seedling / saplings (<15 cm DBH) per half ha:	no
Other comments:	Part of TEC

List of understorey species

Species	Naturalised
<i>Acacia extensa</i>	
<i>Acacia pulchella</i>	
<i>Austrostipa flavescens</i>	
<i>Briza maxima</i>	x
<i>Kunzea glabrescens</i>	
<i>Leucopogon conostephioides</i>	
<i>Melaleuca thymoides</i>	



Patch assessment number:23	CS33
Latitude:	-33.60278725
Longitude:	115.5108822
Date:	16/10/20
Estimated size of patch:	2-5 ha
Site photo:	babb3df4-2e15-4734-81d1-cf240fbdf139
Photo direction:	South West
Landform system:	Bassendean
Topographic position:	Dry flat
Condition:	Good
Soil colour	Yellow-brown
Soil type:	Sand
Dominant trees 10 - 30m:	<i>Corymbia calophylla</i> , <i>Eucalyptus gomphocephala</i>
Structural form of tuart:	Single Stem
Estimated number of Tuarts in patch:	50
Diameter at breast height:	>50 cm
% Cover native understory cover:	<50%
Disturbances:	
Weed cover:	<10%
Evidence of fire:	no
Time since fire:	
Evidence of tuart dieback:	no
Level of dieback impact:	
Indicators of important landscape, habitat or regeneration features:	
Patch is less than 100 m from bushland > 1ha in at least good condition with >=50% native species:	yes
Patch contains a mean of >= 2 trees >=50 cm DBH per half ha of any native tree:	yes
The patch displays evidence of natural regeneration of at least a mean of 15 eucalypts seedling / saplings (<15 cm DBH) per half ha:	yes
Other comments:	Part of TEC

List of understorey species

Species	Naturalised
<i>Allocasuarina humilis</i>	
<i>Brachyloma preissii</i>	
<i>Briza maxima</i>	x
<i>Conostylis aculeata</i>	
<i>Desmocladus flexuosa</i>	
<i>Hardenbergia comptoniana</i>	
<i>Hakea prostrata</i>	
<i>Hardenbergia comptoniana</i>	
<i>Hibbertia hypericoides</i>	
<i>Hibbertia cuneiformis</i>	
<i>Leucopogon racemulosus</i>	
<i>Melaleuca thymoides</i>	
<i>Oxalis pes-caprae</i>	x
<i>Regelia ciliata</i>	
<i>Xanthorrhoea brunonis</i>	



Patch assessment number: 22	CS34
Latitude:	-33.59660195
Longitude:	115.5157227
Date:	16/10/20
Estimated size of patch:	<0.5 ha
Site photo:	6ddb2f-ed59-47c5-a291-3fcb2b3ffc4
Photo direction:	South West
Landform system:	Bassendean
Topographic position:	Dry flat
Condition:	Degraded
Soil colour	Yellow-brown
Soil type:	Sand
Dominant trees 10 - 30m:	<i>Eucalyptus gomphocephala</i>
Structural form of tuart:	Single Stem
Estimated number of Tuarts in patch:	25
Diameter at breast height:	>50 cm
% Cover native understory cover:	<50%
Disturbances:	
Weed cover:	10-30%
Evidence of fire:	no
Time since fire:	
Evidence of tuart dieback:	no
Level of dieback impact:	
Indicators of important landscape, habitat or regeneration features:	
Patch is less than 100 m from bushland > 1ha in at least good condition with >=50% native species:	yes
Patch contains a mean of >= 2 trees >=50 cm DBH per half ha of any native tree:	yes
The patch displays evidence of natural regeneration of at least a mean of 15 eucalypts seedling / saplings (<15 cm DBH) per half ha:	no
Other comments:	Part of TEC

List of understorey species

Species	Naturalised
<i>Brachyloma preissii</i>	
<i>Briza maxima</i>	x
<i>Bromus diandrus</i>	x
<i>Ehrharta calycina</i>	x
<i>Ehrharta longiflora</i>	x
<i>Hakea prostrata</i>	
<i>Kunzea glabrescens</i>	
<i>Lomandra micrantha</i>	



Patch assessment number:16	CS14a
Latitude:	-33.61573306
Longitude:	115.4803206
Date:	18/11/20
Estimated size of patch:	<0.5 ha
Site photo:	d3a1ac40-1116-4bd7-8cee-69c7b6b7af22
Photo direction:	North East
Landform system:	Spearwood
Topographic position:	Dry flat
Condition:	Completely degraded
Soil colour	Yellow-brown
Soil type:	Loamy sand
Dominant trees 10 - 30m:	Eucalyptus rudis, Eucalyptus gomphocephala
Structural form of tuart:	Single Stem
Estimated number of Tuarts in patch:	3
Diameter at breast height:	>50 cm
% Cover native understory cover:	<50%
Disturbances:	
Weed cover:	>70%
Evidence of fire:	No
Time since fire:	
Evidence of tuart dieback:	No
Level of dieback impact:	
Indicators of important landscape, habitat or regeneration features:	
Patch is less than 100 m from bushland > 1ha in at least good condition with >=50% native species:	yes
Patch contains a mean of >= 2 trees >=50 cm DBH per half ha of any native tree:	yes
The patch displays evidence of natural regeneration of at least a mean of 15 eucalypts seedling / saplings (<15 cm DBH) per half ha:	no
Other comments:	

List of understorey species

Species	Naturalised
<i>Asparagus asparagoides</i>	x
<i>Avena barbata</i>	x
<i>Calothamnus quadrifidus</i> subsp. <i>teretifolius</i>	
<i>Dipogon lignosus</i>	x
<i>Ehrharta calycina</i>	x
<i>Kunzea glabrescens</i>	
<i>Ornithopus compressus</i>	x



Patch assessment number:15	CS15
Latitude:	-33.61672036
Longitude:	115.4788999
Date:	18/11/20
Estimated size of patch:	<0.5 ha
Site photo:	4871b112-dbc9-4e2e-aed6-a41e0f519de9
Photo direction:	North East
Landform system:	Spearwood
Topographic position:	Dry flat
Condition:	Completely degraded
Soil colour	Yellow-brown
Soil type:	Loamy sand
Dominant trees 10 - 30m:	Eucalyptus rudis, Eucalyptus gomphocephala
Structural form of tuart:	Single Stem
Estimated number of Tuarts in patch:	3
Diameter at breast height:	>50 cm
% Cover native understory cover:	<50%
Disturbances:	
Weed cover:	>70%
Evidence of fire:	No
Time since fire:	
Evidence of tuart dieback:	No
Level of dieback impact:	
Indicators of important landscape, habitat or regeneration features:	
Patch is less than 100 m from bushland > 1ha in at least good condition with >=50% native species:	yes
Patch contains a mean of >= 2 trees >=50 cm DBH per half ha of any native tree:	yes
The patch displays evidence of natural regeneration of at least a mean of 15 eucalypts seedling / saplings (<15 cm DBH) per half ha:	no
Other comments:	

List of understorey species

Species	Naturalised
<i>Avena barbata</i>	x
<i>Ehrharta calycina</i>	x
<i>Kunzea glabrescens</i>	x



Patch assessment number: 14	CS16
Latitude:	-33.61752063
Longitude:	115.4780527
Date:	18/11/20
Estimated size of patch:	<0.5 ha
Site photo:	a6513744-c498-48e8-a03b-f321c4e7f677
Photo direction:	South West
Landform system:	Spearwood
Topographic position:	Dry flat
Condition:	Completely degraded
Soil colour	Yellow-brown
Soil type:	Loamy sand
Dominant trees 10 – 30m:	Eucalyptus rudis, Eucalyptus gomphocephala
Structural form of tuart:	Single Stem
Estimated number of Tuarts in patch:	5
Diameter at breast height:	>50 cm
% Cover native understory cover:	<50%
Disturbances:	
Weed cover:	>70%
Evidence of fire:	No
Time since fire:	
Evidence of tuart dieback:	No
Level of dieback impact:	
Indicators of important landscape, habitat or regeneration features:	
Patch is less than 100 m from bushland > 1ha in at least good condition with >=50% native species:	yes
Patch contains a mean of >= 2 trees >=50 cm DBH per half ha of any native tree:	yes
The patch displays evidence of natural regeneration of at least a mean of 15 eucalypts seedling / saplings (<15 cm DBH) per half ha:	no
Other comments:	

List of understorey species

Species	Naturalised
<i>Avena barbata</i>	x
<i>Ehrharta calycina</i>	x
<i>Trifolium arvensis</i>	x



Patch assessment number: 13	CS17
Latitude:	-33.618486
Longitude:	115.477055
Date:	18/11/20
Estimated size of patch:	<0.5 ha
Site photo:	9c1b69d1-67db-468c-9681-d5abfb719cd4
Photo direction:	South West
Landform system:	Spearwood
Topographic position:	Dry flat
Condition:	Completely degraded
Soil colour	Yellow-brown
Soil type:	Loamy sand
Dominant trees 10 – 30m:	Eucalyptus rudis, Eucalyptus gomphocephala
Structural form of tuart:	Single Stem
Estimated number of Tuarts in patch:	2
Diameter at breast height:	>50 cm
% Cover native understory cover:	<50%
Disturbances:	
Weed cover:	>70%
Evidence of fire:	No
Time since fire:	
Evidence of tuart dieback:	No
Level of dieback impact:	
Indicators of important landscape, habitat or regeneration features:	
Patch is less than 100 m from bushland > 1ha in at least good condition with >=50% native species:	yes
Patch contains a mean of >= 2 trees >=50 cm DBH per half ha of any native tree:	yes
The patch displays evidence of natural regeneration of at least a mean of 15 eucalypts seedling / saplings (<15 cm DBH) per half ha:	no
Other comments:	

List of understorey species

Species	Naturalised
<i>Avena barbata</i>	x
<i>Calothamnus quadrifidus</i> subsp. <i>teretifolius</i>	
<i>Ehrharta calycina</i>	x
<i>Kunzea glabrescens</i>	



Patch assessment number: 7	CS19
Latitude:	-33.62981365
Longitude:	115.4631983
Date:	18/11/20
Estimated size of patch:	<0.5 ha
Site photo:	c3f5db0e-9712-4f27-a584-e49dd0a102fd
Photo direction:	West
Landform system:	Spearwood
Topographic position:	Dry flat
Condition:	Degraded
Soil colour	Yellow-brown
Soil type:	Loamy sand
Dominant trees 10 - 30m:	Eucalyptus gomphocephala
Structural form of tuart:	Single Stem
Estimated number of Tuarts in patch:	3
Diameter at breast height:	>50 cm
% Cover native understory cover:	<50%
Disturbances:	
Weed cover:	>70%
Evidence of fire:	No
Time since fire:	
Evidence of tuart dieback:	No
Level of dieback impact:	
Indicators of important landscape, habitat or regeneration features:	
Patch is less than 100 m from bushland > 1ha in at least good condition with \geq 50% native species:	yes
Patch contains a mean of \geq 2 trees \geq 50 cm DBH per half ha of any native tree:	yes
The patch displays evidence of natural regeneration of at least a mean of 15 eucalypts seedling / saplings (<15 cm DBH) per half ha:	no
Other comments:	

List of understorey species

Species	Naturalised
<i>Acacia extensa</i>	
<i>Acacia pulchella</i>	
<i>Avena barbata</i>	x
<i>Brachyloma preissii</i>	
<i>Briza maxima</i>	x
<i>Calothamnus quadrifidus</i> subsp. <i>teretifolius</i>	
<i>Ehrharta calycina</i>	x
<i>Hakea lissocarpha</i>	
<i>Hibbertia cuneiformis</i>	
<i>Hypochaeris glabra</i>	x
<i>Kunzea glabrescens</i>	
<i>Monadenia bracteata</i>	



Patch assessment number: 22	CS01
Latitude:	-33.59983463
Longitude:	115.5110884
Date:	2020-11-17
Estimated size of patch:	>5 ha
Site photo:	cd6262c8-65b8-4bb3-bca8-13d7d2070648
Photo direction:	North East
Landform system:	Spearwood
Topographic position:	Dry flat
Condition:	Good
Soil colour	Yellow-brown
Soil type:	Sand
Dominant trees 10 - 30m:	<i>Eucalyptus gomphocephala</i> , <i>Corymbia calophylla</i>
Structural form of tuart:	Single Stem
Estimated number of Tuarts in patch:	1000
Diameter at breast height:	>50 cm
% Cover native understory cover:	<50%
Disturbances:	
Weed cover:	<10%
Evidence of fire:	no
Time since fire:	
Evidence of tuart dieback:	no
Level of dieback impact	
Indicators of important landscape, habitat or regeneration features:	
Patch is less than 100 m from bushland > 1ha in at least good condition with >=50% native species:	yes
Patch contains a mean of >= 2 trees >=50 cm DBH per half ha of any native tree:	yes
The patch displays evidence of natural regeneration of at least a mean of 15 eucalypts seedling / saplings (<15 cm DBH) per half ha:	yes
Other comments:	Mine site regeneration area TEC

List of understorey species

Taxon Name	Naturalised
<i>Hibbertia cuneiformis</i>	
<i>Hypochaeris glabra</i>	x
<i>Kunzea glabrescens</i>	
<i>Regelia ciliata</i>	
<i>Ursinia anthemoides</i>	x



Patch assessment number: 22	CS23
Latitude:	-33.5999356
Longitude:	115.5128291
Date:	2020-11-17
Estimated size of patch:	>5 ha
Site photo:	81f17a17-b19c-476f-b4ee-24b10505c31e
Photo direction:	North West
Landform system:	Spearwood
Topographic position:	Dry flat
Condition:	Degraded
Soil colour	Yellow-brown
Soil type:	Loamy sand
Dominant trees 10 - 30m:	<i>Eucalyptus gomphocephala</i>
Structural form of tuart:	Single Stem
Estimated number of Tuarts in patch:	500
Diameter at breast height:	>15 cm
% Cover native understory cover:	<50%
Disturbances:	
Weed cover:	<10%
Evidence of fire:	no
Time since fire:	
Evidence of tuart dieback:	no
Level of dieback impact	
Indicators of important landscape, habitat or regeneration features:	
Patch is less than 100 m from bushland > 1ha in at least good condition with $\geq 50\%$ native species:	no
Patch contains a mean of ≥ 2 trees ≥ 50 cm DBH per half ha of any native tree:	no
The patch displays evidence of natural regeneration of at least a mean of 15 eucalypts seedling / saplings (<15 cm DBH) per half ha:	no
Other comments:	Revegetation TEC

List of understorey species

Taxon Name	Naturalised
<i>Asparagus asparagoides</i>	x
<i>Hakea amplexicaulis</i>	
<i>Hibbertia cuneiformis</i>	



Patch assessment number: 22	CS02
Latitude:	-33.6015233
Longitude:	115.5118167
Date:	2020-11-17
Estimated size of patch:	>5 ha
Site photo:	a9f68a6c-0ef2-4b5b-a4af-b91ee4b3b446
Photo direction:	East
Landform system:	Spearwood
Topographic position:	Dry flat
Condition:	Good
Soil colour	Yellow-brown
Soil type:	Sand
Dominant trees 10 - 30m:	<i>Eucalyptus gomphocephala</i> , <i>Corymbia calophylla</i>
Structural form of tuart:	Single Stem
Estimated number of Tuarts in patch:	1000
Diameter at breast height:	>50 cm
% Cover native understory cover:	>=50%
Disturbances:	
Weed cover:	<10%
Evidence of fire:	no
Time since fire:	
Evidence of tuart dieback:	no
Level of dieback impact	
Indicators of important landscape, habitat or regeneration features:	
Patch is less than 100 m from bushland > 1ha in at least good condition with >=50% native species:	yes
Patch contains a mean of >= 2 trees >=50 cm DBH per half ha of any native tree:	yes
The patch displays evidence of natural regeneration of at least a mean of 15 eucalypts seedling / saplings (<15 cm DBH) per half ha:	yes
Other comments	Historically revegetated Part of TEC

List of understorey species

Taxon Name	Naturalised
<i>Acacia pycnantha</i>	x
<i>Austrostipa hemipogon</i>	
<i>Brachyloma preissii</i>	
<i>Briza maxima</i>	x
<i>Dianealla caerulea</i> "Little Jess"	x
<i>Ehrharta calycina</i>	x
<i>Euphorbia peplus</i>	x
<i>Gastrolobium praemorsum</i>	
<i>Hakea prostrata</i>	
<i>Hardenbergia comptoniana</i>	
<i>Hypochaeris glabra</i>	x
<i>Kennedia prostrata</i>	
<i>Regelia ciliata</i>	
<i>Tricoryne elatior</i>	
<i>Ursinia anthemoides</i>	x



Patch assessment number:23	CS03
Latitude:	-33.60300405
Longitude:	115.5105319
Date:	2020-11-17
Estimated size of patch:	0.5 - 2 ha
Site photo:	6eb6ec64-9f3b-4611-8304-5386a1045eed
Photo direction:	North
Landform system:	Spearwood
Topographic position:	Dry flat
Condition:	Good
Soil colour	Yellow-brown
Soil type:	Sand
Dominant trees 10 - 30m:	<i>Eucalyptus gomphocephala</i> , <i>Corymbia calophylla</i>
Structural form of tuart:	Single Stem
Estimated number of Tuarts in patch:	30
Diameter at breast height:	>50 cm
% Cover native understory cover:	<50%
Disturbances:	
Weed cover:	30-70%
Evidence of fire:	no
Time since fire:	
Evidence of tuart dieback:	no
Level of dieback impact:	
Indicators of important landscape, habitat or regeneration features:	
Patch is less than 100 m from bushland > 1ha in at least good condition with >=50% native species:	yes
Patch contains a mean of >= 2 trees >=50 cm DBH per half ha of any native tree:	yes
The patch displays evidence of natural regeneration of at least a mean of 15 eucalypts seedling / saplings (<15 cm DBH) per half ha:	yes
Other comments	Regenerated area Part of a TEC

List of understorey species

Species	Naturalised
<i>Acacia saligna</i>	
<i>Avena barbata</i>	x
<i>Brachyloma preissii</i>	
<i>Briza maxima</i>	x
<i>Ehrharta calycina</i>	x
<i>Hakea prostrata</i>	
<i>Hibbertia cuneiformis</i>	
<i>Hypochaeris glabra</i>	x
<i>Kunzea glabrescens</i>	
<i>Lysimachia arvensis</i> var. <i>caerulea</i>	
<i>Regelia ciliata</i>	



Patch assessment number: 23	CS04
Latitude:	-33.60358232
Longitude:	115.5096293
Date:	2020-11-17
Estimated size of patch:	<0.5 ha
Site photo:	fe2bcd73-ac75-432b-a0be-5370be751f0d
Photo direction:	East
Landform system:	Spearwood
Topographic position:	Dune
Condition:	Good
Soil colour	Orange-brown
Soil type:	Loamy sand
Dominant trees 10 - 30m:	<i>Eucalyptus gomphocephala</i>
Structural form of tuart:	Single Stem
Estimated number of Tuarts in patch:	3
Diameter at breast height:	>50 cm
% Cover native understory cover:	<50%
Disturbances:	
Weed cover:	<10%
Evidence of fire:	no
Time since fire:	
Evidence of tuart dieback:	no
Level of dieback impact:	
Indicators of important landscape, habitat or regeneration features:	
Patch is less than 100 m from bushland > 1ha in at least good condition with >=50% native species:	yes
Patch contains a mean of >= 2 trees >=50 cm DBH per half ha of any native tree:	yes
The patch displays evidence of natural regeneration of at least a mean of 15 eucalypts seedling / saplings (<15 cm DBH) per half ha:	yes
Other comments	Mine site regeneration site, lots of leaf litter Part of a TEC

List of understorey species

Species	Naturalised
<i>Acacia pycnantha</i>	x
<i>Acacia saligna</i>	
<i>Austrostipa hemipogon</i>	
<i>Briza maxima</i>	x
<i>Gastrolobium praemorsum</i>	
<i>Hibbertia cuneiformis</i>	
<i>Kunzea glabrescens</i>	



Patch assessment number:23	CS05
Latitude:	-33.60440152
Longitude:	115.5086018
Date:	2020-11-17
Estimated size of patch:	<0.5 ha
Site photo:	24d55126-7553-4611-81c8-56d0c900e9f2
Photo direction:	North East
Landform system:	Spearwood
Topographic position:	Dune
Condition:	Good
Soil colour	Orange-brown
Soil type:	Loamy sand
Dominant trees 10 - 30m:	<i>Eucalyptus gomphocephala</i>
Structural form of tuart:	Single Stem
Estimated number of Tuarts in patch:	10
Diameter at breast height:	>50 cm,>15 cm
% Cover native understory cover:	>=50%
Disturbances:	
Weed cover:	<10%
Evidence of fire:	no
Time since fire:	
Evidence of tuart dieback:	no
Level of dieback impact:	
Indicators of important landscape, habitat or regeneration features:	
Patch is less than 100 m from bushland > 1ha in at least good condition with >=50% native species:	yes
Patch contains a mean of >= 2 trees >=50 cm DBH per half ha of any native tree:	yes
The patch displays evidence of natural regeneration of at least a mean of 15 eucalypts seedling / saplings (<15 cm DBH) per half ha:	yes
Other comments	Part of TEC

List of understorey species

Species	Naturalised
<i>Briza maxima</i>	x
<i>Ehrharta calycina</i>	x
<i>Gastrolobium praemorsum</i>	
<i>Hibbertia cuneiformis</i>	
<i>Kunzea glabrescens</i>	
<i>Poranthera microphylla</i>	
<i>Trachymene pilosa</i>	



Patch assessment number:19	CS06
Latitude:	-33.60817262
Longitude:	115.5010372
Date:	2020-11-17
Estimated size of patch:	2-5 ha
Site photo:	703a8cf7-087b-4118-9c62-d3cd893e1a17
Photo direction:	North
Landform system:	Spearwood
Topographic position:	Dry flat
Condition:	Good
Soil colour	Grey-brown
Soil type:	Sand
Dominant trees 10 - 30m:	<i>Eucalyptus gomphocephala</i>
Structural form of tuart:	Single Stem
Estimated number of Tuarts in patch:	500
Diameter at breast height:	>50 cm
% Cover native understory cover:	>=50%
Disturbances:	
Weed cover:	<10%
Evidence of fire:	
Time since fire:	
Evidence of tuart dieback:	
Level of dieback impact:	
Indicators of important landscape, habitat or regeneration features:	
Patch is less than 100 m from bushland > 1ha in at least good condition with >=50% native species:	yes
Patch contains a mean of >= 2 trees >=50 cm DBH per half ha of any native tree:	yes
The patch displays evidence of natural regeneration of at least a mean of 15 eucalypts seedling / saplings (<15 cm DBH) per half ha:	yes
Other comments	

List of understorey species

Species	Naturalised
<i>Eragrostis curvula</i>	x
<i>Hakea prostrata</i>	
<i>Hibbertia cuneiformis</i>	
<i>Hypochaeris glabra</i>	x
<i>Kunzea glabrescens</i>	
<i>Melaleuca thymoides</i>	
<i>Microlaena stipoides</i>	
<i>Oxalis glabra</i>	x
<i>Pelargonium capitatum</i>	x
<i>Regelia ciliata</i>	



Patch assessment number: 18	CS07
Latitude:	-33.61151407
Longitude:	115.4969583
Date:	2020-11-17
Estimated size of patch:	<0.5 ha
Site photo:	e317b5c4-e466-4299-9eb5-4a09e42033bb
Photo direction:	South
Landform system:	Bassendean
Topographic position:	Dry flat
Condition:	Degraded
Soil colour	Grey
Soil type:	Sand
Dominant trees 10 - 30m:	<i>Corymbia calophylla</i> , <i>Eucalyptus gomphocephala</i>
Structural form of tuart:	Single Stem
Estimated number of Tuarts in patch:	3
Diameter at breast height:	>50 cm
% Cover native understory cover:	<50%
Disturbances:	
Weed cover:	>70%
Evidence of fire:	no
Time since fire:	
Evidence of tuart dieback:	no
Level of dieback impact:	
Indicators of important landscape, habitat or regeneration features:	
Patch is less than 100 m from bushland > 1ha in at least good condition with >=50% native species:	yes
Patch contains a mean of >= 2 trees >=50 cm DBH per half ha of any native tree:	yes
The patch displays evidence of natural regeneration of at least a mean of 15 eucalypts seedling / saplings (<15 cm DBH) per half ha:	no
Other comments	

List of understorey species

Species	Naturalised
<i>Acacia pulchella</i>	
<i>Avena barbata</i>	x
<i>Briza maxima</i>	x
<i>Kunzea glabrescens</i>	
<i>Melaleuca thymoides</i>	



Patch assessment number:17	CS08
Latitude:	-33.61275996
Longitude:	115.4939311
Date:	2020-11-17
Estimated size of patch:	<0.5 ha
Site photo:	dd0f2991-9874-4ffe-a434-40ceb0e0e524
Photo direction:	South East
Landform system:	Spearwood
Topographic position:	Dry flat
Condition:	Degraded
Soil colour	Orange-brown
Soil type:	Sandy loam
Dominant trees 10 - 30m:	<i>Eucalyptus gomphocephala</i> , <i>Eucalyptus rudis</i>
Structural form of tuart:	Single Stem
Estimated number of Tuarts in patch:	5
Diameter at breast height:	>50 cm
% Cover native understory cover:	<50%
Disturbances:	
Weed cover:	>70%
Evidence of fire:	no
Time since fire:	
Evidence of tuart dieback:	no
Level of dieback impact:	
Indicators of important landscape, habitat or regeneration features:	
Patch is less than 100 m from bushland > 1ha in at least good condition with >=50% native species:	yes
Patch contains a mean of >= 2 trees >=50 cm DBH per half ha of any native tree:	yes
The patch displays evidence of natural regeneration of at least a mean of 15 eucalypts seedling / saplings (<15 cm DBH) per half ha:	no
Other comments	

List of understorey species

Species	Naturalised
<i>Avena barbata</i>	x
<i>Bromus diandrus</i>	x
<i>Cynodon dactylon</i>	x
<i>Ehrharta calycina</i>	x
<i>Kunzea glabrescens</i>	



Patch assessment number: 11	CS09
Latitude:	-33.62613655
Longitude:	115.4690475
Date:	2020-11-17
Estimated size of patch:	<0.5 ha
Site photo:	dfcf73ea-2090-47f5-bb72-378f0448bdc5
Photo direction:	South
Landform system:	Bassendean
Topographic position:	Dry flat
Condition:	Degraded
Soil colour	Orange-brown
Soil type:	Loamy sand
Dominant trees 10 - 30m:	<i>Eucalyptus rudis</i> , <i>Eucalyptus gomphocephala</i> , <i>Corymbia calophylla</i>
Structural form of tuart:	Single Stem
Estimated number of Tuarts in patch:	15
Diameter at breast height:	>50 cm
% Cover native understory cover:	<50%
Disturbances:	
Weed cover:	>70%
Evidence of fire:	no
Time since fire:	
Evidence of tuart dieback:	no
Level of dieback impact:	
Indicators of important landscape, habitat or regeneration features:	
Patch is less than 100 m from bushland > 1ha in at least good condition with >=50% native species:	yes
Patch contains a mean of >= 2 trees >=50 cm DBH per half ha of any native tree:	yes
The patch displays evidence of natural regeneration of at least a mean of 15 eucalypts seedling / saplings (<15 cm DBH) per half ha:	no
Other comments	Mine site regeneration, Tuart trees to south of site on private property

List of understorey species

Species	Naturalised
<i>Briza maxima</i>	x
<i>Bromus diandrus</i>	x
<i>Calothamnus quadrifidus</i> subsp. <i>teretifolius</i>	
<i>Ehrharta calycina</i>	x
<i>Kunzea glabrescens</i>	
<i>Melaleuca osullivanii</i>	



Patch assessment number: 12	CS10
Latitude:	-33.62502042
Longitude:	115.469432
Date:	2020-11-17
Estimated size of patch:	<0.5 ha
Site photo:	1329ccae-8cbc-443a-a45b-fef52065393e
Photo direction:	North
Landform system:	Spearwood
Topographic position:	Dry flat
Condition:	Degraded
Soil colour	Yellow-brown
Soil type:	Loamy sand
Dominant trees 10 – 30m:	<i>Eucalyptus gomphocephala</i> , <i>Eucalyptus rudis</i>
Structural form of tuart:	Single Stem
Estimated number of Tuarts in patch:	50
Diameter at breast height:	>50 cm
% Cover native understory cover:	<50%
Disturbances:	
Weed cover:	10-30%
Evidence of fire:	no
Time since fire:	
Evidence of tuart dieback:	no
Level of dieback impact:	
Indicators of important landscape, habitat or regeneration features:	
Patch is less than 100 m from bushland > 1ha in at least good condition with >=50% native species:	yes
Patch contains a mean of >= 2 trees >=50 cm DBH per half ha of any native tree:	yes
The patch displays evidence of natural regeneration of at least a mean of 15 eucalypts seedling / saplings (<15 cm DBH) per half ha:	no
Other comments	

List of understorey species

Species	Naturalised
<i>Avena barbata</i>	x
<i>Briza maxima</i>	x
<i>Calothamnus quadrifidus</i> subsp. <i>teretifolius</i>	
<i>Cynodon dactylon</i>	x
<i>Ehrharta calycina</i>	x
<i>Hakea lissocarpha</i>	
<i>Hibbertia hypericoides</i>	
<i>Kennedia prostrata</i>	
<i>Kunzea glabrescens</i>	
<i>Zantedeschia aethiopica</i>	x



Patch assessment number: 11	CS11
Latitude:	-33.62682332
Longitude:	115.4681034
Date:	2020-11-17
Estimated size of patch:	<0.5 ha
Site photo:	326f0b8e-34c4-4193-b7cf-7e44565d50de
Photo direction:	South East
Landform system:	Bassendean
Topographic position:	Dry flat
Condition:	Degraded
Soil colour	Orange-brown
Soil type:	Loamy sand
Dominant trees 10 - 30m:	<i>Eucalyptus rudis</i> , <i>Eucalyptus gomphocephala</i>
Structural form of tuart:	Single Stem
Estimated number of Tuarts in patch:	5
Diameter at breast height:	>50 cm
% Cover native understory cover:	<50%
Disturbances:	
Weed cover:	>70%
Evidence of fire:	no
Time since fire:	
Evidence of tuart dieback:	no
Level of dieback impact:	
Indicators of important landscape, habitat or regeneration features:	
Patch is less than 100 m from bushland > 1ha in at least good condition with >=50% native species:	yes
Patch contains a mean of >= 2 trees >=50 cm DBH per half ha of any native tree:	yes
The patch displays evidence of natural regeneration of at least a mean of 15 eucalypts seedling / saplings (<15 cm DBH) per half ha:	no
Other comments:	

List of understorey species

Species	Naturalised
<i>Briza maxima</i>	x
<i>Bromus diandrus</i>	x
<i>Calothamnus quadrifidus</i> subsp. <i>teretifolius</i>	
<i>Ehrharta calycina</i>	x



Patch assessment number:22	CS22
Latitude:	-33.600648
Longitude:	115.510137
Date:	10/12/20
Estimated size of patch:	>5 ha
Site photo:	8b8e0999-08e7-4bba-ab1b-79876d4518c0
Photo direction:	East
Landform system:	Spearwood
Topographic position:	Dry flat
Condition:	Good
Soil colour	Yellow-brown
Soil type:	Sand
Dominant trees 10 - 30m:	Eucalyptus gomphocephala
Structural form of tuart:	Single Stem
Estimated number of Tuarts in patch:	500
Diameter at breast height:	>50 cm
% Cover native understory cover:	<50%
Disturbances:	
Weed cover:	<10%
Evidence of fire:	No
Time since fire:	
Evidence of tuart dieback:	No
Level of dieback impact:	
Indicators of important landscape, habitat or regeneration features:	
Patch is less than 100 m from bushland > 1ha in at least good condition with >=50% native species:	yes
Patch contains a mean of >= 2 trees >=50 cm DBH per half ha of any native tree:	yes
The patch displays evidence of natural regeneration of at least a mean of 15 eucalypts seedling / saplings (<15 cm DBH) per half ha:	no
Other comments:	TEC

List of understorey species

Species	Naturalised
<i>Acacia pycnantha</i>	x
<i>Briza maxima</i>	x
<i>Hypochaeris glabra</i>	x
<i>Kunzea glabrescens</i>	
<i>Verticordia attenuata</i>	



Patch assessment number: 24	CS20
Latitude:	-33.591777
Longitude:	115.516916
Date:	18/11/20
Estimated size of patch:	2-5a
Site photo:	da7160a0-f760-416f-9097-735d6bbb209f
Photo direction:	West
Landform system:	Spearwood
Topographic position:	Dry flat
Condition:	Good
Soil colour	Orange-brown
Soil type:	Loamy Sand
Dominant trees 10 - 30m:	Eucalyptus gomphocephala
Structural form of tuart:	Single Stem
Estimated number of Tuarts in patch:	100
Diameter at breast height:	>50 cm
% Cover native understory cover:	<50%
Disturbances:	
Weed cover:	<10%
Evidence of fire:	No
Time since fire:	
Evidence of tuart dieback:	No
Level of dieback impact:	
Indicators of important landscape, habitat or regeneration features:	
Patch is less than 100 m from bushland > 1ha in at least good condition with >=50% native species:	yes
Patch contains a mean of >= 2 trees >=50 cm DBH per half ha of any native tree:	yes
The patch displays evidence of natural regeneration of at least a mean of 15 eucalypts seedling / saplings (<15 cm DBH) per half ha:	yes
Other comments:	Area has all been revegetated, with some natural regrowth Part of TEC

List of understorey species

Species	Naturalised
<i>Briza maxima</i>	x
<i>Hibbertia cuneiformis</i>	
<i>Kunzea glabrescens</i>	
<i>Paraserianthes lapantha</i>	
<i>Ursinia anthemoides</i>	x



Patch assessment number:24	CS21
Latitude:	-33.58927231
Longitude:	115.521296
Date:	10/12/20
Estimated size of patch:	>5 ha
Site photo:	468036b5-2b30-48e7-8116-f351e9fbb50c
Photo direction:	North West
Landform system:	Spearwood
Topographic position:	Dry flat
Condition:	Degraded
Soil colour	Orange-brown
Soil type:	Loamy sand
Dominant trees 10 – 30m:	Eucalyptus gomphocephala, Corymbia calophylla, E. camaldulensis
Structural form of tuart:	Single Stem
Estimated number of Tuarts in patch:	500
Diameter at breast height:	>50 cm
% Cover native understory cover:	<50%
Disturbances:	
Weed cover:	30-70%
Evidence of fire:	No
Time since fire:	
Evidence of tuart dieback:	No
Level of dieback impact:	
Indicators of important landscape, habitat or regeneration features:	
Patch is less than 100 m from bushland > 1ha in at least good condition with >=50% native species:	no
Patch contains a mean of >= 2 trees >=50 cm DBH per half ha of any native tree:	yes
The patch displays evidence of natural regeneration of at least a mean of 15 eucalypts seedling / saplings (<15 cm DBH) per half ha:	yes
Other comments:	Seedlings of marri, TEC

List of understorey species

Species	Naturalised
<i>Acacia decurrens</i>	x
<i>Anthoxanthum odoratum</i>	x
<i>Avena barbata</i>	x
<i>Briza maxima</i>	x
<i>Cynosurus echinatus</i>	x
<i>Ehrharta longiflora</i>	x
<i>Hibbertia cuneiformis</i>	
<i>Hibbertia hypericoides</i>	
<i>Hypochaeris glabra</i>	x
<i>Lolium rigidum</i>	x
<i>Monadenia bracteata</i>	x
<i>Ursinia anthemoides</i>	x
<i>Zantedeschia aethiopica</i>	x

Appendix 2. Quadrat Location Details Claypan TEC



Quadrat: RUA01 Established: 17/12/2020 Soil: Yellow brown clay
 Condition: Very Good Easting: Northing: Photo direction: looking NE

Species	Cover	Species	Cover
<i>Aira caryophyllea</i>	1	<i>Lagenophora huegelii</i>	2
<i>Anthoxanthum odoratum</i>	2	<i>Kunzea glabrescens</i>	2
<i>Bartsia viscosa</i>	2	<i>Lepidosperma longitudinale</i>	2
<i>Briza minor</i>	1	<i>Leptocarpus decipiens</i>	3
<i>Caesia micrantha</i>	2	<i>Lotus subbiflorus</i>	2
<i>Centaurea erythraea</i>	2	<i>Lysimachia arvensis var. caerulea</i>	2
<i>Centrolepis aristatus</i>	1	<i>Lythrum hyssopifolia</i>	2
<i>Cicendia filiformis</i>	2	<i>Melaleuca lateritia</i>	4
<i>Cyathochaeta avenacea</i>	2	<i>Melaleuca raphiophylla</i>	2
<i>Gahnia trifida</i>	4	<i>Mentha pulegium</i>	2
<i>Goodenia micrantha</i>	2	<i>Microlaena stipoides</i>	1
<i>Haemodorum simplex</i>	adj	<i>Microtis media subsp. media</i>	2
<i>Hakea varia</i>	2	<i>Patersonia occidentalis</i>	1
<i>Hyalosperma cotula</i>	1	<i>Polypogon monspeliensis</i>	2
<i>Hypochaeris glabra</i>	1	<i>Regelia ciliata</i>	4
<i>Isolepis cernua</i>	1	<i>Romulea rosea</i>	2
<i>Isolepis cyperoides</i>	2	<i>Siloxerus humifusus</i>	adj
<i>Isolepis oldfieldii</i>	2	<i>Stylidium androsaceum</i>	1
<i>Juncus capitatus</i>	2	<i>Stylidium crassifolium</i>	2
<i>Juncus bufonius</i>	2	<i>Viminaria juncea</i>	adj
<i>Juncus microcephalus</i>	2	<i>Zantedeschia aethiopica</i>	2
<i>Juncus pallidus</i>	2		



Quadrat: RUA02 Established: 17/12/2020 Soil: Grey brown sandy loam
 Condition: Good Photo direction: looking NE

Species	Cover	Species	Cover
<i>Agonis flexuosa</i>	2	<i>Mentha pulegium</i>	1
<i>Agrostocrinum scabrum</i>	2	<i>Microlaena stipoides</i>	2
<i>Anthoxanthum odoratum</i>	2	<i>Microtis media</i> subsp. <i>media</i>	2
<i>Avena barbata</i>	2	<i>Opercularia apiciflora</i>	1
<i>Briza maxima</i>	2	<i>Polypogon monspeliensis</i>	2
<i>Briza minor</i>	2	<i>Romulea rosea</i>	2
<i>Bromus diandrus</i>	2	<i>Sonchus asper</i>	1
<i>Callitriche stagnalis</i>	1	<i>Tricoryne elatior</i>	2
<i>Centaurea erythraea</i>	2	<i>Trifolium dubium</i>	2
<i>Conyza bonariensis</i>	2	<i>Xanthorrhoea brunonis</i>	2
<i>Corymbia calophylla</i>	5	<i>Zantedeschia aethiopica</i>	2
<i>Cyathochaeta avenacea</i>	2		
<i>Gahnia trifida</i>	2		
<i>Hibbertia cuneiformis</i>	2		
<i>Hypochaeris glabra</i>	2		
<i>Juncus pallidus</i>	2		
<i>Lepidosperma longitudinale</i>	3		
<i>Lotus subbiflorus</i>	2		
<i>Lysimachia arvensis</i> var. <i>caerulea</i>	1		
<i>Lythrum hyssopifolia</i>	1		
<i>Melaleuca raphiophylla</i>	3		
<i>Melaleuca viminea</i>	2		



Quadrat: RUA03 Established: 17/12/2020 Soil: Grey brown sandy loam
 Condition: Good
 Photo direction: looking NE

Species	Cover
<i>Agonis flexuosa</i>	2
<i>Austrostipa hemipogon</i>	1
<i>Avena barbata</i>	2
<i>Banksia littoralis</i>	2
<i>Briza maxima</i>	2
<i>Bromus diandrus</i>	2
<i>Ehrharta calycina</i>	2
<i>Ehrharta longiflora</i>	2
<i>Gahnia trifida</i>	2
<i>Kunzea glabrescens</i>	2
<i>Lepidosperma longitudinale</i>	4
<i>Lythrum hyssopifolia</i>	2
<i>Melaleuca raphiophylla</i>	4
<i>Melaleuca teretifolia</i>	1
<i>Microtis media subsp. media</i>	1
<i>Patersonia occidentalis</i>	1
<i>Sonchus oleraceus</i>	1
<i>Zantedeschia aethiopica</i>	1



Quadrat: RUA04 Established: 17/12/2020 Soil: Grey black sandy loam
Note: Clay observed in cutting about 50-75cm below surface.
Condition: Very Good
Photo direction: looking NE

Species	Cover
<i>Baumea juncea</i>	5
<i>Cassutha racemosa</i>	2
<i>Cynodon dactylon</i>	3
<i>Bartsia viscosa</i>	1
<i>Hakea ceratophylla</i>	3
<i>Hakea varia</i>	2
<i>Juncus microcephalus</i>	2
<i>Melaleuca incana</i>	2
<i>Melaleuca preissiana</i>	2