Detailed and Targeted Flora and Vegetation Survey

Drakesbrook Public Cemetery
Mitchell Avenue, Waroona
Western Australia

Prepared for the Shire of Waroona
January 2023

PO Box 9179, Picton WA 6229
0484 771 825 | enquiries@ecoedge.com.au

Version	Origin	Review	Review date	Release approval	Issue date
V1	R. Smith	D. Brace	20/12/2022		
V2	E. Hutt	R. Smith	4/1/2023		
Final Draft	D. Brace	C. Spencer	19/1/2023	Ecoedge	23/1/2023
Final	SoWarooona	Ecoedge	31/1/2023	Ecoedege	3/2/2023

Executive Summary

Ecoedge was engaged by the Shire of Waroona to undertake a spring Targeted and Detailed flora and vegetation survey of the Waroona Cemetery within the Shire of Waroona. The cemetery contains about 2.5 hectares of native vegetation.

The Shire is investigating redevelopment opportunities at this site and required the survey to inform project planning and any environmental approvals that may be required, as part of a future proposal.

One hundred and ten vascular flora taxa were identified within the survey area, of which 35 (32%) were non-native species. No Threatened or Priority taxa, or species otherwise of conservation significance were found within the survey area.

Watsonia meriana was the only Declared pest plant, found during the survey.

Only one vegetation unit was mapped within the survey area, which varied widely in condition and integrity: Jarrah-Marri open forest. Based on the results of the MVA approximately 1.69 ha of the Jarrah-Marri open forest vegetation in Degraded-or-better condition was determined to be an occurrence of the threatened ecological community FCT01b (Southern *Corymbia calophylla* woodlands on heavy soils) which is listed as 'Vulnerable'. Generally, this community is restricted to remnant vegetation south of Dardanup, so the occurrence identified during the current survey represents a significant northward extension.

One vegetation complex was mapped to occur across the survey area: the Forrestfield Complex. The complex had less than 30% of its Statewide pre-European extent of the SCP remaining (12.29%). The actual vegetation of the survey area, when allowance is made for the extent of degradation, is a good match for the vegetation complex categorised at the Forrestfield Complex.

There was one Beard's vegetation association mapped to occur across the survey area: Association 3 'Medium forest; jarrah-marri'. This association has 67.76% of its pre-European extent of the SCP remaining, which is above the Commonwealth retention target of 30%. Association 3 is a good match for the vegetation within the survey area in terms of its dominant species and structure.

There are no connected parcels of vegetation within the survey area that are linked to the regional ecological axis lines that occur to the south and east of the survey area. The nearest priority value rated vegetation parcel is located approximately 460 m to the east of the survey area, with another parcel located approximately 600 m to the west of the survey area.

No wetlands, including Conservation category wetlands, or watercourses were mapped within the survey area.

There are no formally mapped ESAs within the survey area.

Contents

Table of Tables

Table of Figures

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.

Report for the benefit of the Client

The report has been prepared for the benefit of the Client and no other party. Ecoedge assumes no responsibility and will not be liable to any other person or organisation for or in relation to any matter dealt with or conclusions expressed in the report or for any loss or damage suffered by any other person or organisation arising from matters dealt with or conclusions expressed in the report (including, without limitation, matters arising from any negligent act or omission of Ecoedge or for any loss or damage suffered by any other party relying on the matters dealt with or conclusions expressed in the report). Other parties should not rely upon the report or the accuracy or completeness of any conclusions and should make their own enquiries and obtain independent advice in relation to such matters.

1 Introduction

Ecoedge Environmental Services (Ecoedge) was engaged by the Shire of Waroona (the Shire) in July 2022, to undertake a spring Detailed and Targeted flora and vegetation survey of the Waroona Cemetery (or known as the Drakesbrook Public Cemetery) within the Shire of Waroona (the survey area) (**Figure 1** and **Figure 2**).

The survey area is located to the east of the South Western Highway within the boundaries of the townsite of Waroona, and has an area of approximately 5 hectares (ha). The Shire is investigating redevelopment opportunities for the site and required the survey to inform project planning and environmental approvals, that may be required as part of a future proposal.

The flora and vegetation survey was undertaken on 9 September 2022 by Russell Smith (flora permit FB2000500) and Ben Eckermann (flora permit FB62000262) in accordance with the Environmental Protection Authority (EPA) Technical Guidance - Flora and Vegetation Surveys for Environmental Impact Assessment (EPA 2016).

This report compiles findings of the survey.

2 Scope and objectives

The Shire required a desktop assessment to be conducted prior to the field survey to identify relevant key features and constraints which were in or nearby the survey area, such as Threatened and Priority Flora, Threatened and Priority Ecological Communities (TEC and PECs), riparian vegetation, unusual soil/landscape systems, conservation estates, poorly represented vegetation associations and or vegetation complexes and Environmentally Sensitive Areas (ESAs). The desktop assessment area (study area) encompassed a ten-kilometre (km) buffer to the survey area (**Figure 2**).

The field survey was required to ground-truth the desktop assessment findings and delineate all significant flora and vegetation components within the survey area, including TECs and PECs and Threatened and Priority flora.

The survey and report were required to be undertaken in accordance with the Environmental Protection Authority (EPA) Technical Guidance - Flora and Vegetation Surveys for Environmental Impact Assessment (EPA 2016) and meet requirements of other relevant State, and Commonwealth guidelines for threatened species and communities, such as approved conservation advice for *Environmental Protection and Biodiversity Act 1999* (EPBC Act 1999) threatened species and communities.

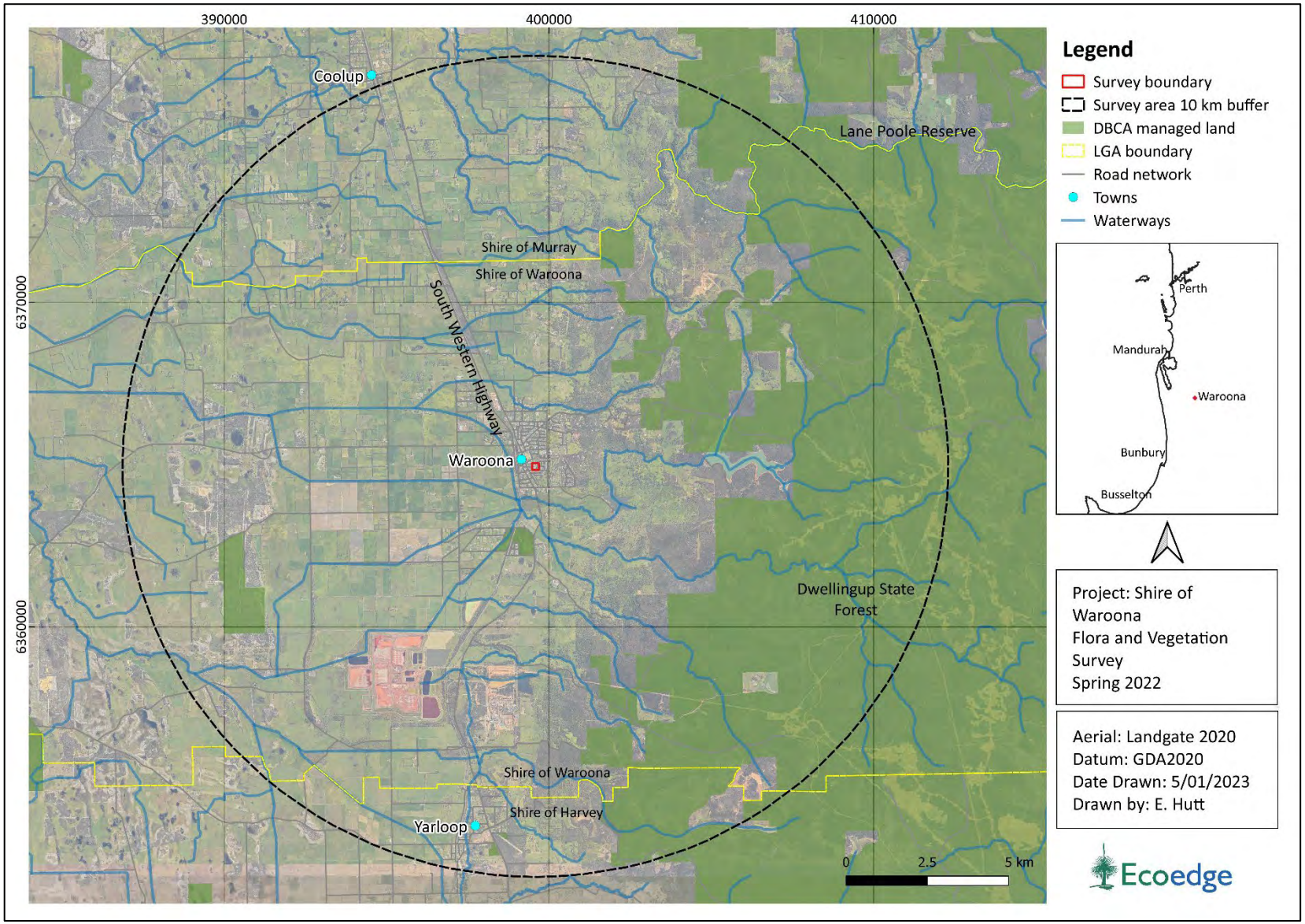


Figure 1. Aerial photograph showing the location of the survey area and 10 km buffer study area.

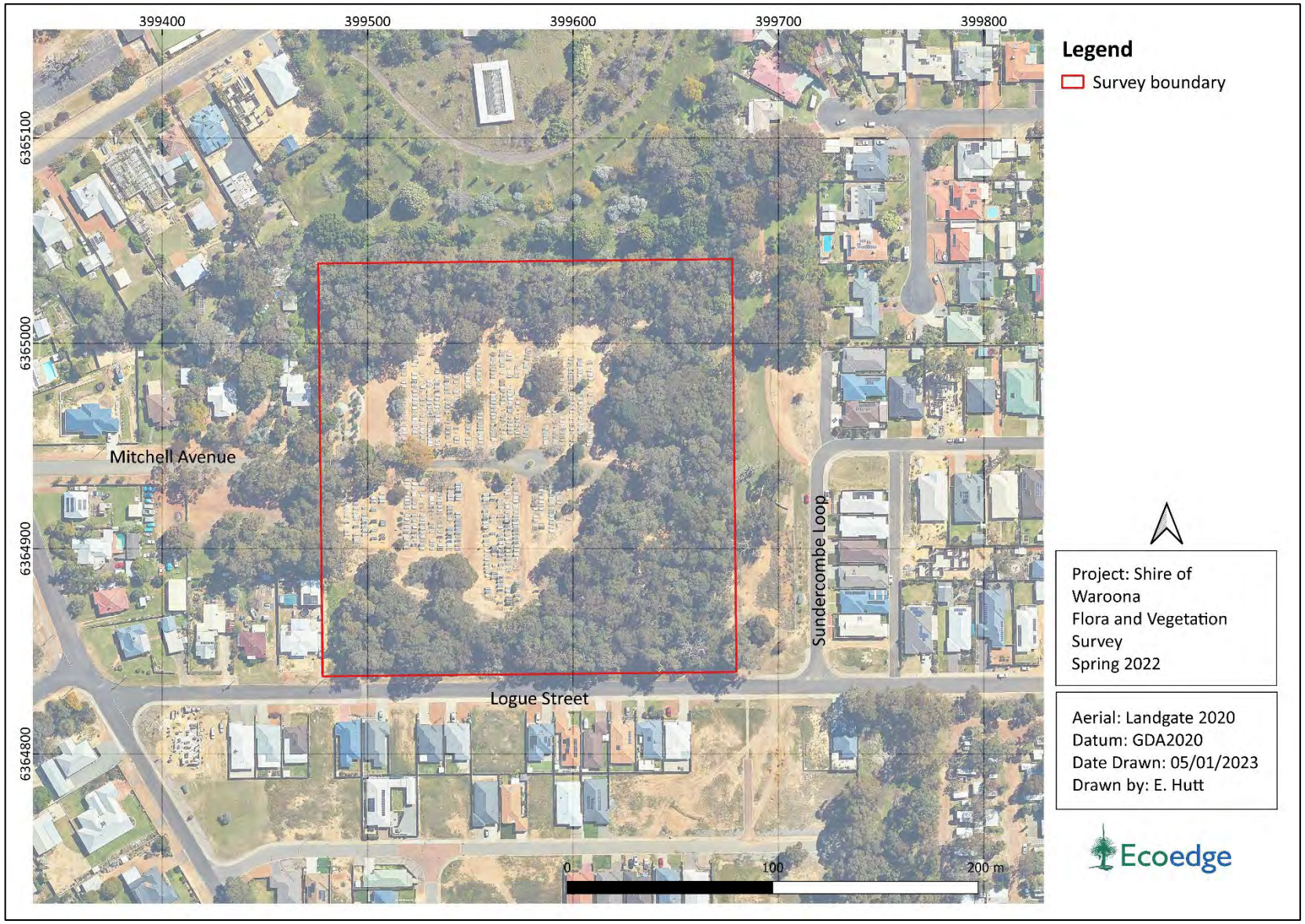


Figure 2. Aerial photograph showing the location of the survey area.

3 Methods

3.1 Desktop assessment

Prior to the field survey, a desktop assessment was undertaken to provide contextual information on the flora and vegetation within the survey area. The desktop studies included a review of the following information.

- Regional geology and soil mapping (van Gool & Kipling 1992).
- Vegetation complex mapping of the South West Forest Region of Western Australia (Mattiske and Havel 1998) and the System 6 area (Heddle et al. 1980) as updated by Webb et al. (2016).
- Beard's Pre-European Vegetation Association mapping dataset (DPIRD-006) (Beard et al. 2013, DPIRD 2019).
- WA Threatened and Priority Ecological Communities DBCA database extracts from the Department of Biodiversity, Conservation and Attractions (DBCA 2022a) and TEC and PEC listings (DBCA 2018, DBCA 2021, DBCA 2022b).
- Federal Protected Matters Search Tool results (DCCEEW 2022a).
- Threatened and Priority flora Naturemap search results provided by DBCA (DBCA 2022c).
- Extract from the Department's Threatened Flora database and the WA Herbarium database (DBCA 2022d).
- Geomorphic Wetlands, Swan Coastal Plain Data Set DBCA-019 (DBCA 2022e).
- Environmentally sensitive areas distribution maps and data (DWER 2021).
- Surface Hydrology Lines (National) (Crossman & Li 2015).
- Regional Ecological Linkages (Molloy et al. 2009).

3.2 Significant flora likelihood of occurrence

Prior to undertaking the survey, an assessment of the likelihood of occurrence of Threatened and Priority flora occurring within the survey area was undertaken. The rationale for determining this pre-survey (and post-survey) likelihood of occurrence is provided in **Appendix 1**.

3.3 Field survey

The detailed and targeted flora and vegetation survey was undertaken on 9 September 2022 by Russell Smith (flora permit FB2000500) and Ben Eckermann (flora permit FB62000262) in accordance with the Environmental Protection Authority (EPA) Technical Guidance - Flora and Vegetation Surveys for Environmental Impact Assessment (EPA 2016).

The time of survey was within the optimum time for field identification of most of the threatened and priority flora identified as potentially occurring within the survey area. However, because the survey was done in spring one priority taxon, the fungus *Amanita fibrillopes*, would not have been visible because it grows in winter and would have withered by the time of survey.

The dominant and characteristic species, as well as some soil information, was collected within the survey area, and vegetation condition was recorded at 65 points. It was apparent that, although it varied in condition, there was only one vegetation unit within the survey area. A 10 m x 10 m floristic quadrat was installed within some of the best quality vegetation.

The quadrat information was used to identify and describe the vegetation unit using the NVIS system (Level 5; NVIS 2017).

Vegetation condition was assessed using the method of the EPA (2016) (**Appendix 2**).
Flora species not identified in the field were photographed for later identification.

3.4 Multivariate analysis

The floristic data from the quadrat placed in the survey area was compared to the full set of quadrat data from various Swan Coastal Plain surveys (Keighery et al. 2012). In total 1,592 taxa and 1,099 quadrats were used in the analysis.

The MVA used two-way classification (Agglomerative Hierarchical Fusion) of the presence/absence data for each quadrat. The flexible UPGMA classification strategy was used (β = -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”) were accepted in each case. The primary output of the classification was a dendrogram.

3.5 Survey limitations

Limitations with regards 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	Not a constraint	The survey scope was prepared in consultation with the Shire and was designed to comply with EPA requirements.
Proportion of flora identified	Not a constraint	The survey was carried within the prime flowering season for the southern Swan Coastal Plain.
Climatic and seasonal effects	Not a constraint	Rainfall till the end of October at Wagerup Refinery the nearest station with records for 2022 was 94% of the long-term average.
Availability of contextual information	Not a constraint	A regional survey has been carried out of the vegetation of the Southern Swan Coastal Plain.
Completeness of the survey	Not a constraint	The survey was carried out within the spring and flowering season and all parts of the survey area were accessible. Only a fungus *Amanita fibrillopes* (P1) would not be visible during spring.
Skill and knowledge of the botanists (vascular flora)	Not a constraint	The botanists have a combined 30 years of experience in flora surveys in the south-west of W.A.
Disturbance (fire, grazing, clearing etc.)	Minor	There has been considerable disturbance of much of the survey area (cemetery) and adjacent to it, and subsequent weed invasion.

4 Results desktop assessment

4.1 Biogeographic region and location

The survey area is situated within the Perth (SWA02) sub-region of the Swan Coastal Plain (SCP) biogeographic region just to the west of the Northern Jarrah Forest (JF1) subregion of the Jarrah Forest (JAF) biogeographic region as defined in the Interim Biogeographical Regionalisation for Australia (IBRA) (Commonwealth of Australia 2016).

4.2 Landform and soils

A hierarchy of soil-landscape mapping has been developed to assist in categorising soils across all regions of WA (Schoknecht et al. 2004). At the broadest scale the survey area occurs at the eastern edge of the Swan Coastal Plain's Pinjarra Zone (213Pj) near the base of the Darling Scarp where the Western Darling Range Zone (255) begins. The region in between these two zones consists of the gently undulating foot slopes of the Darling Scarp and is classified as the Forrestfield System (213Fo), which runs from the eastern margin of the Swan Coastal Plain down to Capel. The system can be identified by its duplex sandy gravels, pale deep sands and grey deep sandy duplexes (van Gool & Kipling 1992) (**Figure 3**).

Within the Forrestfield system, the survey area is located within one soil unit phase, Forrestfield F2b (213Fo_F2b). This phase is categorised by moderately deep to deep, gravelly acidic yellow duplex soils and rare laterite which are situated on low slopes and foot slopes up to 5-10% (DPIRD 2022). Another Forrestfield phase (213Fo-F1c) occurs to the south east of the survey area, these soils are situated on lower slopes with an incline of 1-15% with well drained deep uniform yellowish brown sands which are generally free of laterite or gravel. To the east of the survey area lies the Murray Valley DR2 phase (255Mv) which consists of red and yellow gradational earths and duplex soils with variable depth and common rock outcrops (DPIRD 2022). This soil phase occurs on moderately inclined slopes of between 3-20%. To the west and south of the survey area are Pinjarra Zone soil phases (213_Pj) which occur on flat to very gently undulating plains. These soils are poorly drained and can vary from deep bleached siliceous sands to acidic gradational yellow or grey-brown earths and mottled yellow duplex soils with loam to clay loam surface horizons (DPIRD 2022). The location of these soil units is shown in **Figure 3**.

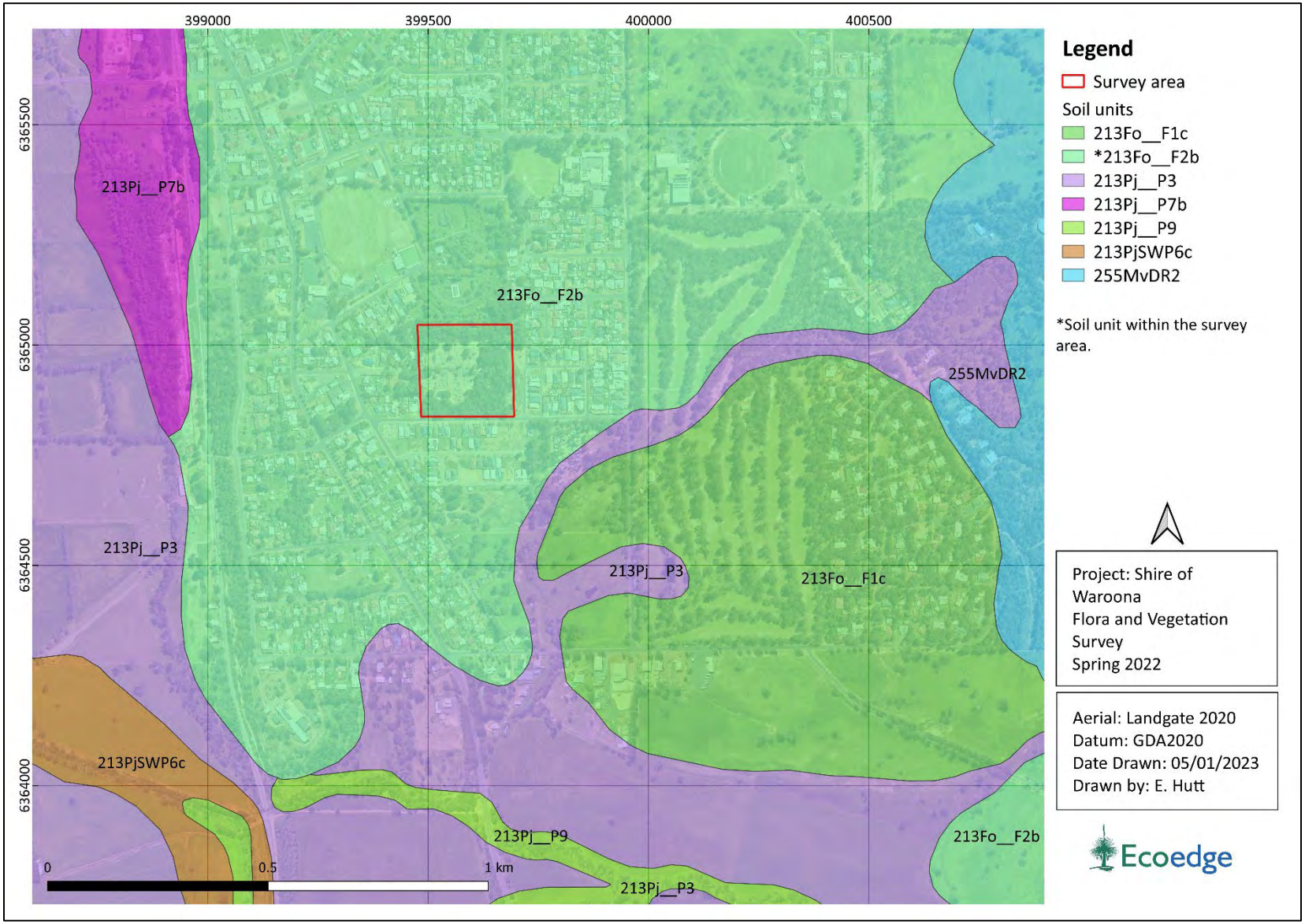


Figure 3. Land units mapped in and nearby the survey area (DPIRD 2022, van Gool & Kipling 1992).

4.3 Vegetation description according to pre-European mapping datasets

4.3.1 Vegetation complexes

The comprehensive pre-1750 distribution of vegetation complexes[1] across the southwest of Western Australia is based on two main data sets. Heddle et al.'s 1980 1:250,000 scale vegetation complex mapping of the 'System 6' area comprising of the greater Perth and Darling Range Region and Mattiske and Havel's 1998 1:50,000 scale mapping of forest vegetation covered by the Regional Forest Agreement 1999[2] (Webb et al. 2016). Both data sets were prepared in order to inform the adequacy of biodiversity conservation through state managed reserves (EPA 1993, South-West Regional Forest Agreement 1999). In 2016 these data sets were revised by the Department of Parks and Wildlife (DPaW) (Webb et al. 2016) in order to fill data gaps and improve alignment and correlation between the data sets.

According to the vegetation complex mapping as updated by Webb et al. in 2016 there is one complex, the Forrestfield complex, mapped across the survey area. This complex is described in **Table 2** and shown in **Figure 4.** Three other complexes occur in the area surrounding the survey area. The Guildford complex appears in the north west region, the Dardanup complex to the west and south, and the Darling Scarp (DS2) complex abuts the Forrestfield complex to the east (**Figure 4**).

Table 2. Vegetation complexes mapped for the survey area (Webb et al. 2016).

Vegetation Complex	Description
Forrestfield Complex	Vegetation ranges from open forest of *Corymbia calophylla* (Marri) - *Eucalyptus wandoo* (Wandoo) - *Eucalyptus marginata* (Jarrah) to open forest of *Eucalyptus marginata* (Jarrah) - *Corymbia calophylla* (Marri) - *Allocasuarina fraseriana* (Sheoak) - Banksia species. Fringing woodland of *Eucalyptus rudis* (Flooded Gum) in the gullies that dissect this landform.

4.3.2 Vegetation associations

A systematic survey of native vegetation in Western Australia was undertaken by J. S. Beard (along with others) during the 1970s, which described vegetation systems in the southwest of Western Australia at a scale of 1:250,000. Beard's vegetation maps attempted to depict the vegetation as it might have been prior to European settlement in terms of type and extent (Beeston et al. 2001). The Beard Vegetation Association dataset, also referred to as the pre-European native vegetation extent dataset, was digitised by Shepherd et al. (2002).

[1] Vegetation complex mapping is based on broadscale assessment of regional patterns of vegetation in relation to underlying landforms, soils and climatic trends.

[2] Mattiske and Havel's (1998) mapping also included an assessment of an area of the very southern portion of the Swan Coastal Plain landform (Webb et al. 2016).

Beard vegetation associations have been described to a minimum standard of Level 3 “Broad Floristic Formation” for the National Vegetation Inventory System (NVIS) (state-wide to regional scale) [3] (NVIS 2017).

The survey area comprised only one Beard vegetation association: association 3 ‘Medium forest; jarrah-marri’ (**Figure 5**).

[3] Beard’s vegetation mapping units are referred to as ‘associations’ however these do not correspond to the NVIS Level 5 ‘Associations’. The NVIS system was developed long after Beard’s work was completed, and while both classification systems use the same term, NVIS ‘Associations’ describe vegetation in more detail than do Beard’s.

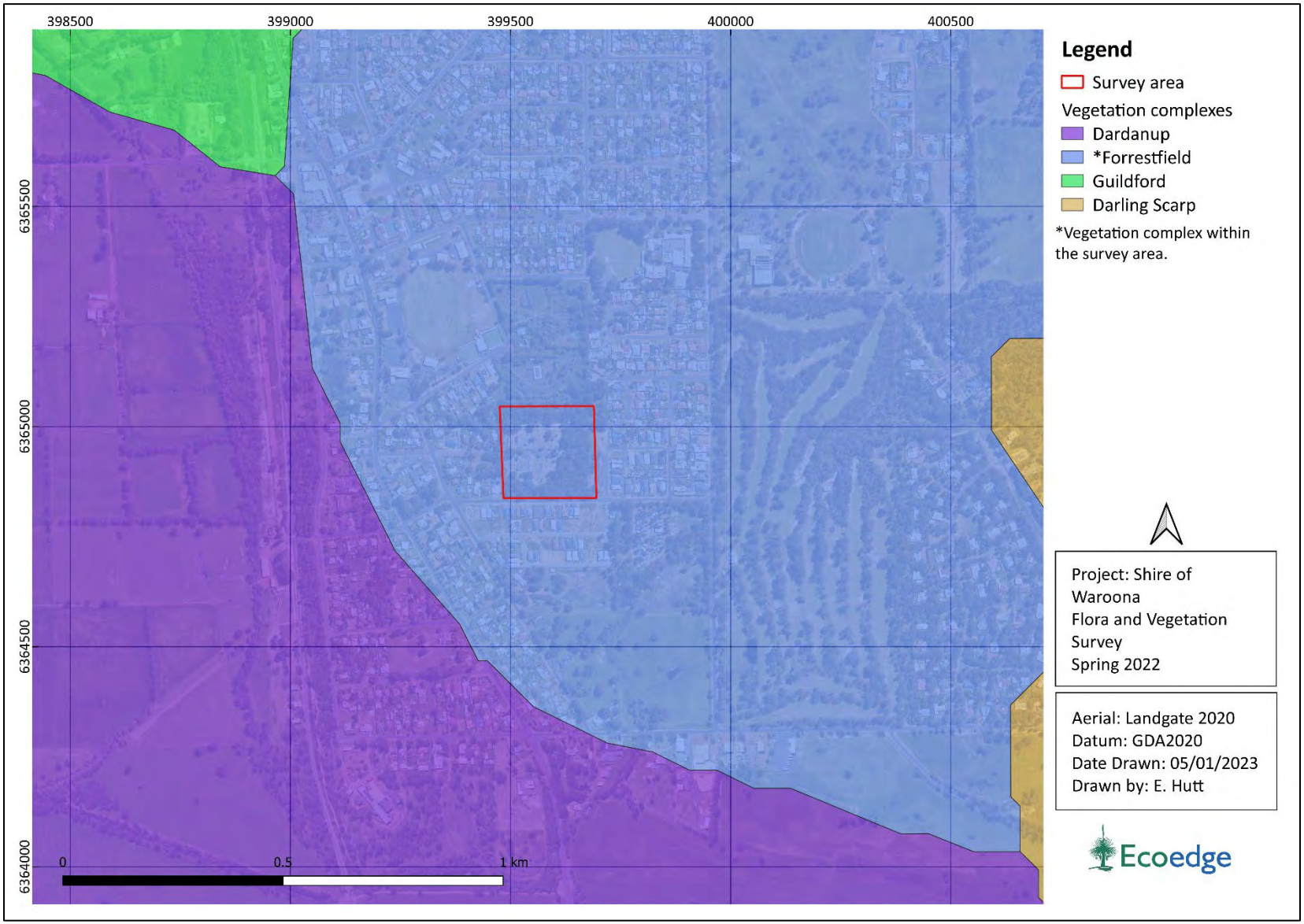


Figure 4. Vegetation complexes mapped in and nearby the survey area (DPaW 2018, Webb et al. 2016).

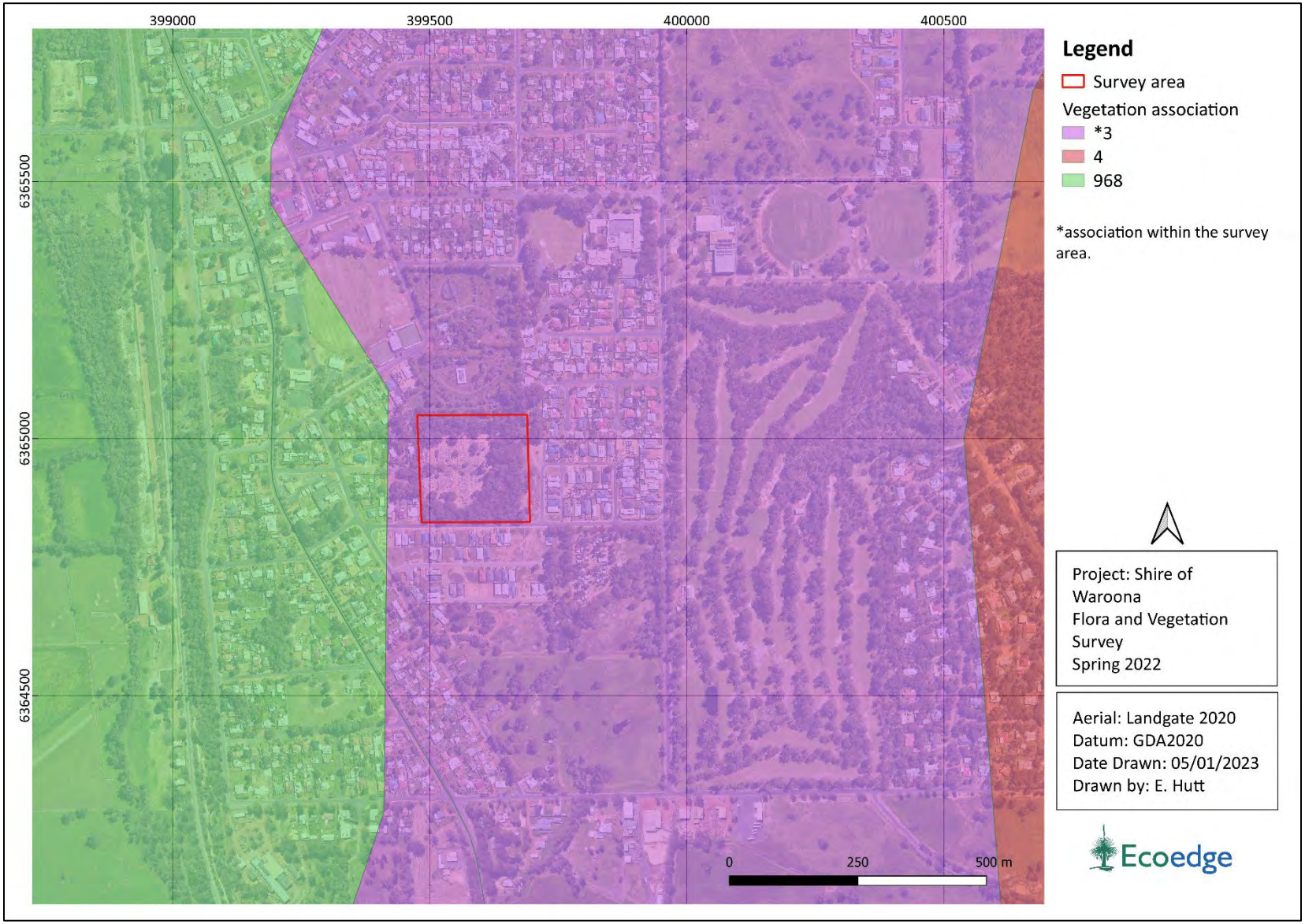


Figure 5. Vegetation associations mapped in and nearby the survey area (Beard et al. 2013).

4.3.3 Assessment of remaining extent against pre-European extent

In 2001, the Commonwealth of Australia stated National Targets and Objectives for Biodiversity Conservation, which recognised that the retention of 30%, or more, of the pre-clearing extent of each ecological community was necessary if Australia's biological diversity was to be protected (Environment Australia 2001).

In its report on the Statewide Vegetation Statistics incorporating the Comprehensive, Adequate and Representative (CAR) Reserve Analysis, the Government of Western Australia (GoWA) provides information on the pre-European and current extent of the ecological communities of Western Australia and reports on the status of the CAR reserve system for WA (GoWA 2019a). This system is also based on the National retention targets of 30% overall. Only reserves managed by DBCA under the *Conservation and Land Management Act 1984* are considered for inclusion in the "CAR Reserve Analysis". In Western Australia these statistics have been based on Beard's vegetation associations and Webb et al.'s (2016) updated vegetation complexes.

The percentage remaining of the pre-European extent vegetation and the percentage of current extent in DBCA managed land for the one complex and one association described for the survey area are presented in **Table 3** and **Table 4** respectively.

In summary the Forrestfield complex which comprises the survey area is poorly represented at a state level with less than 13% of the pre-European extent remaining (**Table 3**).

Association 3 attains the above 30% retention target at a state level (67.76%), and within the shire boundary it is highly represented with 83.64% remaining. A large percentage of the association within the Shire is held in DBCA lands. At the IBRA region and subregion levels the association drops below the 30% threshold in both cases (**Table 4**).

The red, orange and yellow shading in the tables indicates the status of the Commonwealth 30% retention target.

Status of the Commonwealth retention target	>30%	<30%	<10%

Table 3. The vegetation complex mapped within the survey area with regards to the Commonwealth retention targets (GoWA 2019b).

Region	Pre-European (ha)	Current Extent (ha)	% Remaining	% Remaining in DBCA reserves[4]
Forrestfield Complex				
Swan Coastal Plain	22,812.92	2,803.36	12.29	1.67
Shire of Waroona	1,622.98	189.73	11.69	n/a

* Excludes Crown Freehold Department Interest Lands that are managed under Section 8(a) of the CALM Act.

Table 4. The vegetation association within the survey area with regards to the Commonwealth retention targets (GoWA 2019a).

Region	Pre-European (ha)	Current Extent (ha)	% Remaining	% Remaining in DBCA Managed Land*
Association 3				
State-wide	2,661,404.62	1,803,437.48	67.76	55.23
IBRA region: Swan Coastal Plain (SWA)	17,364.58	3,150.77	18.14	2.11
IBRA sub-region Perth (SWA02)	16,754.96	2,789.47	16.65	2.18
Shire of Waroona	38,239.99	31,984.46	83.64	78.50

* Excludes Crown Freehold Department Interest Lands that are managed under Section 8(a) of the CALM Act.

[4] The % remaining in DBCA land is not calculated for the vegetation complex mapping data set.

4.4 Threatened and Priority ecological communities

Ecological communities are defined by Western Australia's DBCA as "...naturally occurring biological assemblages that occur in a particular type of habitat. They are the sum of species within an ecosystem and, as a whole, they provide many of the processes which support specific ecosystems and provide ecological services." (DEC 2013).

Under Section 27 of the *Biodiversity Conservation Act 2016* (BC Act), the Western Australian Minister for Environment may list communities considered under significant threat as a TEC. These TECs can be listed under one of three conservation categories. These categories are Critically Endangered (CR), Endangered (EN), Vulnerable (VU). The BC Act also provides for listing communities as collapsed ecological communities.

Possible TECs that do not meet survey criteria are added to the DBCA's Priority ecological community lists under Priorities 1, 2 or 3 (referred to as P1, P2, P3). Ecological communities that are adequately known, are rare but not Threatened, that meet criteria for near Threatened, or that have been recently removed from the Threatened list, are placed in Priority 4 (P4). These ecological communities require regular monitoring. Conservation Dependent ecological communities are placed in Priority 5 (P5) (DEC 2013).

The current listing of Threatened and Priority ecological communities is specified in DBCA (2018, 2021b). The conservation categories for these Threatened and Priority ecological communities are defined in **Appendix 3**.

TECs can also be listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). There are three categories of TEC under the EPBC Act: Critically Endangered (CR), Endangered (EN) and Vulnerable (VU) (Department of Agriculture, Water and the Environment) (DCCEEW 2022b). These are defined in **Appendix 4.**

The desktop assessment, which included a Protected Matters Search (DCCEEW 2022a) and review of DBCA TEC and PEC database extracts (DBCA 2022a), found four EPBC Act, seven BC Act listed TECs, and three State listed PECs within the 10 km study area.

Outcomes of these searches are presented in **Table 5.** The results of the DBCA records are shown in **Figure 6.**

Table 5. Threatened and Priority ecological communities occurring within study area (DCCEEW 2022a, DBCA 2022a).

Community name and description	Status (WA)	Status (EPBC Act)
'Claypans of the Swan Coastal Plain' – a federally listed TEC consisting of four State-listed communities, 3 of which occur in the study area: 1. SCP08 Herb rich shrublands in clay pans 2. SCP09 Dense shrublands on clay flats 3. SCP10a Shrublands on dry clay flats	T (VU)	T (CR)
'Banksia Woodlands of the Swan Coastal Plain' – a federally listed TEC which can occur in a number of State-listed communities, including:	P3	T (EN)
1. SCP20b *Banksia attenuata* and/or *Eucalyptus marginata* woodlands of the eastern side of the Swan Coastal Plain.		
2. SCP21c Low lying *Banksia attenuata* woodlands or shrublands.		
Corymbia calophylla – Kingia australis woodlands on heavy soils of the Swan Coastal Plain (SCP3a)	T(CR)	T(EN)
Corymbia calophylla- Eucalyptus marginata woodlands on sandy clay soils of the southern Swan Coastal Plain (SCP3b)	T(VU)	N/A
Corymbia calophylla – Xanthorrhoea preissii woodlands and shrublands of the Swan Coastal Plain (SCP3c)	T(CR)	T (EN)

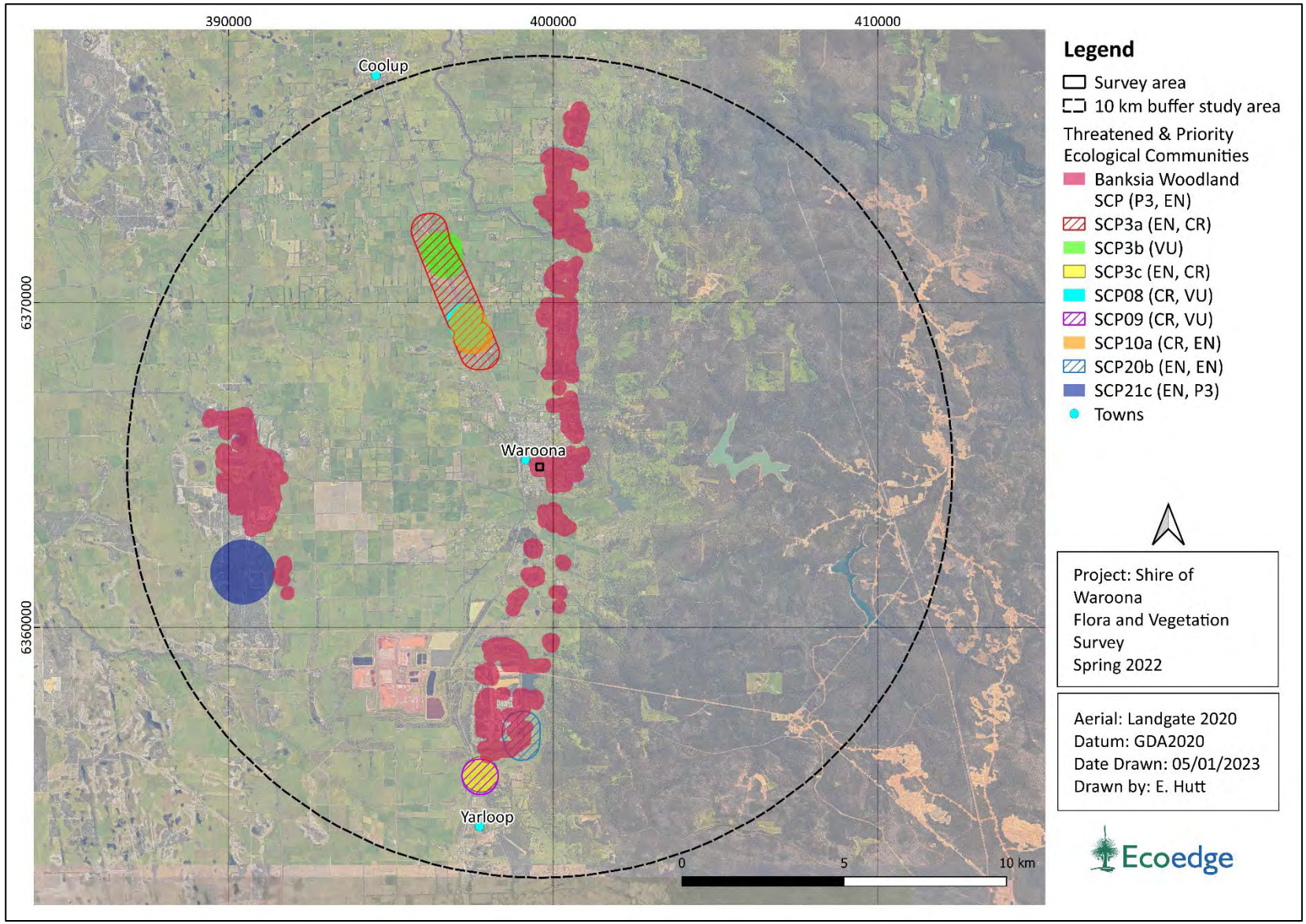


Figure 6. Threatened and Priority ecological communities within 10 km of the survey area (DBCA 2022a).

4.5 Threatened and Priority flora

Species of flora and fauna are defined as having a Threatened or Priority conservation status where their extant populations are restricted geographically and/or under threat of possible extinction. The DBCA recognises these threats and consequently applies regulations towards population and species protection.

Threatened extant flora species are listed under Section 19 of the BC Act. They are ranked according to their level of threat using the International Union for Conservation of Nature (IUCN) Red List categories and criteria. The categories are Critically Endangered (CR), Endangered (EN), Vulnerable (VU). It is an offence to "take" or damage Threatened flora without Ministerial approval. Section 5 of the Act defines "to take" as "… to gather, pluck, cut, pull up, destroy, dig up, remove, harvest or damage flora by any means".

Priority flora is under consideration for future declaration as "Threatened flora", dependent on more information. Species classified as Priority One to Three (referred to as P1, P2 and P3) are in need of further survey to determine their status, while Priority Four (P4) species are adequately known rare or Threatened species that require regular monitoring.

Threatened flora lists are formally reviewed annually, whilst the Priority flora list is subject to a less formal ongoing review. The current listing of Threatened and Priority flora was updated on 6 October 2022 (DBCA 2022b).

Categories of Threatened and Priority flora as defined by the BC Act are presented in **Appendix 5** (DBCA 2019).

Threatened flora may also be protected under the Commonwealth EPBC Act and be listed in one of six categories. Definitions of these categories are summarised in **Appendix 6** (DCCEEW 2022b).

Threatened or Priority flora occurring within 10 km of the survey area generated from a NatureMap search (DBCA 2022c) and a Protected Matters Search Tool query (DCCEEW 2022a). DBCA and WA Herbarium Threatened and Priority flora data downloads (DBCA 2022d) are provided in **Appendix 7**.

Twenty-eight significant species were identified within this search area, and all were found unlikely to occur. There were no species that were regarded as possible or likely to occur within the survey area and there were no significant species recorded within the survey area (DBCA 2022c, DBCA 2022d). The locations of these significant flora are shown in **Figure 7**.

A breakdown of the likelihood of occurrence of all potential species according to conservation status is provided in **Table 6,** with the complete likelihood of occurrence assessment provided in **Appendix 8**.

Table 6. Likelihood of occurrence according to conservation status.

Likelihood of occurrence	Total number	Priority 1	Priority 2	Priority 3	Priority 4	Threatened
Likely	**0**	-	-	-	-	-
Possible	**0**	-	-	-	-	-
Unlikely	**28**	3	3	9	8	5
Total	**28**	**3**	**3**	**9**	**8**	**5**

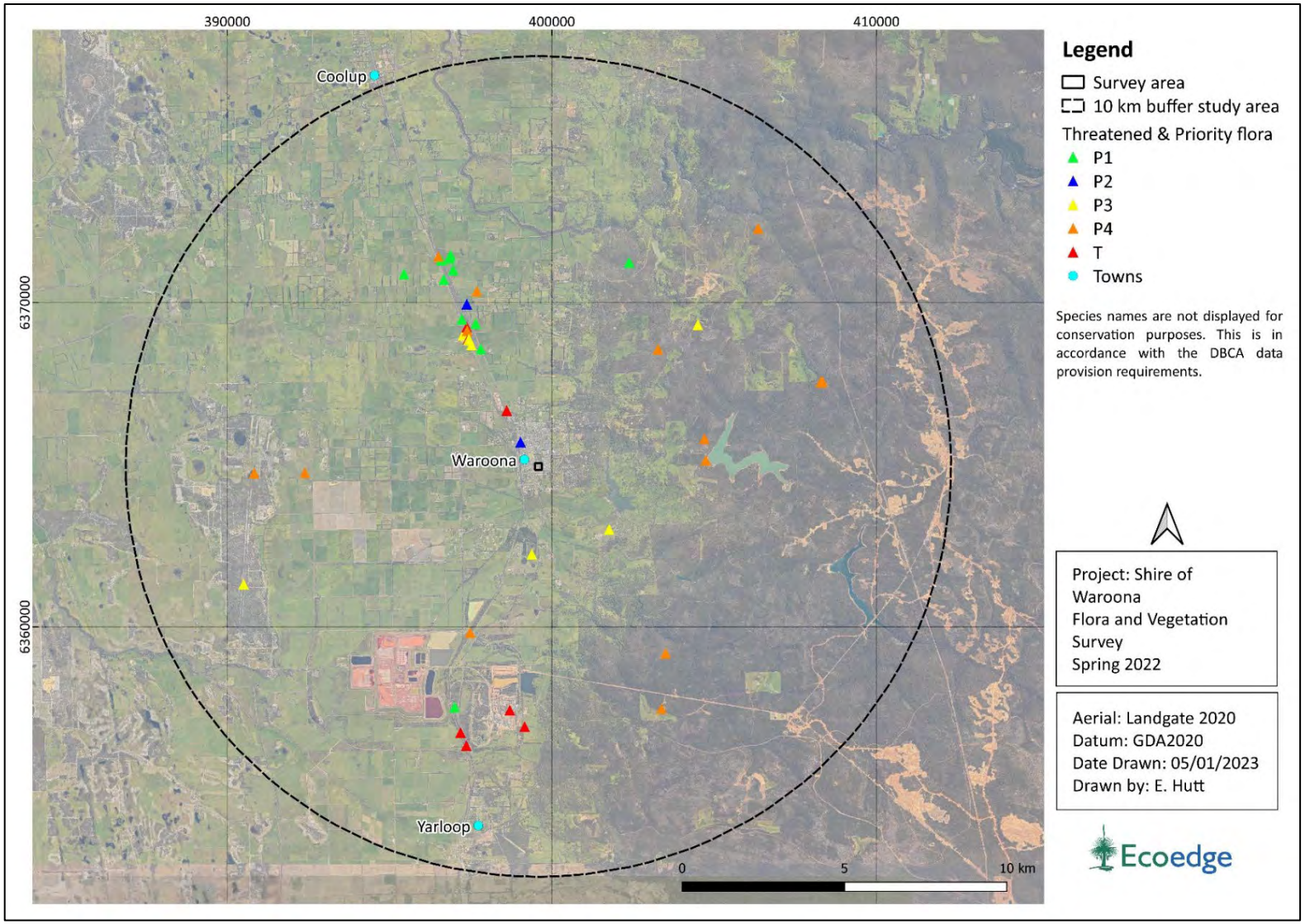


Figure 7. Threatened and Priority flora within the 10 km study area (DBCA 2022d).

4.6 Wetlands and water courses

4.6.1 Wetlands

Wetlands on the SCP have been classified into types using the geomorphic wetland classification system of Semeniuk & Semeniuk (1995), which is based on the characteristics of landform and water permanence, for example, lakes, palusplains and damplands. These are described in **Table 8.** The SCP wetlands have also been evaluated and assigned an appropriate management category and corresponding category objective, providing guidance on the nature of the management and protection the wetland should be afforded. These categories are described in **Table 9.**

Table 7. Wetland types (adapted from Semeniuk & Semeniuk 1995).

Management Category	Basin	Flat	Channel	Slope	Highland
Permanently inundated	Lake		River		
Seasonally inundated	Sumpland	Floodplain	Creek		
Intermittent inundation	Playa	Barlkarra	Wadi		
Seasonally waterlogged	Dampland	Palusplain	Trough	Paluslope	Palusmont

Table 8. Definitions of and objectives for the different wetland management categories (EPA 2008).

Management Category	Definition	Category Objective
Conservation	Wetlands with high conservation value for both natural or human use	To preserve wetland (natural) attributes and functions
Resource Enhancement (RE)	Wetlands with moderate natural and human use attributes that can be restored or enhanced	To restore wetlands through maintenance and enhancement of wetland functions and attributes
Multiple Use (MU)	Wetlands that score poorly on both natural and human use attributes	To use, develop and manage wetlands in the context of water, town and environmental planning

There are no wetlands, including Conservation Category wetlands mapped within the survey area (DBCA 2022e). The nearest wetland to the survey area is part of the extensive system of Multiple Use palusplain wetlands which extend west approximately 600 m to the west and 500 m south of the survey area (**Figure 8** and **Figure 9**).

4.6.2 Watercourses

There are no watercourses mapped within the survey area. To the west of the survey area are a network of artificial waterways and drains that act to drain the Pinjarra Plain soils for agricultural purposes (Shire of Waroona 2009). The closest of these is the Drakesbrook Drain approximately 600 m to the west. Approximately 2 km to the east, the perennial Drakes Brook flows into the artificial Lake Moyanup before joining the drainage network (**Figure 8**). **Figure 10** shows the drainage network in the surrounding area.

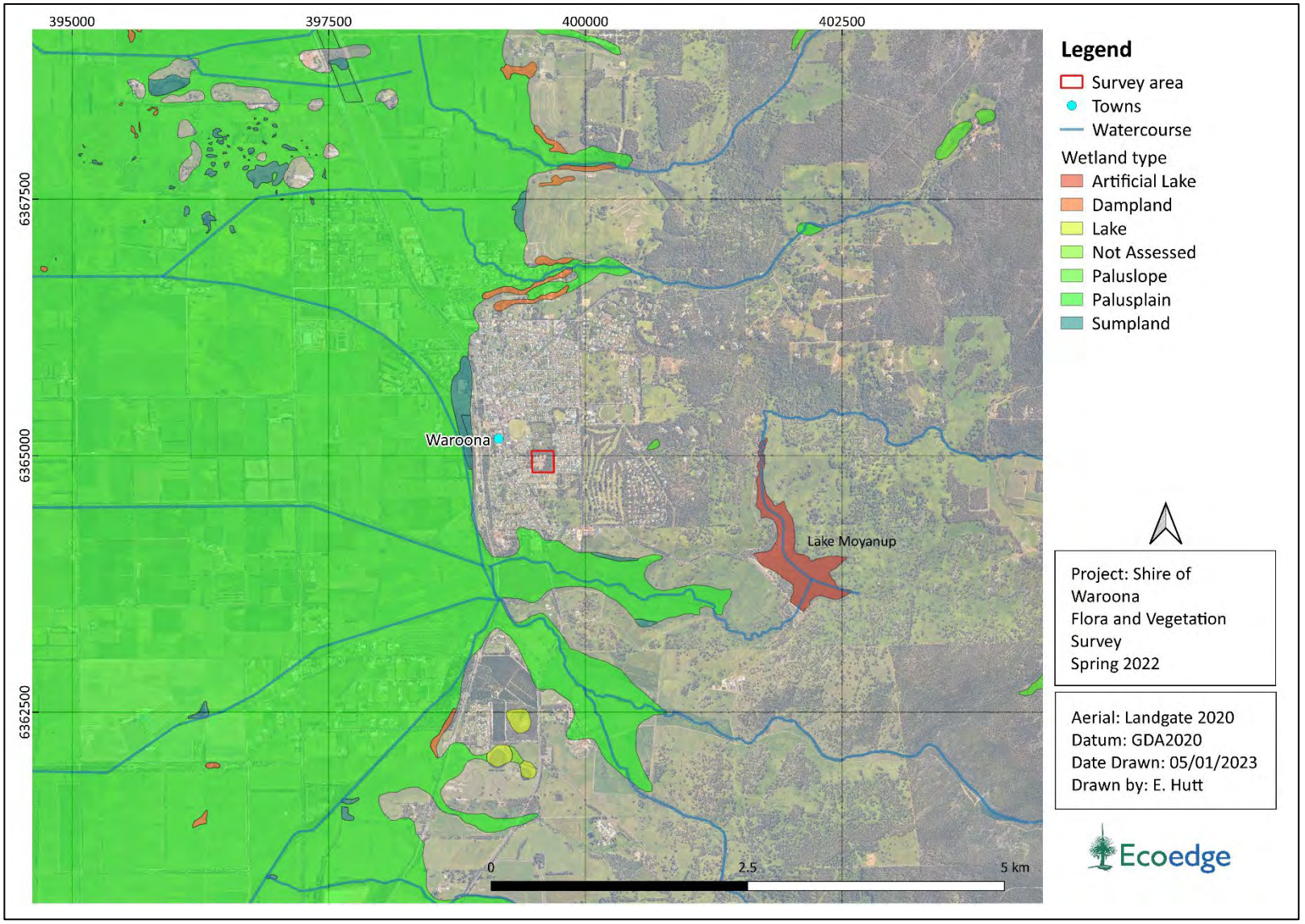


Figure 8. Geomorphic wetland type and watercourses in proximity to the survey area (DBCA 2022e).

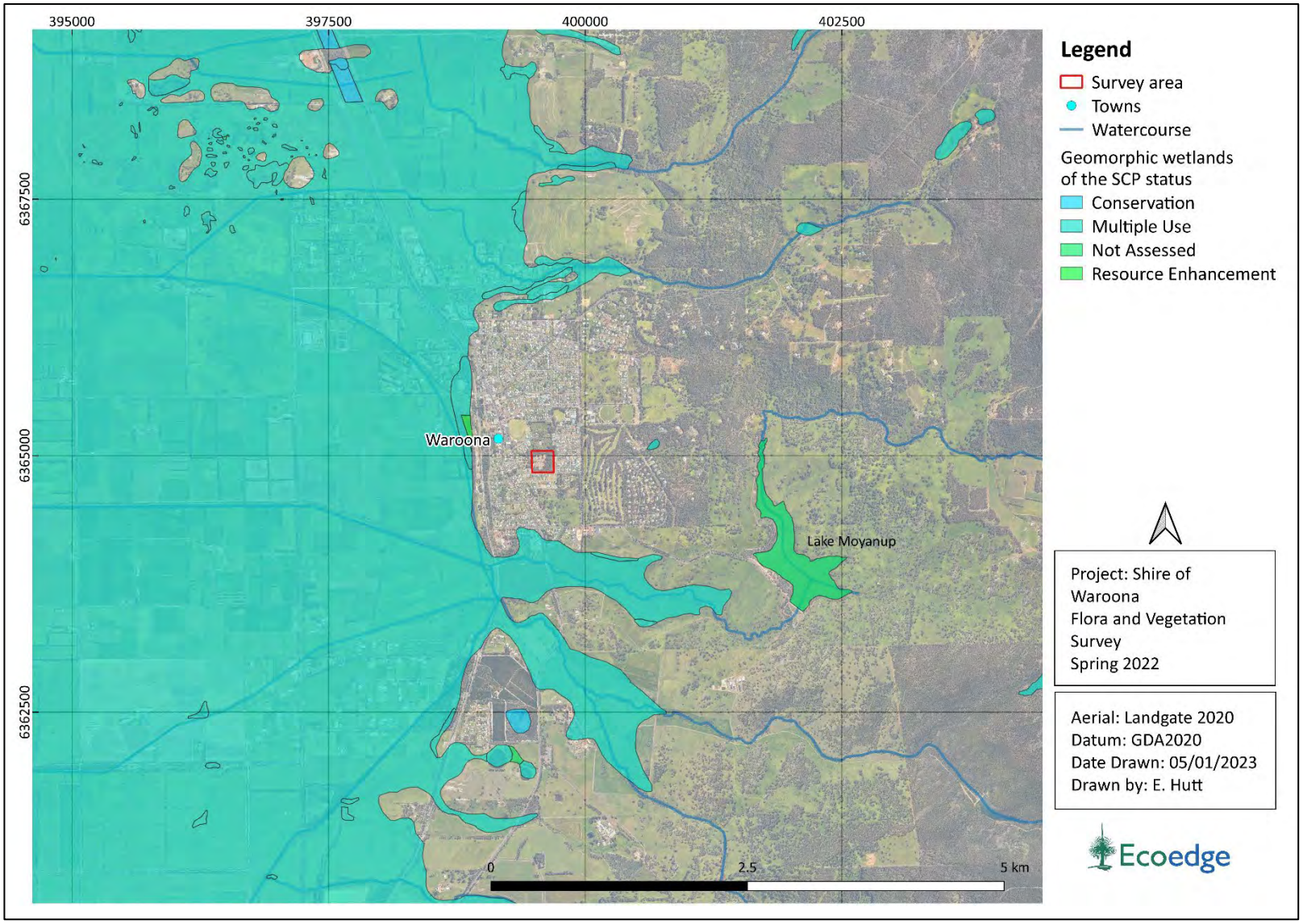


Figure 9. Status of geomorphic wetlands in proximity to the survey area (DBCA 2022e).

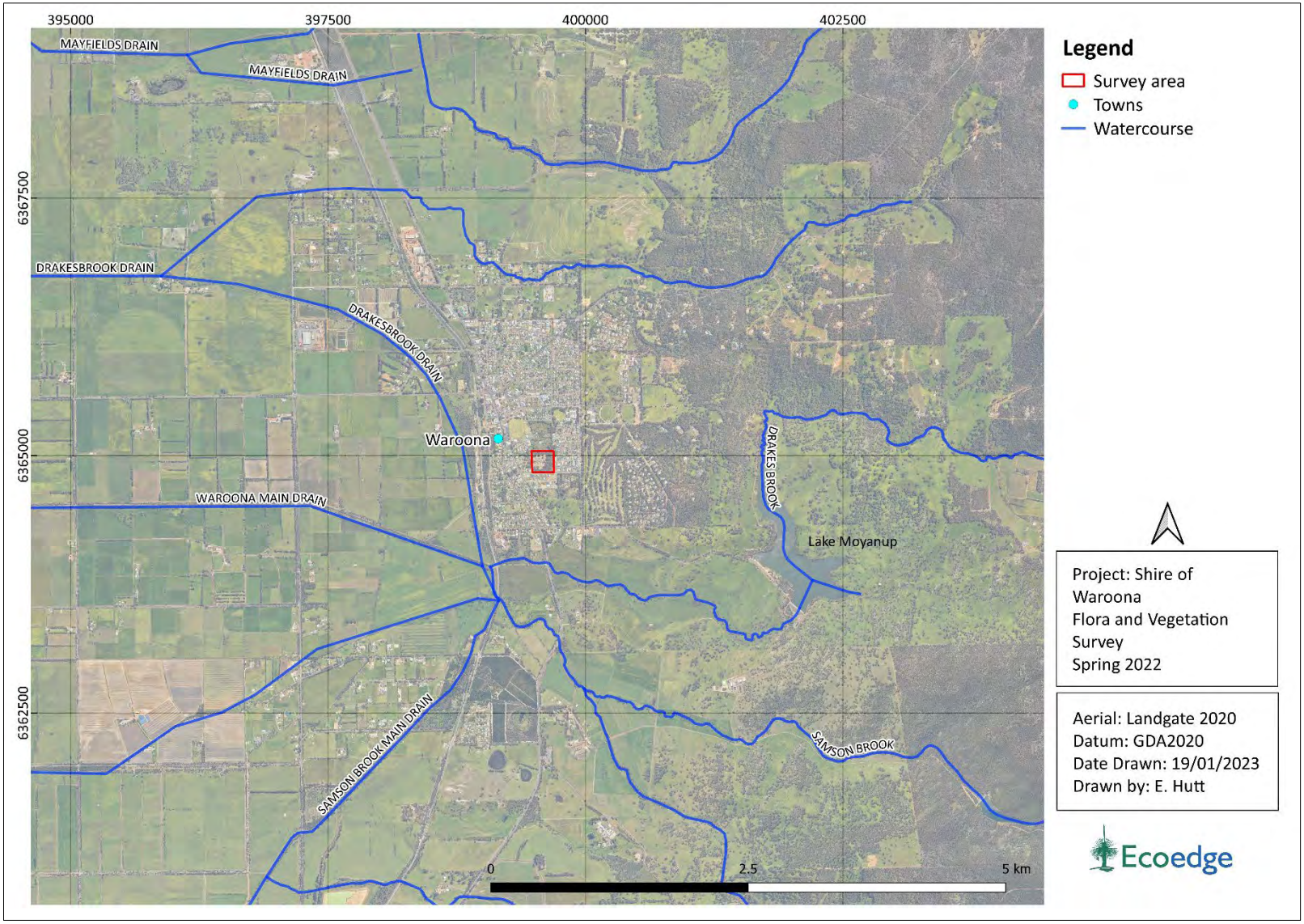


Figure 10. Location of drainage canals and watercourses in proximity to the survey area (Crossman & Li 2015).

4.7 Regional ecological linkages

Regional ecological linkages "link protected patches of regional significance by retaining the best (condition) patches available as steppingstones for flora and fauna between regionally significant areas" (Molloy et al. 2009).

Regional ecological linkages have been mapped by Molloy et al. (2009) across the SW of Western Australia in an area spanning between just north of Mandurah to Walpole in the south-east.

Molloy et al. (2009) assessed and assigned "proximity value" (pv) ratings to all patches of remnant native vegetation as a way of indicating the value of their connectivity with regional ecological linkages. This was based on their distance from the nearest mapped regional ecological linkage axis line and connected parcels of remnant vegetation (**Table 10**).

Table 9. Linkage proximity values rating assigned to patches of remnant vegetation within a landscape from Molloy et al. (2009).

Proximity value	Description
1a	with an edge touching or < 100 m from a linkage
1b	with an edge touching or < 100 m from a natural area selected in 1a
1c	with an edge touching or < 100 m from a natural area selected in 1b
2a	with an edge touching or < 500 m from a linkage
2b	with an edge touching or < 500 m from a natural area selected in 2a
2c	with an edge touching or < 500 m from a natural area selected in 2b
3a	with an edge touching or < 1000 m from a linkage
3b	with an edge touching or < 1000 m from a natural area selected in 3a
3c	with an edge touching or < 1000 m from a natural area selected in 3b

A number of regional ecological axis lines mapped by Molloy et al. (2009) occur to the south and east of the survey area. These are associated with native vegetation around the various waterways (**Figure 11**). There is no pv rated vegetation within the survey area, however there is 1a and 1b pv rated vegetation approximately 460 m to the east which is related to a north-south axis line and Dwellingup State Forest, and a 3a pv rated parcel associated with the Drakesbrook Drain approximately 600 m to the west **(Figure 11)**.

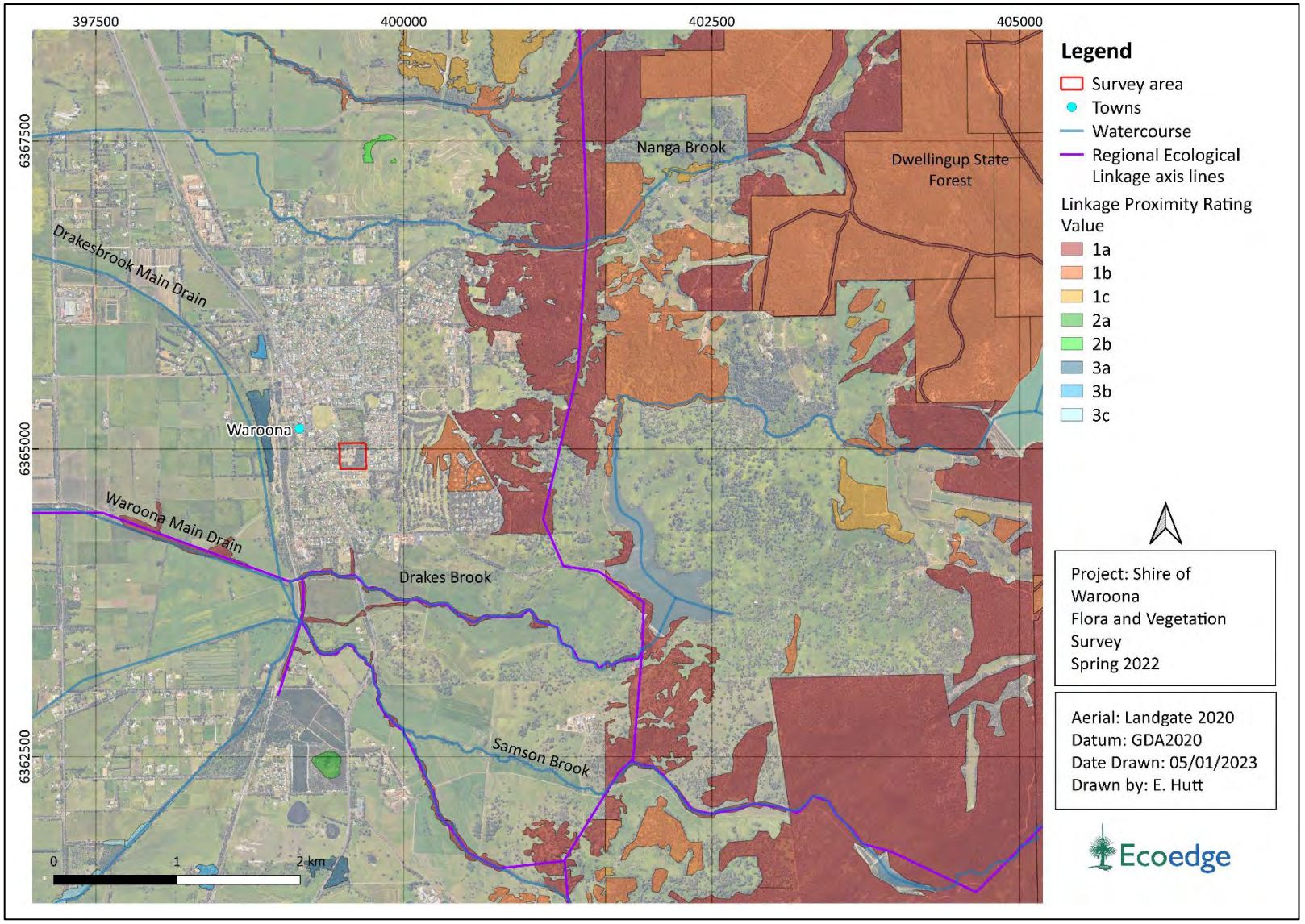


Figure 11. The survey area in relation to regional ecological linkages (Molloy et al. 2009).

4.8 Environmentally Sensitive Areas

ESAs are protected under the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*. They are selected for their environmental values at State or National levels (Government of Western Australia 2005). They include:

- Defined wetlands and riparian vegetation within 50 m
- Areas covered by Threatened ecological communities
- Area of vegetation within 50 m of Threatened flora
- Bush Forever sites
- Declared World Heritage property sites.

There are no formally mapped ESAs within the survey area (DWER 2020). However, according to the ESA criteria outlined above, an ESA associated with Threatened Flora does occur approximately 3.3 km to the north of the survey area and another approximately 7.7 km to the south of the survey area (**Figure 12**).

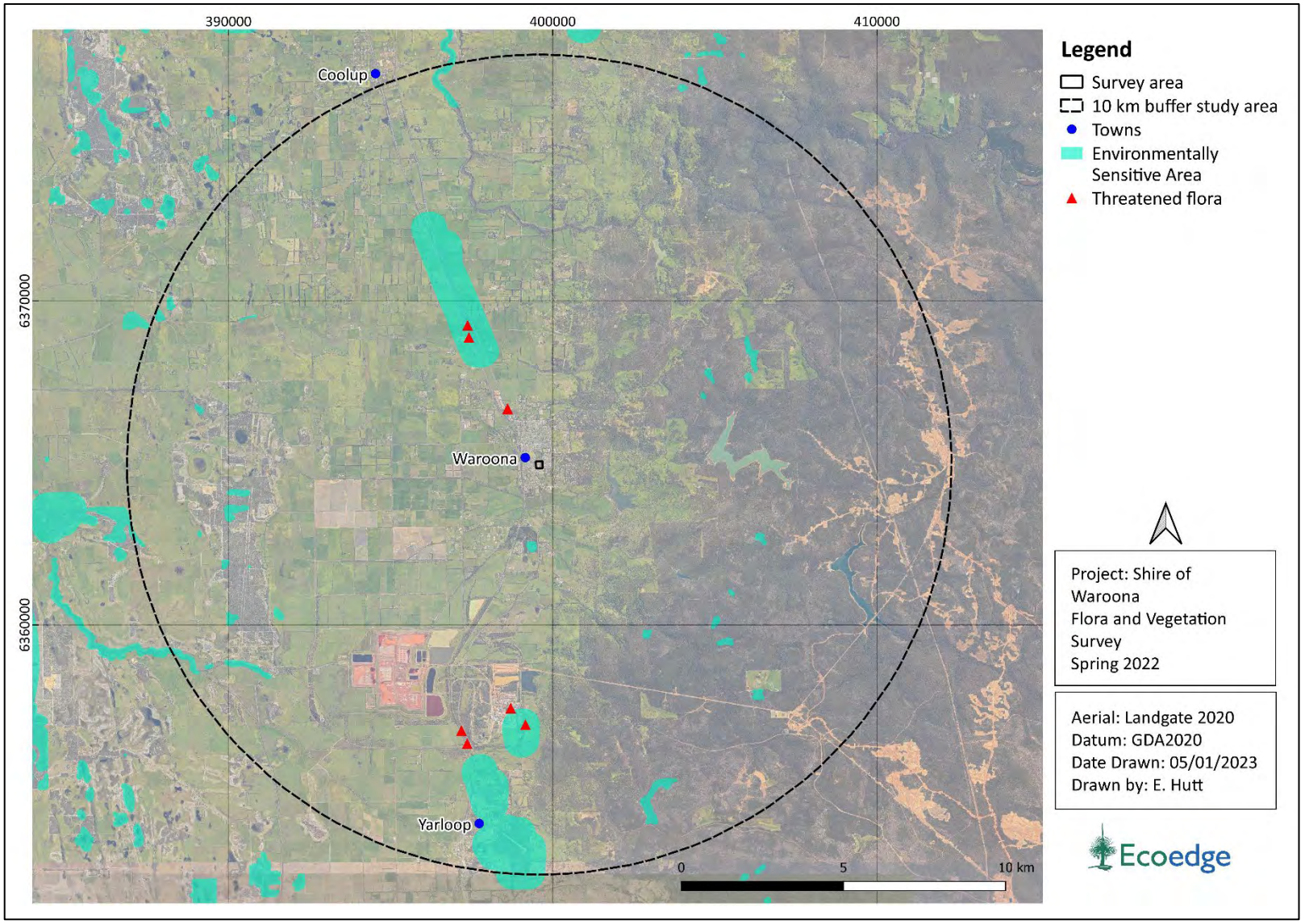


Figure 12. ESAs within study area (DWER 2021).

5 Survey results

Tracklog and quadrat location was recorded and shown in **Appendix 9**.

5.1 Flora

One hundred and ten vascular flora taxa were identified within the survey area, of which 35 (32%) were non-native species. No Threatened or Priority taxa, or species otherwise of conservation significance were found. A list of species found during this survey is provided in **Appendix 10**.

5.2 Post likelihood of occurrence

Almost Threatened or Priority taxa potentially occurring in the survey area were assigned a post-survey residual likelihood of "Unlikely". This was because no suitable habitat was found within the survey area, they were searched for at an appropriate time of year and they were not seen. However, the Priority 3 fungus *Amanita fibrillopes*, would not have been visible at the time of survey but maybe present if targeted in winter.

A summary of the post survey likelihood of occurrence according to conservation status is provided in **Table 11.**

Table 10. Vascular flora post survey likelihood of occurrence according to conservation status.

Likelihood of occurrence	Total No.	Priority 1	Priority 2	Priority 3	Priority 4	Threatened
Recorded	**0**	-	-	-	-	-
Possible	**1**	-	-	1	-	-
Unlikely	**27**	3	3	8	8	5
Total	**28**	**3**	**3**	**9**	**8**	**5**

5.3 Declared pest plants and environmental weeds

Although there was a high proportion of non-native taxa within the survey area, with several serious environmental weeds present including various Acacia species, **Watsonia meriana* was the only Declared pest plant. There is, however, no requirement to control this species within the shire of Waroona. Individual plants were not recorded however a weed control program will soon be able to find them as required.

5.4 Vegetation units

There was only one native vegetation unit within the survey area, though it varied widely in condition or integrity, with weeds forming a large component of the understorey in places:

> Open forest of *Eucalyptus marginata* and *Corymbia calophylla* over low open woodland of *Banksia grandis* over medium open shrubland of *Daviesia divaricata*, *Xanthorrhoea preissii* and *Xylomelum occidentale* over low shrubland of *Bossiaea ornata*, *Dasypogon bromeliifolius*, *Lysiandra calycina*, scattered forbs including *Haemodorum laxum* and *Lomandra sericea* and open sedgeland of *Lepidosperma squamatum*, *Mesomelaena tetragona* and *Morelotia octandra* on grey-brown sandy loam.

Figure 13 shows the extend of the native vegetation and the planted section of the cemetery.

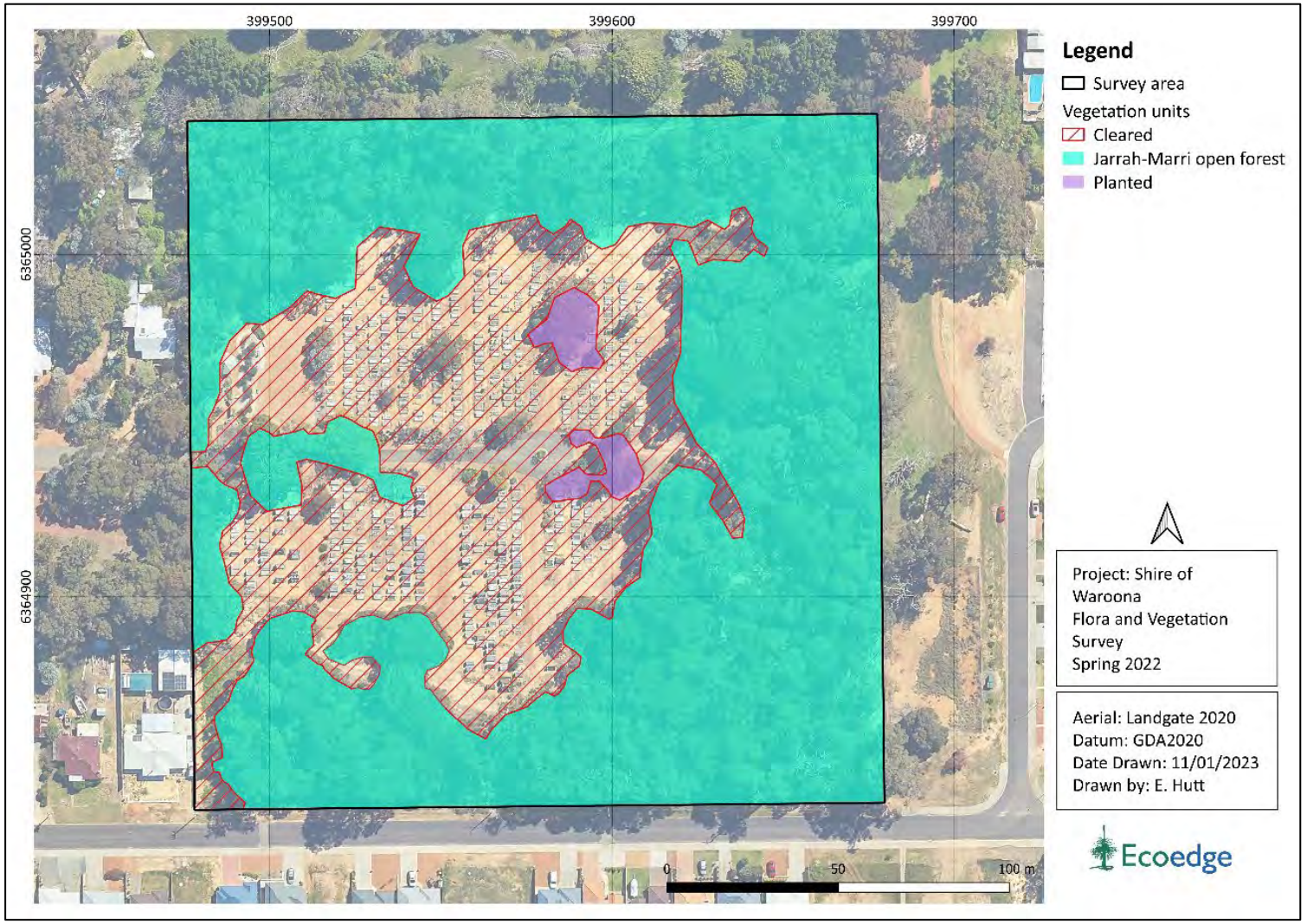


Figure 13. Vegetation units within the survey area.

5.5 Multivariate analysis

As mentioned in **section 3.3**, the primary output of the MVA was a dendrogram which groups quadrats according to their degree of floristic similarity to each other. Somewhat surprisingly, the quadrat sited within the survey area (CEME01) was grouped with quadrats from the Swan Coastal Plain surveys assigned to FCT01b (Southern *Corymbia calophylla* woodlands on heavy soils). Normally, FCT01b is restricted to the Swan Coastal Plain south of the Capel River. It is listed as a Vulnerable Threatened ecological community by the WA Minister for Environment and therefore this vegetation within the Cemetery is a State listed TEC. **Figure 14** shows a portion of the MVA results. The data for quadrat CEME01 is provided n **Appendix 11**.

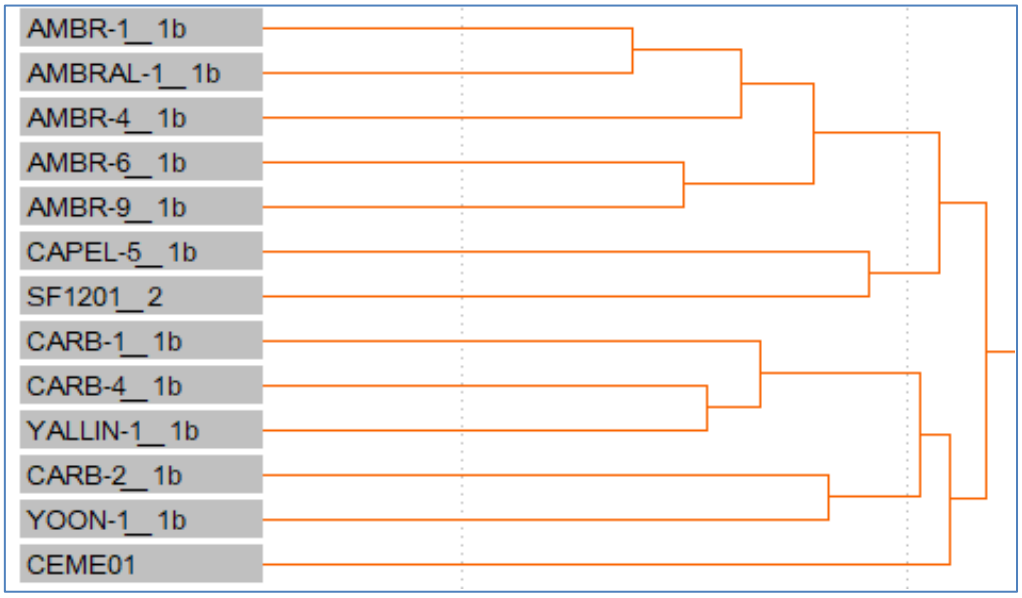


Figure 14. Portion of the dendrogram produced by the MVA of quadrat floristic data showing the survey area quadrat CEME01.

5.6 Threatened Ecological community

Of the approximately 2.5 ha of native vegetation within the survey area two-thirds (about 1.69 ha) was in Degraded or better condition (DEC 2011) and thus has been mapped as the TEC FCT01b (Southern *Corymbia calophylla* woodlands on heavy soils).

Past physical disturbance, as well as a variety of weeds spreading into the bushland, particularly Acacia species, such as **Acacia dealbata* (Silver wattle), and **A. longifolia* (Sydney Golden wattle) have contributed to its degradation.

A breakdown of the condition of the survey area is provided in (**Table 13**), with vegetation condition shown in **Figure 15** and the areas of TEC in **Figure 16.** The DBCA TEC reporting form is provide in **Appendix 12**.

Table 11. Area and percentage of the survey area in vegetation condition classes.

Vegetation unit	Condition	Area (ha)	%	TEC
Jarrah-Marri open forest	Very Good	0.321	12.61	Yes
	Good	0.492	19.33	Yes
	Degraded	0.875	34.38	Yes
Total State listed TEC		1.688		
	Completely Degraded	0.857	33.67	No
	Total	**2.545**	**100.00**	
Planted		0.091		
Cleared		1.419		

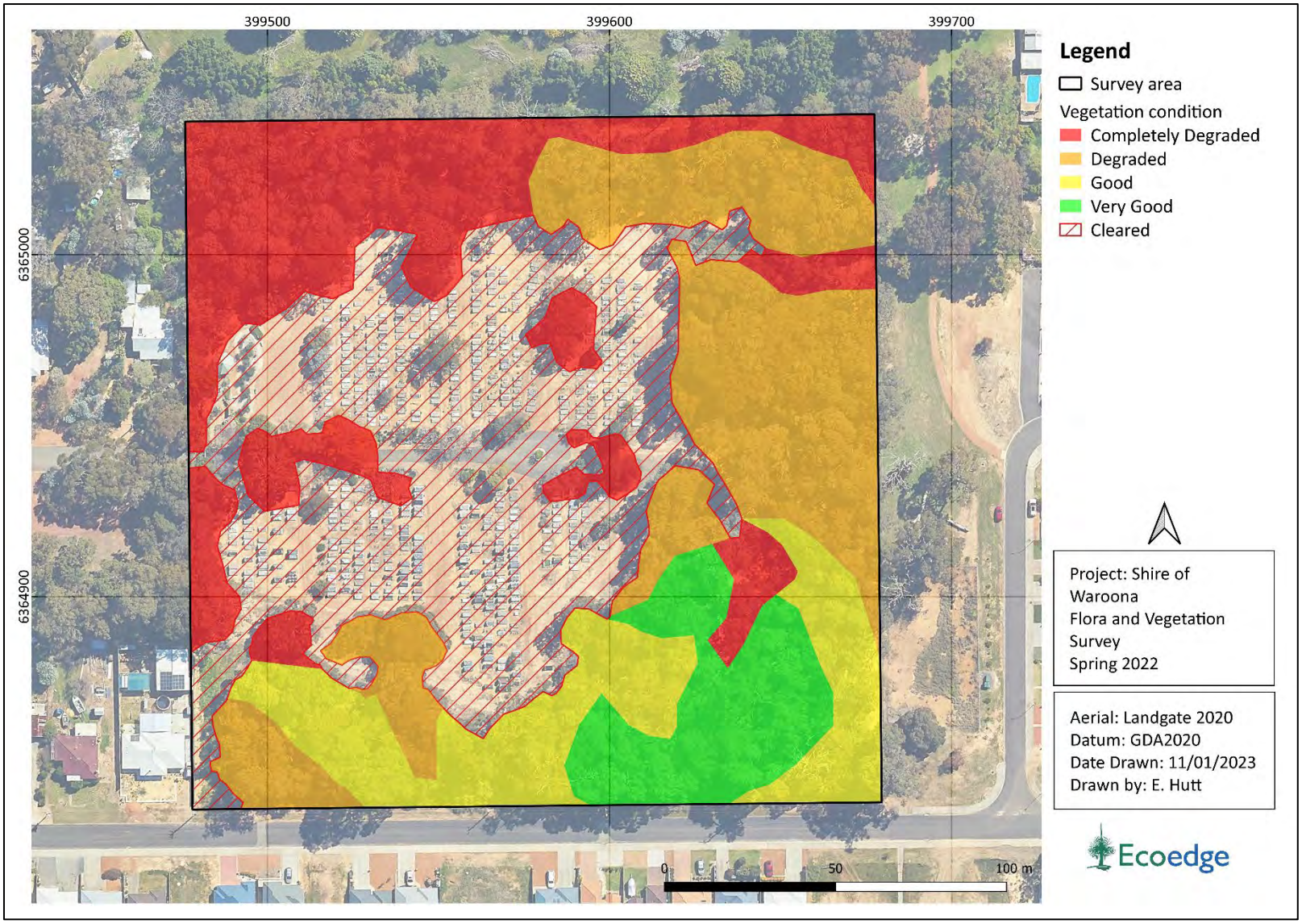


Figure 15. Vegetation condition within the survey area.

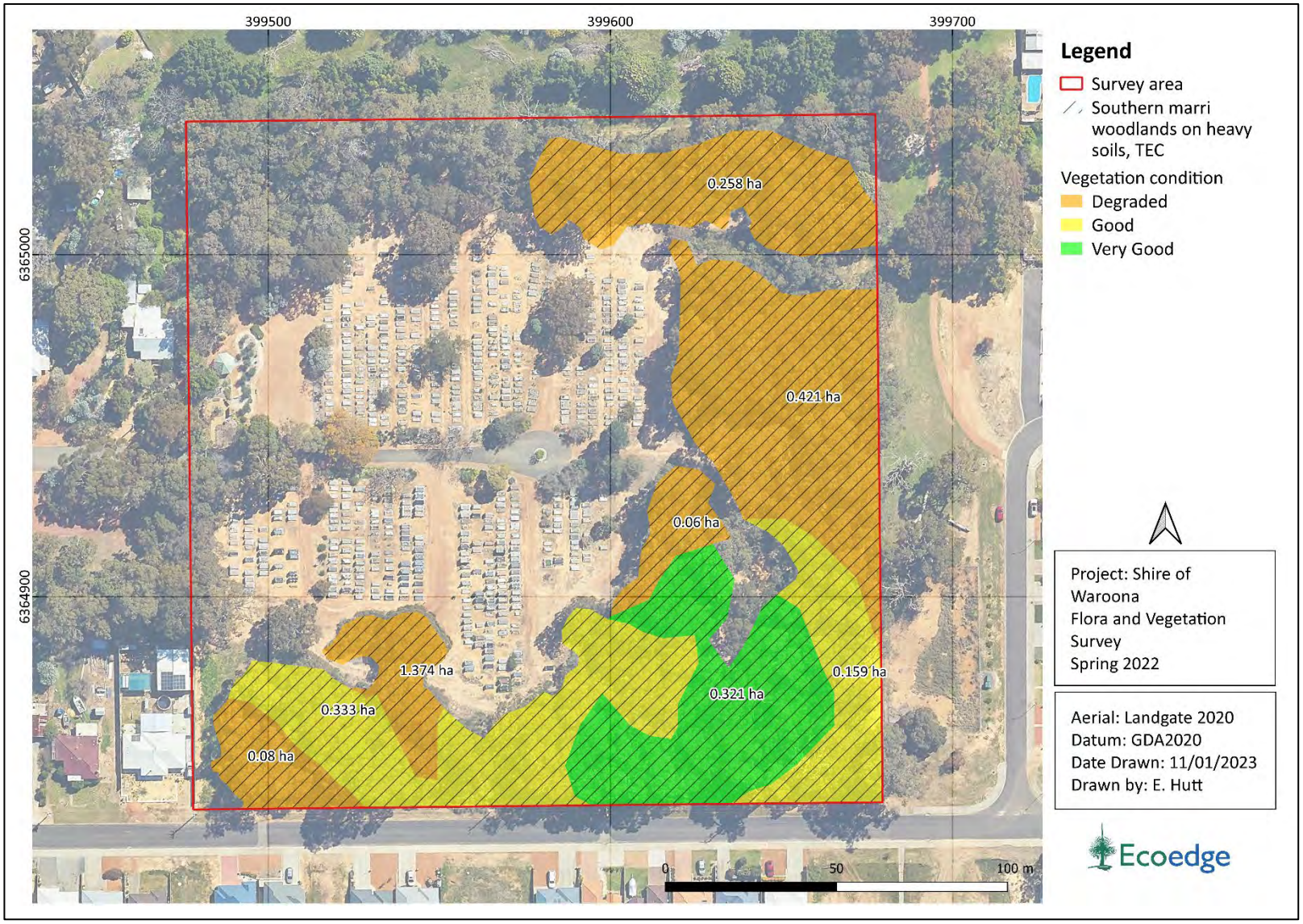


Figure 16. The location and condition of the community FCT01b (Southern *Corymbia calophylla* woodlands on heavy soils).

6 Discussion and conclusions

6.1 Significance of flora

No Threatened or Priority taxa, or species otherwise of conservation significance were found within the survey area.

6.2 Threatened Ecological community

Only one vegetation unit was present in the survey area though it varied widely in condition. Based on the results of the MVA 1.69 ha of the Jarrah-Marri open forest vegetation in Degraded-or-better condition was determined to be an occurrence of the threatened ecological community FCT01b (Southern *Corymbia calophylla* woodlands on heavy soils) which is listed as 'Vulnerable'. Generally, this community is restricted to remnant vegetation south of Dardanup, so the occurrence identified during the current survey represents a significant northward extension.

As per Threatened and Priority Ecological Communities Report Form - Field Manual (DEC 2011; page 2), where there is no formal prescription, with respects to condition, that all areas in Degraded or better condition are representative of the TEC. The DEC 2011 field manual also states that "new occurrences will be considered on a case-by-case basis to determine whether they are in good enough condition to be considered an extant occurrence of a TEC or PEC".

6.3 Vegetation complexes and associations

One vegetation complex and one of Beard's vegetation associations are mapped to occur across the survey area: the Forrestfield Complex and association 3. The complex (12.29%) had less than 30% of its Statewide pre-European extent of the SCP remaining, whereas the association was above the 30% Commonwealth retention target with 67.76% remaining Statewide.

The actual vegetation, when allowance is made for the extent of degradation, is a good match for the vegetation complex categorised as the Forrestfield Complex.

The Beard vegetation association mapped across the survey area, Association 3 'Medium forest; jarrah-marri', is a good match for the vegetation within the survey area in terms of its dominant species and structure.

6.4 Regional ecological linkages

There are no connected parcels of vegetation within the survey area that are linked to the regional ecological axis lines that occur to the south and east of the survey area. The nearest pv rated vegetation parcel is located approximately 460 m to the east of the survey area, with another parcel located approximately 600 m to the west of the survey area.

There is no statutory basis for the protection of regional ecological linkages. However, in general, the importance of ecological linkages has been recognised as an environmental policy consideration in EPA and Planning policy (EPA 2008 and references therein).

6.5 Wetlands or water courses

There are no wetlands or water courses mapped within the survey area.

The closest waterway (Drakesbrook Drain) is located approximately 600 m to the west of the survey area. An extensive system of Multiple Use palusplain wetlands is situated approximately 600 m to the west and 500 m to the south of the survey area.

6.6 Environmentally sensitive areas

There are no formally mapped ESAs within the survey area.

Two ESAs associated with Threatened Flora occur within the 10km study area. One is located approximately 3.3 km to the north of the survey area, and the other is approximately 7.7 km to the south of the survey area.

7 References

Beard, J. S., Beeston, G.R., Harvey, J.M., Hopkins, A. J. M. and Shepherd, D. P. (2013). The vegetation of Western Australia at the 1:3,000,000 scale. Explanatory memoir. Second edition. Conservation Science Western Australia 9: 1-152.

Beeston, G.R., Hopkins, A.J.M. and Shepherd, D.P. (eds) (2001). *Land-use and Vegetation, Western Australia*. Agriculture Western Australia, South Perth and National Land and Water Resources Audit, Canberra, from: http://www.agriculture.gov.au/abares/aclump/Documents/WA%20Luse%201997%20Report.pdf

Belbin, L. (2003). PATN - A Revised User's Guide. Blatant Fabrications Pty Ltd.

Commonwealth of Australia and the State of Western Australia (1999). *Regional Forest Agreement for the South-West Forest Region of Western Australia*. Commonwealth and Western Australia Regional Forest Agreement Steering Committee. Canberra, Australia.

Commonwealth of Australia (2016). *Interim Biogeographic Regionalisation for Australia (IBRA), Version 7 (Subregions)*. Department of Climate Change, Energy, the Environment and Water. https://data.gov.au/data/dataset/interim-biogeographic-regionalisation-for-australia-ibra-version-7-subregions

Crossman, S., Li, O. (2015). Surface Hydrology Lines (National). Geoscience Australia, Canberra. http://pid.geoscience.gov.au/dataset/ga/83130

Department of Biodiversity, Conservation and Attractions (2018). Threatened ecological communities endorsed by the Minister for the Environment (June 2018). https://www.dpaw.wa.gov.au/images/plants-animals/threatened-species/threatened_ecological_communities_endorsed_by_the_minister_for_the_environment_june_2018.pdf.

Department of Biodiversity, Conservation and Attractions (DBCA) (2019). Conservation codes for Western Australian Flora and Fauna (updated 10 December 2020). https://www.dpaw.wa.gov.au/images/Conservation%20codes%20for%20Western%20Australian%20Flora%20and%20Fauna%20179KB.pdf.

Department of Biodiversity, Conservation and Attractions (DBCA) (2021). Priority ecological communities for Western Australia, Version 32. Species and Communities Program, Department of Biodiversity, Conservation and Attractions, 15 July 2021. https://www.dpaw.wa.gov.au/images/documents/plants-animals/threatened-species/Listings/Priority%20Ecological%20Communities%20list.pdf

Department of Biodiversity, Conservation and Attractions (DBCA) (2022a). *Extract from the Department's Threatened and Priority Ecological Community database,* DBCA Species and Communities Branch, 3 November 2022.

Department of Biodiversity, Conservation and Attractions (DBCA) (2022b). Threatened and Priority Flora list (5 December 2018). Department of Biodiversity Conservation and Attractions. https://www.dpaw.wa.gov.au/plants-and-animals/threatened-species-and-communities/threatened-plants.

Department of Biodiversity, Conservation and Attractions (DBCA) (2022c). *Naturemap, Western Australian Herbarium*. Supplied 6 November 2022.

Department of Biodiversity, Conservation and Attractions (DBCA) (2022d). Extract from the Department's and Western Australian Herbarium Threatened and Priority Flora database, DBCA Species and Communities Branch, 3 November 2022.

Department of Biodiversity, Conservation and Attractions (DBCA) (2022e). Geomorphic Wetlands, Swan Coastal Plain Data Set DBCA-019, last updated 22 August 2022. https://catalogue.data.wa.gov.au/dataset/geomorphic-wetlands-swan-coastal-plain

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2020). Categories of Threatened species under the EPBC Act. https://www.environment.gov.au/biodiversity/threatened/species.

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2022a). *Protected Matters Search Tool query*. Generated 31 October 2022.

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2022b). Categories of Threatened ecological communities under the EPBC Act. http://www.environment.gov.au/biodiversity/threatened/communities/about#What_is_a_threatened_ecological_community_TEC.

Department of Environment and Conservation (DEC) (2011). Threatened ecological community occurrence report form - field manual.

Department of Environment and Conservation (DEC) (2013). *Definitions, categories and criteria for threatened and priority ecological communities*. Department of Environment and Conservation, Perth, Western Australia.

Department of the Environment and Energy (DoEE) (2017). Approved Conservation Advice for Corymbia calophylla - Xanthorrhoea preissii woodlands and shrublands of the Swan Coastal Plain. Canberra: Department of the Environment and Energy. Available from: http://www.environment.gov.au/biodiversity/threatened/communities/pubs/18-conservation-advice.pdf In effect under the EPBC Act from 13-Jul-2017

Department of Parks and Wildlife (DPaW) (2011). Threatened and Priority Ecological Communities Report Form – Field Manual. Version 1.0. https://www.dpaw.wa.gov.au/images/documents/plants-animals/monitoring/forms/tec_orf_fieldmanual_2011.pdf.

Department of Parks and Wildlife (DPaW) (2018). Mapping of Vegetation Complexes in the South West forest region of Western Australia (DBCA-047). Last updated 24 August 2018

Department of Primary Industries and Regional Development (DPIRD) (2019). Pre-European Vegetation (DPIRD-006). Last updated 23 July 2019. https://catalogue.data.wa.gov.au/dataset/pre-european-dpird-006.

Department of Primary Industries and Regional Development (DPIRD) (2022). Soil Landscape Mapping – Best Available (DPIRD-027). Last updated 213 July 2022. https://catalogue.data.wa.gov.au/dataset/soil-landscape-mapping-best-available

Department of Water Environment Regulation (DWER) (2021). Clearing Regulations - *Environmentally Sensitive Areas* (DWER046), last updated 9 November 2021 https://catalogue.data.wa.gov.au/dataset/clearing-regulations-environmentally-sensitive-areas-dwer-046.

Environment Australia (2001). National objectives and targets for biodiversity conservation 2001–2005. http://www.environment.gov.au/resource/national-objectives-and-targets-biodiversity-conservation-2001%E2%80%932005.

Environmental Protection Authority (EPA) (1993) Red Book, Status report (1993) on the implementation of Conservation Reserves for Western Australia as recommended by the EPA (1976 – 1984), Report 15.

Environmental Protection Authority (EPA) (2008). Environmental Guidance for Planning and Development. Guidance Statement 33.

Environmental Protection Authority (EPA) (2016). *Technical Guidance Flora and Vegetation Surveys for Environmental Impact.* EPA, Perth, Western Australia. http://www.epa.wa.gov.au/sites/default/files/Policies_and_Guidance/EPA/Technical/Guidance/FloraandVegetationsurvey_Dec13.pdf

Gibson, N., Keighery, B.J., Keighery, G.J., Burbidge, A.H. and Lyons, M.N. (1994). A floristic survey of the southern Swan Coastal Plain: report to Heritage Council of W.A. and Australian Heritage Commission. Department of Conservation and Land Management, Western Australia.

Government of Western Australia (GoWA) (2005). Environmental Protection (Environmentally Sensitive Areas) Notice 2005 (Environmental Protection Act 1986). *Government Gazette, No.55*.

Government of Western Australia (GoWA) (2019a). 2018 Statewide Vegetation Statistics incorporating the CAR Reserve Analysis (Full Report). Current as of March 2019. WA Department of Biodiversity, Conservation and Attractions, Perth. https://catalogue.data.wa.gov.au/dataset/dbca-statewide-vegetation-statistics

Government of Western Australia (GoWA) (2019b). 2018 South West Vegetation Complex Statistics. Current as of March 2019. WA Department of Biodiversity, Conservation and Attractions, Perth, https://catalogue.data.wa.gov.au/dataset/dbca

Heddle, E.M., Loneragan, O.W. and Havel, J.J. (1980). Vegetation of the Darling System. In: Atlas of Natural Resources, Darling System, Western Australia. Department of Conservation and Environment, Western Australia.

Keighery, B., Keighery, G., Longman, V.M., and Clarke, K.A. (2012). Weed and native flora quadrat data compiled between 1990 – 1996 for the Swan Coastal Plain. Data compiled for the Departments of Environmental Protection and Conservation and Land Management

Keighery, G. & Keighery, B. (2020). Flora of the Swan Coastal Plains Foothills 3: Vascular Flora of the Korijekup Conservation Park, Harvey

Mattiske, E.M. and Havel, J.J. (1998). Vegetation Mapping in the South West of Western Australia and Regional Forest Agreement vegetation complexes. Map sheets for Pemberton, Collie, Pinjarra, Busselton-Margaret River, Mt Barker, and Perth, Western Australia. Scale 1:250,000. Department of Conservation and Land Management, Perth.

Molloy, S., O'Connor, T., Wood, J. and Wallrodt, S. (2009). South West Regional Ecological Linkages Technical Report. Western Australian Local Government Association (WALGA) and the Department of Environment and Conservation (DEC). West Perth.

NVIS Technical Working Group (2017) Australian Vegetation Attribute Manual: National Vegetation Information System, Version 7.0. Department of the Environment and Energy, Canberra. Prep by Bolton, M.P., deLacey, C. and Bossard, K.B. (Eds).

Schoknecht, N., Tille, P., and Purdie, B. (2004). Soil-landscape mapping in south-western Australia. Resource Management Technical Report 280. Department of Agriculture and Food, 3 Baron-Hay Court, South Perth, Western Australia, 6155.

Semeniuk, C.A. and Semeniuk, V. (1995), A Geomorphic Approach to Global Classification for Inland Wetlands. Vegetatio, 118, 103-124.

Shire of Waroona (2009). Local Planning Strategy – March 2009. https://www.waroona.wa.gov.au/Assets/Documents/local-planning-strategy/Waroona-LPS.final.whole-document.pdf.

Shepherd, D., Beeston, G. and Hopkins, A. (2002). *Native Vegetation in Western Australia – Extent, Type and Status*. Department of Agriculture, Perth.

Van Gool, D. and Kipling, B. (1992). *Land resources map in the southern section of the Peel-Harvey catchment, swan coastal plain, Western Australia.* Department of Primary Industries and Regional Development, Western Australia, Perth. Map.

Webb, A., Kinloch, J., Keighery, G. and Pitt, G. (2016). The Extension of Vegetation Complex Mapping to Landform boundaries within the Swan Coastal Plain Landform and Forested Region of South West Western Australia. Department of Parks and Wildlife, Bunbury, WA.

Appendix 1. Threatened and Priority flora likelihood of occurrence assessment rationale.

Rating	Presurvey rationale	Post survey rationale
Recorded		Taxon was or has been recorded in the survey area.
Likely	Known to occur within one kilometre (km) of the survey area with suitable habitat known or predicted to occur within the survey area.	The taxon is known to occur within one km of the survey area and very suitable habitat was present, but the taxon was not observed for one of the following reasons. **L1.** The taxon was dormant at the time of survey and could therefore not be located. **L2.** The habitat was compromised, for example due to a recent fire. **L3.** The survey area is challenging to survey.The taxon is non- descript and difficult to find because, for example, it occurs in large areas of rocky granite outcrops, or within an expanse of open water.
Possible	Known to occur within a five-ten km of the survey area with suitable habitat known or predicted to occur within the survey area.	The taxon is known from within a five to ten km radius of the survey area, and suitable habitat for the species was present, but despite a thorough search being carried out, the species was not observed. The taxon may however be present for any of the following reasons. **P1.** The taxon was dormant at the time of survey and could therefore not be located. **P2.** The habitat was compromised, for example, due to a recent fire. **P3.** The survey area is challenging to survey. Te taxon is non- descript and difficult to find because, for example, it occurs in large areas of rocky granite outcrops, or within an expanse of open water.
Unlikely	Known or predicted to occur within ten km, but no suitable habitat is known or predicted to occur within the survey area.	The taxon was not found and is unlikely to be present for one or more of the following reasons: **U1.** No suitable habitat was observed, and the taxon is known to be restricted to a narrow and clearly defined habitat type. **U2.** Suitable or potential habitat was present and appropriately searched, but the taxon was not observed. **U3.** Suitable habitat present, but these areas were too degraded for the taxon to occur, for example, due to weed invasion and/or clearing.

Example of application of pre and post-survey likelihood of occurrence

Taxon	Cons Status	Flowering	Description	Pre survey likelihood	Post Survey Likelihood
Drakaea elastica	T (EN)	Sept-October	Tuberous, perennial, herb, 0.12-0.3 m high. Fl. red, green, yellow. White or grey sand. Low-lying situations adjoining winter-wet swamps.	**Likely**	**Unlikely (U2)**

Appendix 2. Vegetation condition scale (EPA 2016).

Vegetation Condition	South West and Interzone Botanical Provinces
Pristine	Pristine or nearly so, no obvious signs of disturbance or damage caused by human activities since European settlement.
Excellent	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species. Damage to trees caused by fire, the presence of non-aggressive weeds and occasional vehicle tracks.
Very Good	Vegetation structure altered, obvious signs of disturbance. Disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.
Good	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. Disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.
Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. Disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds at high density, partial clearing, dieback and grazing.
Completely Degraded	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees and shrubs.

Appendix 3. Categories of Threatened ecological communities under the EPBC Act.

Category	Definition
Critically endangered (CR)	If, at that time, an ecological community is facing an extremely high risk of extinction in the wild in the immediate future (indicative timeframe being the next 10 years).
Endangered (EN)	If, at that time, an ecological community is not critically endangered but is facing a very high risk of extinction in the wild in the near future (indicative timeframe being the next 20 years).
Vulnerable (VU)	If, at that time, an ecological, community is not critically endangered or endangered but is facing a high risk of extinction in the wild in the medium–term future (indicative timeframe being the next 50 years).

Appendix 4. Categories of Threatened and Priority ecological communities under the BC Act.

Conservation code	Category
(T) Threatened ecological community pursuant to Sect 27 of the *Biodiversity Conservation Act 2016.*	
T	(T) CR – Critically endangered An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or that was originally of limited distribution and is facing severe modification or destruction throughout its range in the immediate future, or is already severely degraded throughout its range but capable of being substantially restored or rehabilitated.
	(T) EN - Endangered An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or was originally of limited distribution and is in danger of significant modification throughout its range or severe modification or destruction over most of its range in the near future.
	(T) VU - Vulnerable An ecological community that has been adequately surveyed and is found to be declining and/or has declined in distribution and/or condition and whose ultimate security has not yet been assured and/or a community that is still widespread but is believed likely to move into a category of higher threat in the near future if threatening processes continue or begin operating throughout its range.
(P) Priority species – possible threatened communities.	
P1	Poorly known communities Ecological communities that are known from very few occurrences with a very restricted distribution (generally ≤5 occurrences or a total area of ≤ 100ha). Occurrences are believed to be under threat either due to limited extent, or being on lands under immediate threat (e.g. within agricultural or pastoral lands, urban areas, active mineral leases) or for which current threats exist. May include communities with occurrences on protected lands. Communities may be included if they are comparatively well-known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under immediate threat from known threatening processes across their range.

Conservation code	Category
P2	Poorly known communities Communities that are known from few occurrences with a restricted distribution (generally ≤10 occurrences or a total area of ≤200ha). At least some occurrences are not believed to be under immediate threat (within approximately 10 years) of destruction or degradation. Communities may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under threat from known threatening processes.
P3	Poorly known communities a) Communities that are known from several to many occurrences, a significant number or area of which are not under threat of habitat destruction or degradation or: b) communities known from a few widespread occurrences, which are either large or with significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat (within approximately 10 years), or; c) communities made up of large, and/or widespread occurrences, that may or may not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing by domestic and/or feral stock, inappropriate fire regimes, clearing, hydrological change etc. Communities may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and/or are not well defined, and known threatening processes exist that could affect them.
P4	Ecological communities that are adequately known, rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list. These communities require regular monitoring. a) Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection but could be if present circumstances change. These species are usually represented on conservation lands. b) Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for vulnerable but are not listed as Conservation Dependent. c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.
P5	Conservation dependent ecological communities Ecological communities that are not threatened but are subject to a specific conservation program, the cessation of which would result in the community becoming threatened within five years.

Appendix 5. Definitions of conservation codes for Threatened and Priority flora.

Conservation code	Category
(T) Threatened species pursuant to Sect 19 of the BC Act 2016.	
T	(T) CR – Critically endangered Threatened species considered to be "*facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with criteria set out in the ministerial guidelines*".
	(T) EN - Endangered Threatened species considered to be "*facing a very high risk of extinction in the wild in the near future, as determined in accordance with criteria set out in the ministerial guidelines*".
	(T) VU - Vulnerable Threatened species considered to be "*facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with criteria set out in the ministerial guidelines*".
(P) Priority species – possible Threatened species.	
P1	Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.
P2	Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.

Conservation code	Category
P3	Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species are in need of further survey.
P4	(a) Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection but could be if present circumstances change. These species are usually represented on conservation lands. (b) Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for vulnerable but are not listed as Conservation Dependent. (c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

Appendix 6. Categories of Threatened species under the EPBC Act.

Category	Definition
Extinct (Ex)	A native species is eligible to be included in the ***extinct*** category at a particular time if, at that time, there is no reasonable doubt that the last member of the species has died.
Extinct in the Wild (ExW)	A native species is eligible to be included in the extinct in the wild category at a particular time if, at that time (a) it is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or (b) it has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.
Critically Endangered (CE)	A native species is eligible to be included in the critically endangered category at a particular time if, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.
Endangered (EN)	A native species is eligible to be included in the endangered category at a particular time if, at that time (a) it is not critically endangered; and (b) it is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria.
Vulnerable (VU)	A native species is eligible to be included in the vulnerable category at a particular time if, at that time (a) it is not critically endangered or endangered; and (b) it is facing a high risk of extinction in the wild in the medium term future, as determined in accordance with the prescribed criteria.
Conservation Dependent (CD)	A native species is eligible to be included in the conservation dependent category at a particular time if, at that time, the species is the focus of a specific conservation program, the cessation of which would result in the species becoming vulnerable, endangered or critically endangered within a period of 5 years.

Appendix 7. NatureMap reports and Protected Matters Search Tool.

#	*TAXON*	CONS	KINGDOM
1	*Amanita fibrillopes*	P3	Fungi
2	*Eleocharis keigheryi*	VU	Plantae
3	*Morelotia australiensis*	VU	Plantae
4	*Diuris drummondii*	VU	Plantae
5	*Synaphea stenoloba*	CR	Plantae
6	*Caladenia huegelii*	CR	Plantae
7	*Grevillea bipinnatifida* subsp. *pagna*	P1	Plantae
8	*Synaphea odocoileops*	P1	Plantae
9	*Phyllangium palustre*	P2	Plantae
10	*Millotia tenuifolia* var. *laevis*	P2	Plantae
11	*Melaleuca viminalis*	P2	Plantae
12	*Angianthus drummondii*	P3	Plantae
13	*Schoenus capillifolius*	P3	Plantae
14	*Chamaescilla gibsonii*	P3	Plantae
15	*Eryngium* sp. *Ferox* (G.J. Keighery 16034)	P3	Plantae
16	*Boronia capitata* subsp. *gracilis*	P3	Plantae
17	*Myriophyllum echinatum*	P3	Plantae
18	*Schoenus* sp. *Waroona* (G.J. Keighery 12235)	P3	Plantae
19	*Stylidium aceratum*	P3	Plantae
20	*Aponogeton hexatepalus*	P4	Plantae
21	*Ornduffia submersa*	P4	Plantae
22	*Schoenus natans*	P4	Plantae
23	*Eucalyptus* x *graniticola*	P4	Plantae
24	*Trithuria australis*	P4	Plantae
25	*Caladenia speciosa*	P4	Plantae
26	*Conostylis pauciflora* subsp. *pauciflora*	P4	Plantae
27	*Calothamnus graniticus* subsp. *leptophyllus*	P4	Plantae
28	*Stylidium ireneae*	P4	Plantae

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 31-Oct-2022

Summary

Matters of National Environment Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance (Ramsar	1
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	5
Listed Threatened Species:	30
Listed Migratory Species:	9

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at https://www.dcceew.gov.au/parks-heritage/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Lands:	3
Commonwealth Heritage Places:	None
Listed Marine Species:	14
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have

State and Territory Reserves:	3
Regional Forest Agreements:	1
Nationally Important Wetlands:	None
EPBC Act Referrals:	12
Key Ecological Features (Marine):	None
Biologically Important Areas:	None
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar Wetlands) [Resource Information]

Ramsar Site Name	Proximity	Buffer Status
Peel-yalgorup system	Within 10km of Ramsar site	In feature area

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.
Status of Vulnerable, Disallowed and Ineligible are not MNES under the EPBC Act.

Community Name	Threatened Category	Presence Text	Buffer Status
Banksia Woodlands of the Swan Coastal Plain ecological community	Endangered	Community likely to occur within area	In feature area
Clay Pans of the Swan Coastal Plain	Critically Endangered	Community likely to occur within area	In buffer area only
Corymbia calophylla - Kingia australis woodlands on heavy soils of the Swan Coastal Plain	Endangered	Community known to occur within area	In buffer area only
Corymbia calophylla - Xanthorrhoea preissii woodlands and shrublands of the Swan Coastal Plain	Endangered	Community known to occur within area	In buffer area only
Tuart (Eucalyptus gomphocephala) Woodlands and Forests of the Swan Coastal Plain ecological community	Critically Endangered	Community may occur within area	In feature area

Listed Threatened Species [Resource Information]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

Scientific Name	Threatened Category	Presence Text	Buffer Status
BIRD			
Atrichornis clamosus			
Noisy Scrub-bird, Tjimiluk [654]	Endangered	Species or species habitat may occur within area	In buffer area only
Botaurus poiciloptilus			
Australasian Bittern [1001]	Endangered	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Calidris ferruginea](#) Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area	In feature area
[Calyptorhynchus banksii naso](#) Forest Red-tailed Black-Cockatoo, Karrak [67034]	Vulnerable	Species or species habitat known to occur within area	In feature area
[Falco hypoleucos](#) Grey Falcon [929]	Vulnerable	Species or species habitat may occur within area	In feature area
[Leipoa ocellata](#) Malleefowl [934]	Vulnerable	Species or species habitat likely to occur within area	In feature area
[Numenius madagascariensis](#) Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area	In feature area
[Rostratula australis](#) Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area	In feature area
[Zanda baudinii listed as Calyptorhynchus baudinii](#) Baudin's Black-Cockatoo, Long-billed Black-cockatoo [87736]	Endangered	Roosting known to occur within area	In feature area
[Zanda latirostris listed as Calyptorhynchus latirostris](#) Carnaby's Black Cockatoo, Short-billed Black-cockatoo [87737]	Endangered	Species or species habitat known to occur within area	In feature area
MAMMAL			
[Dasyurus geoffroii](#) Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat known to occur within area	In feature area
[Pseudocheirus occidentalis](#) Western Ringtail Possum, Ngwayir, Womp, Woder, Ngoor, Ngoolangit [25911]	Critically Endangered	Species or species habitat likely to occur within area	In feature area
[Setonix brachyurus](#) Quokka [229]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
OTHER			

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Westralunio carteri](#) Carter's Freshwater Mussel, Freshwater Mussel [86266]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
PLANT			
[Andersonia gracilis](#) Slender Andersonia [14470]	Endangered	Species or species habitat may occur within area	In buffer area only
[Anthocercis gracilis](#) Slender Tailflower [11103]	Vulnerable	Species or species habitat may occur within area	In buffer area only
[Caladenia huegelii](#) King Spider-orchid, Grand Spider-orchid, Rusty Spider-orchid [7309]	Endangered	Species or species habitat known to occur within area	In buffer area only
[Diuris drummondii](#) Tall Donkey Orchid [4365]	Vulnerable	Species or species habitat may occur within area	In buffer area only
[Diuris micrantha](#) Dwarf Bee-orchid [55082]	Vulnerable	Species or species habitat likely to occur within area	In feature area
[Diuris purdiei](#) Purdie's Donkey-orchid [12950]	Endangered	Species or species habitat likely to occur within area	In feature area
[Drakaea elastica](#) Glossy-leafed Hammer Orchid, Glossy-leaved Hammer Orchid, Warty Hammer Orchid [16753]	Endangered	Species or species habitat known to occur within area	In buffer area only
[Drakaea micrantha](#) Dwarf Hammer-orchid [56755]	Vulnerable	Species or species habitat likely to occur within area	In feature area
[Eleocharis keigheryi](#) Keighery's Eleocharis [64893]	Vulnerable	Species or species habitat known to occur within area	In feature area
[Lambertia echinata subsp. occidentalis](#) Western Prickly Honeysuckle [64528]	Endangered	Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Synaphea sp. Fairbridge Farm (D. Papenfus 696)			
Selena's Synaphea [82881]	Critically Endangered	Species or species habitat likely to occur within area	In feature area
Synaphea sp. Pinjarra Plain (A.S. George 17182)			
[86878]	Endangered	Species or species habitat likely to occur within area	In feature area
Synaphea sp. Serpentine (G.R. Brand 103)			
[86879]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Synaphea stenoloba			
Dwellingup Synaphea [66311]	Endangered	Species or species habitat known to occur within area	In feature area
Tetraria australiensis			
Southern Tetraria [10137]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Thelymitra stellata			
Star Sun-orchid [7060]	Endangered	Species or species habitat may occur within area	In buffer area only

Listed Migratory Species			[Resource Information]
Scientific Name	Threatened Category	Presence Text	Buffer Status
Migratory Marine Birds			
Apus pacificus			
Fork-tailed Swift [678]		Species or species habitat likely to occur within area	In feature area
Migratory Terrestrial Species			
Motacilla cinerea			
Grey Wagtail [642]		Species or species habitat may occur within area	In feature area
Migratory Wetlands Species			
Actitis hypoleucos			
Common Sandpiper [59309]		Species or species habitat may occur within area	In feature area
Calidris acuminata			
Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Calidris ferruginea			
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area	In feature area
Calidris melanotos			
Pectoral Sandpiper [858]		Species or species habitat may occur within area	In feature area
Numenius madagascariensis			
Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area	In feature area
Pandion haliaetus			
Osprey [952]		Species or species habitat likely to occur within area	In buffer area only
Tringa nebularia			
Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area	In buffer area only

Other Matters Protected by the EPBC Act

Commonwealth Lands [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Commonwealth Land Name	State	Buffer Status
Unknown		
Commonwealth Land - [50831]	WA	In feature area
Commonwealth Land - [50815]	WA	In buffer area only
Commonwealth Land - [52008]	WA	In buffer area only

Listed Marine Species [Resource Information]

Scientific Name	Threatened Category	Presence Text	Buffer Status
Bird			
Actitis hypoleucos			
Common Sandpiper [59309]		Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area	In feature area
Bubulcus ibis as Ardea ibis Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area overfly marine area	In feature area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area	In feature area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area	In feature area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area	In feature area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area overfly marine area	In feature area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area	In feature area
Pandion haliaetus Osprey [952]		Species or species habitat likely to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Rostratula australis as Rostratula benghalensis (sensu lato)			
Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area overfly marine area	In feature area
Thinornis cucullatus as Thinornis rubricollis			
Hooded Plover, Hooded Dotterel [87735]		Species or species habitat may occur within area overfly marine area	In feature area
Tringa nebularia			
Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area overfly marine area	In buffer area only

Extra Information

State and Territory Reserves [Resource Information]

Protected Area Name	Reserve Type	State	Buffer Status
Buller	Nature Reserve	WA	In buffer area only
Lane Poole Reserve	Conservation Park	WA	In buffer area only
Marrarup	Nature Reserve	WA	In buffer area only

Regional Forest Agreements [Resource Information]

Note that all areas with completed RFAs have been included.

RFA Name	State	Buffer Status
South West WA RFA	Western Australia	In feature area

EPBC Act Referrals [Resource Information]

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Controlled action				
Clearing and sand extraction, Lot 3 Buller Road, Waroona, WA	2018/8138	Controlled Action	Post-Approval	In buffer area only
Natural Gas Pipeline Expansion	2006/2813	Controlled Action	Post-Approval	In buffer area only
Sand extraction and clearing of Portion of Lot 3 Buller Road, Waroona, WA	2017/7916	Controlled Action	Completed	In buffer area only
Sand Extraction Jackson Block, Lot 3 Buller Road, Waroona, WA	2015/7500	Controlled Action	Completed	In buffer area only
Yarragadee Water Supply Development	2005/2073	Controlled Action	Completed	In buffer area only

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Not controlled action				
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed	In feature area
INDIGO Central Submarine Telecommunications Cable	2017/8127	Not Controlled Action	Completed	In feature area
Parkland clearing of Jarrah and Marri trees for pasture improvement	2011/5986	Not Controlled Action	Completed	In buffer area only
Samson Brook Dam Remedial Works	2012/6329	Not Controlled Action	Completed	In buffer area only
Wagerup Cogeneration Project	2006/2688	Not Controlled Action	Completed	In buffer area only
Waroona mineral sand mine	2005/2345	Not Controlled Action	Completed	In feature area
Not controlled action (particular manner)				
INDIGO Marine Cable Route Survey (INDIGO)	2017/7996	Not Controlled Action (Particular Manner)	Post-Approval	In feature area

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data are available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance

3 DATA SOURCES

Threatened ecological communities

For threatened ecological communities where the distribution is well known, maps are generated based on information contained in recovery plans, State vegetation maps and remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species

Threatened, migratory and marine species distributions have been discerned through a variety of methods. Where distributions are well known and if time permits, distributions are inferred from either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc.) together with point locations and described habitat; or modelled (MAXENT or BIOCLIM habitat modelling) using

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded
- seals which have only been mapped for breeding sites near the Australian continent

The breeding sites may be important for the protection of the Commonwealth Marine environment.

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact us page.

Department of Climate Change, Energy, the Environment and Water
GPO Box 3090
Canberra ACT 2601 Australia
+61 2 6274 1111

Appendix 8. Pre and post survey likelihood of occurrence table.

Pre and post survey likelihood of threatened and priority flora occurring within the survey area, based on a comparison of known (DBCA 2022d and 2022c) and potential species (DCCEEW 2022a) within the 10 km radius study area.

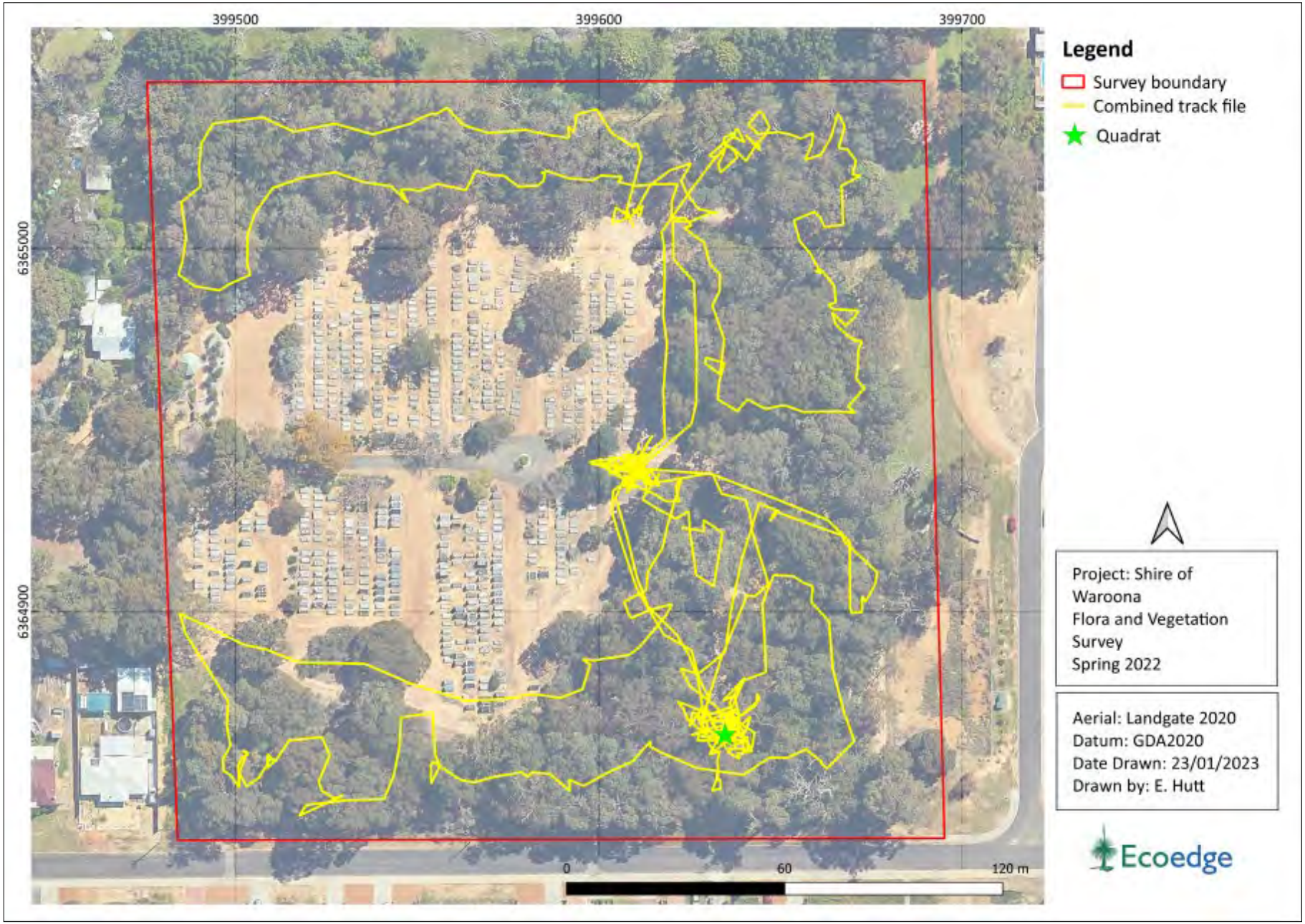
Species	Cons Status*	Flowering	Description and Habitat	Likelihood	Post Survey Likelihood
Caladenia huegelii	T (EN)	Sep-Oct	Tuberous, perennial, herb, 0.25-0.6 m high. Fl. green, cream, red. Grey or brown sand, clay loam. (Jarrah banksia woodland usually associated with the Bassendean sand-dune system, rarely in the Spearwood system).	Unlikely	Unlikely (U1)
Synaphea stenoloba	T (EN)	Aug-Oct	Caespitose shrub, 0.3–0.45 m high. Fl. Yellow. Sandy or sandy clay soils. Winter-wet flats, granite. Shrublands and woodlands on loamy soils.	Unlikely	Unlikely (U1)
Diuris drummondii	T (VU)	Nov-Jan	Tuberous, perennial, herb, 0.5-1.05 m high. Fl. yellow. Low-lying depressions, swamps.	Unlikely	Unlikely (U1)
Eleocharis keigheryi	T (VU)	Aug-Nov	Rhizomatous, clumped perennial, grass-like or herb (sedge), to 0.4 m high. Fl. green. Clay, sandy loam. Emergent in freshwater: creeks, claypans	Unlikely	Unlikely (U1)
Grevillea bipinnatifida subsp. *pagna*	P1	Aug or Oct-Nov	Prostrate, lignotuberous shrub, 0.2-0.7 m high. Fl. red & orange & yellow. Grey sandy clay and loam, ironstone. Seasonal wetlands, swamps, roadsides.	Unlikely	Unlikely (U1)
Hibbertia acrotoma	P1	Aug - ?	Perennial, prostrate shrub. 0.2 - 0.30 m high to 0.30- 0.40 m wide. Fl. Yellow,	Unlikely	Unlikely (U1)
Synaphea odocoileops	P1	Aug-Oct	Tufted, compact shrub, 0.2–0.5 m high. Fl. yellow. Brown-orange loam & sandy clay, granite. Swamps, winter-wet areas.	Unlikely	Unlikely (U1)
Melaleuca viminalis	P2	Sep-Dec	Large shrub – small tree (bottle brush), 10 m with pendulous branches. Fl Red, Along creeklines, heavy soils.	Unlikely	Unlikely (U1)

Species	Cons Status*	Flowering	Description and Habitat	Likelihood	Post Survey Likelihood
Millotia tenuifolia var. *laevis*	P2	Sep-Oct	Ascending to erect annual, herb, 0.02-0.1 m high. Fl. yellow. Granite or laterite soils.	Unlikely	Unlikely (U1)
Phyllangium palustre	P2	Sep to Nov	Annual herb, thickened fleshy-spongy tap root. Fl. White. Herbfields in claypans	Unlikely	Unlikely (U1)
Amanita fibrillopes	P3	Jun - July	Agaric type fungus, Solitary or gregarious, in sandy or gravelly soil in dry sclerophyll forest and Banksia woodland or in humus rich soil in seasonally wet eucalypt and paperbark woodland	Unlikely	Possible (P1)
Angianthus drummondii	P3	Oct-Dec	Erect annual, herb, to 0.1 m high. Fl. yellow. Grey or brown clay soils, ironstone. Seasonally wet flats.	Unlikely	Unlikely (U1)
Boronia capitata subsp. *gracilis*	P3	Jun-Nov	Slender shrub, 0.3-0.6(-3) m high, branches pilose. Fl. pink. White/grey or black sand. Winter-wet swamps,	Unlikely	Unlikely (U1)
Chamaescilla gibsonii	P3	Sep	Clumped tuberous, herb. Fl. blue. Clay to sandy clay. Winter-wet flats, shallow water-filled claypans.	Unlikely	Unlikely (U1)
Eryngium sp. ferox	P3	Nov - December	Tuberous herb; flowers metallic blue, inflorescence bracts metallic blue.	Unlikely	Unlikely (U1)
Myriophyllum echinatum	P3	Nov	Erect annual, herb, 0.02-0.03 m high. Fl. red. Clay. Winter-wet flats.	Unlikely	Unlikely (U1)
Schoenus capillifolius	P3	Oct-Nov	Semi-aquatic tufted annual, grass-like or herb (sedge), 0.05 m high. Fl. green. Brown mud. Claypans.	Unlikely	Unlikely (U1)
Schoenus sp. Waroona (G.J. Keighery 12235)	P3	Oct-Nov	Tufted annual, grass-like or herb (sedge), 0.02-0.06 m high. Fl. brown-red-green. Clay or sandy clay. Winter-wet flats.	Unlikely	Unlikely (U1)
Stylidium aceratum	P3	Oct-Nov	Fibrous rooted annual, herb, 0.05-0.09 m high, leaves spathulate. Fl. pink/white. Sandy soils. Swamp heathland.	Unlikely	Unlikely (U1)

Species	Cons Status*	Flowering	Description and Habitat	Likelihood	Post Survey Likelihood
Aponogeton hexatepalus	P4	Jul-Oct	Rhizomatous or cormous, aquatic perennial, herb, leaves floating. Fl. green, white. Mud. Freshwater: ponds, rivers, claypans.	Unlikely	Unlikely (U1)
Caladenia speciosa	P4	Sep-Oct	Tuberous, perennial, herb, 0.35-0.6 m high. Fl. white, pink. White, grey or black sand.	Unlikely	Unlikely (U1)
Calothamnus graniticus subsp. *leptophyllus*	P4	Jun-Aug	Erect, multi-stemmed shrub, 1-2 m high. Fl. red. Clay over granite, lateritic soils. Hillsides.	Unlikely	Unlikely (U1)
Conostylis pauciflora subsp. *pauciflora*	P4	Aug-Oct	Rhizomatous, stoloniferous perennial, grass-like or herb, 0.1-0.35 m high. Fl. yellow. Grey sand, limestone. Hillslopes, consolidated dunes.	Unlikely	Unlikely (U1)
Eucalyptus x *graniticola* Hopper	P4	?	Mallee 4 m tall with very erect smooth stems, bark pale reddish brown over powder white, dull bright green leaves.	Unlikely	Unlikely (U1)
Ornduffia submersa	P4	Sep-Oct	Tuberous emergent aquatic perennial dwarf shrub, height to 35 cm; flowers white; leaves floating on surface of water. Clay-based ponds and swamps (semi-aquatic)	Unlikely	Unlikely (U1)
Schoenus natans	P4	Oct	Aquatic annual, grass-like or herb (sedge), 0.3 m high. Fl. brown. Winter-wet depressions.	Unlikely	Unlikely (U1)
Stylidium ireneae	P4	Oct to Dec	Erect perennial herb, forming a small compact bush up to 15 cm in diameter. Stems maroon coloured. Corolla pale-pink, lobes laterally paired. Sandy loam. Valleys near creek lines, woodland, often with Agonis.	Unlikely	Unlikely (U1)
Trithuria australis	P4	Nov - Dec	Small reddish aquatic herb. Ponds, pools	Unlikely	Unlikely (U1)

*****Note: The BC Act Conservation Status is shown, EPBC Act status, where relevant, is in brackets.

Appendix 9. Combined track log and quadrat location.



Appendix 10. List of vascular flora found within the survey area.

#	FAMILY_NAME	LATIN NAME	NATURALISED
1	Anarthriaceae	*Lyginia imberbis*	
2	Apiaceae	*Pentapeltis peltigera*	
3	Apiaceae	*Xanthosia huegelii*	
4	Asparagaceae	*Chamaescilla corymbosa*	
5	Asparagaceae	*Lachenalia reflexa*	*
6	Asparagaceae	*Lomandra integra*	
7	Asparagaceae	*Lomandra preissii*	
8	Asparagaceae	*Lomandra purpurea*	
9	Asparagaceae	*Lomandra sericea*	
10	Asteraceae	*Arctotheca calendula*	*
11	Asteraceae	*Hypochaeris glabra*	*
12	Asteraceae	*Osteospermum ecklonis*	*
13	Asteraceae	*Sonchus oleraceus*	*
14	Asteraceae	*Trichocline spathulata*	
15	Casuarinaceae	*Allocasuarina huegeliana*	
16	Colchicaceae	*Burchardia congesta*	
17	Cyperaceae	*Lepidosperma pubisquameum*	
18	Cyperaceae	*Lepidosperma squamatum*	
19	Cyperaceae	*Mesomelaena tetragona*	
20	Cyperaceae	*Morelotia octandra*	
21	Cyperaceae	*Netrostylis* sp. Jarrah Forest (R. Davis 7391)	
22	Cyperaceae	*Schoenus efoliatus*	
23	Dasypogonaceae	*Dasypogon bromeliifolius*	
24	Dilleniaceae	*Hibbertia hypericoides*	
25	Droseraceae	*Drosera erythrorhiza*	
26	Droseraceae	*Drosera pallida*	
27	Elaeocarpaceae	*Tetratheca hirsuta*	
28	Fabaceae	*Acacia dealbata*	*
29	Fabaceae	*Acacia decurrens*	*
30	Fabaceae	*Acacia iteaphylla*	*
31	Fabaceae	*Acacia longifolia*	*
32	Fabaceae	*Acacia podalyriifolia*	*
33	Fabaceae	*Acacia preissiana*	
34	Fabaceae	*Acacia pulchella*	
35	Fabaceae	*Acacia willdenowiana*	
36	Fabaceae	*Bossiaea ornata*	
37	Fabaceae	*Chamaecytisus palmensis*	*
38	Fabaceae	*Daviesia divaricata*	
39	Fabaceae	*Daviesia incrassata*	
40	Fabaceae	*Daviesia physodes*	
41	Fabaceae	*Daviesia rhombifolia*	

#	FAMILY_NAME	LATIN NAME	NATURALISED
42	Fabaceae	*Gastrolobium praemorsum*	
43	Fabaceae	*Gompholobium polymorphum*	
44	Fabaceae	*Hovea chorizemifolia*	
45	Fabaceae	*Hovea trisperma*	
46	Fabaceae	*Jacksonia sternbergiana*	
47	Fabaceae	*Kennedia coccinea*	
48	Fabaceae	*Kennedia prostrata*	
49	Fabaceae	*Labichea punctata*	
50	Goodeniaceae	*Lechenaultia biloba*	
51	Goodeniaceae	*Scaevola calliptera*	
52	Haemodoraceae	*Anigozanthos manglesii*	
53	Haemodoraceae	*Conostylis serrulata*	
54	Haemodoraceae	*Conostylis setosa*	
55	Haemodoraceae	*Haemodorum laxum*	
56	Hemerocallidaceae	*Agrostocrinum hirsutum*	
57	Hemerocallidaceae	*Caesia micrantha*	
58	Iridaceae	*Babiana angustifolia*	*
59	Iridaceae	*Freesia alba × leichtlinii*	*
60	Iridaceae	*Gladiolus angustus*	*
61	Iridaceae	*Ixia maculata*	*
62	Iridaceae	*Patersonia occidentalis*	
63	Iridaceae	*Romulea rosea*	*
64	Iridaceae	*Watsonia meriana*	*
65	Lamiaceae	*Hemigenia pritzelii*	
66	Lamiaceae	*Lavandula dentata*	*
67	Lomariopsidaceae	*Nephrolepis cordifolia*	*
68	Malvaceae	*Brachychiton populneus*	*
69	Myrtaceae	*Agonis flexuosa*	
70	Myrtaceae	*Babingtonia camphorosmae*	
71	Myrtaceae	*Chamelaucium uncinatum*	
72	Myrtaceae	*Corymbia calophylla*	
73	Myrtaceae	*Eucalyptus ?sideroxylon*	*
74	Myrtaceae	*Eucalyptus marginata*	
75	Myrtaceae	*Hypocalymma robustum*	
76	Orchidaceae	*Caladenia flava*	
77	Orchidaceae	*Pyrorchis nigricans*	
78	Oxalidaceae	*Oxalis pes-caprae*	*
79	Oxalidaceae	*Oxalis purpurea*	*
80	Papaveraceae	*Fumaria capreolata*	*
81	Phyllanthaceae	*Lysiandra calycina*	
82	Pinaceae	*Pinus radiata*	*
83	Pittosporaceae	*Billardiera variifolia*	
84	Poaceae	*Avena barbata*	*
85	Poaceae	*Bambusa vulgaris*	*

#	FAMILY_NAME	LATIN NAME	NATURALISED
86	Poaceae	*Briza maxima*	*
87	Poaceae	*Cenchrus clandestinus*	*
88	Poaceae	*Cynodon dactylon*	*
89	Poaceae	*Ehrharta calycina*	*
90	Poaceae	*Ehrharta longiflora*	*
91	Poaceae	*Eragrostis curvula*	*
92	Poaceae	*Neurachne alopecuroidea*	
93	Poaceae	*Tetrarrhena laevis*	
94	Proteaceae	*Adenanthos meisneri*	
95	Proteaceae	*Banksia dallanneyi*	
96	Proteaceae	*Banksia grandis*	
97	Proteaceae	*Banksia sphaerocarpa*	
98	Proteaceae	*Conospermum stoechadis*	
99	Proteaceae	*Grevillea quercifolia*	
100	Proteaceae	*Grevillea wilsonii*	
101	Proteaceae	*Hakea ruscifolia*	
102	Proteaceae	*Xylomelum occidentale*	
103	Rutaceae	*Philotheca spicata*	
104	Salicaceae	*Populus nigra*	*
105	Stylidiaceae	*Stylidium brunonianum*	
106	Tropaeolaceae	*Tropaeolum majus*	*
107	Violaceae	*Hybanthus floribundus*	
108	Xanthorrhoeaceae	*Xanthorrhoea gracilis*	
109	Xanthorrhoeaceae	*Xanthorrhoea preissii*	
110	Zamiaceae	*Macrozamia riedlei*	

Appendix 11. Waroona Cemetery quadrat data

Kemerton Quadrat Record			
Botanist	R. Smith		
Date	7/09/2022		
Waypoint/Quadrat Name	CEME01		
Picture No.	3.02	**Picture Direction**	northwest
Soil Colour	Grey-Brown	**Soil Type**	Sandy Loam
Rock Type		Drainage	Free draining
Vegetation Condition	Very Good		
Fire age	> 10 yrs		
Topographic position	Slope (Moderate)		
Evidence of Phytophthora Dieback	No		

LATIN NAME	COVER	HEIGHT
Acacia willdenowiana	0-5	<1m
Banksia grandis	0-5	1-2m
Bossiaea ornata	0-5	<1m
Briza maxima	0-5	
Caesia micrantha	0-5	
Corymbia calophylla	11-30	10-30m
Dasypogon bromeliifolius	6-10	
Daviesia divaricata	0-5	1-2m
Drosera pallida	0-5	
Ehrharta calycina	0-5	
Eucalyptus marginata	31-70	10-30m
Gastrolobium praemorsum	0-5	<1m

Appendix 11. Waroona Cemetery quadrat data

Gompholobium polymorphum	0-5	<1m
Grevillea quercifolia	0-5	<1m
Haemodorum laxum	0-5	
Hovea chorizemifolia	0-5	<1m
Lepidosperma squamatum	0-5	
Lomandra purpurea	0-5	
Lomandra sericea	0-5	
Lysiandra calycina	6-10	<1m
Mesomelaena tetragona	0-5	
Morelotia octandra	11-30	
Netrostylis sp. Jarrah Forest (R. Davis 7391)	0-5	
Patersonia occidentalis	0-5	
Pentapeltis peltigera	0-5	
Pyrorchis nigricans	0-5	
Scaevola calliptera	0-5	
Tetrarrhena laevis	11-30	
Tetratheca hirsuta	0-5	
Trichocline spathulata	0-5	
Watsonia meriana	0-5	
Xanthorrhoea gracilis	0-5	<1m
Xanthorrhoea preissii	6-10	1-2m
Xylomelum occidentale	0-5	1-2m

Appendix 12. Waroona TEC occurrence report form.

Department of Parks and Wildlife

Threatened and Priority Ecological Community (TEC/PEC) Occurrence Report Form

Version 6.0 July 2013

COMMUNITY: FCT03c **OBSERVATION DATE:** 9/09/2023

New occurrence ☐ **Site ID:** **CONS STATUS:** TEC

OBSERVER/S: Russell Smith & Ben Eckermann **PHONE:** 0447809124

ROLE: botanists **ORGANISATION:** Ecoedge

EMAIL: russell@ecoedge.com.au

DESCRIPTION OF LOCATION (Provide at least nearest town/named locality, and the distance and direction to that place)**:**

Townsite of Waroona, cemetary reserve

Reserve No:

DISTRICT: **LGA:** Waroona2.54 ha Land manager present: ☐

DATUM:

GDA94 / MGA94 ☒
AGD84 / AMG84 ☐
WGS84 ☐
Unknown ☐

COORDINATES: (If UTM coords provided, **Zone** is also required)

DecDegrees ☐ DegMinSec ☐ UTMs ☒

Lat / Northing: 6364932

Long / Easting: 399570

Zone: 50

METHOD USED:

GPS ☒ Differential GPS ☐ Map ☐

No. satellites: Map used:

Boundary polygon captured: ☐ Map used:

LAND TENURE:

Nature reserve ☐	Timber reserve ☐	Private property ☐	Rail reserve ☐	Shire road reserve ☐
National park ☐	State forest ☐	Pastoral lease ☐	MRWA road reserve ☐	Other Crown reserve ☒
Conservation park ☐	Water reserve ☐	UCL ☐	SLK/Pole _____ to _____	Specify other: Cemetary

AREA ASSESSMENT: Edge survey ☐ Partial survey ☐ Full survey ☐ Area observed (m²): 2.54 ha

EFFORT: Time spent surveying (minutes): _____ No. of minutes spent / 100 m²: _____

THREATS - type, and supporting information: e.g. clearing, too frequent fire, weed, disease. Refer to field manual for list of threats & agents.	**Cause/Agent:** e.g. weed type, grazing species, recreation type	Area affected	Current impact (N-E)	Potential Impact (L-E)	Potential Threat Onset (S-L)
• Clearing	12	%			
•		%			
•		%			
•		%			
•		%			
•		%			
•		%			
•		%			
•		%			

*Rate current and potential threat impact: **N=Nil, L=Low, M=Medium, H=High, E=Extreme**

*Estimate time to potential impact: **S=Short (<12mths), M=Medium (<5yrs), L=Long (5yrs+)**

CONDITION OF OCCURRENCE: (Bush Forever Scale) (estimate % of area in each)

Pristine ☐ _____%	Very Good ☒ 12%	Degraded ☒ 34%
Excellent ☐ _____%	Good ☒ 19%	Completely Degraded ☒ 34%

Please return form to:

communities.data@dpaw.wa.gov.au

or Species and Communities Branch, Department of Parks and Wildlife, Locked Bag 104, Bentley Delivery Centre WA 6983

*Record entered by:*_____ *Date entered:*_____ *Database no:*_____

Department of Parks and Wildlife

Threatened and Priority Ecological Community (TEC/PEC) Occurrence Report Form

Version 6.0 July 2013

RECOMMENDED MANAGEMENT ACTIONS: e.g. roadside markers, weed control, etc.

ACTIONS IMPLEMENTED (include date):

HABITAT INFORMATION: (Check more than one box for combinations or where necessary)

LANDFORM:	ROCK TYPE:	LOOSE ROCK:	SOIL TYPE:	SOIL COLOUR:	DRAINAGE:
Crest ☐	Granite ☐	(on soil surface; e.g. gravel, quartz fields)	Sand ☐	Red ☐	Well drained ☒
Hill ☐	Dolerite ☐		Sandy loam ☒	Brown ☒	Seasonally inundated ☐
Ridge ☐	Laterite ☐	0-10% ☒	Loam ☐	Yellow ☐	Permanently inundated ☐
Outcrop ☐	Ironstone ☐	10-30% ☐	Clay loam ☐	White ☐	Tidal ☐
Slope ☒	Limestone ☐	30-50% ☐	Light clay ☐	Grey ☒	
Flat ☐	Quartz ☒	50-100% ☐	Peat ☐	Black ☐	
Open depression ☐					
Drainage line ☐	Specify other:		Specify other:	Specify other:	Specify other:
Closed depression ☐					
Wetland ☐					

Specific Landform Element: (Refer to field manual for additional values)

CONDITION OF SOIL:

Dry ☒ Moist ☐ Waterlogged ☐ Inundated ☐ Cracked ☐ Saline ☐ Other:

VEGETATION CLASSIFICATION:	1. Open forest of Eucalyptus marginata and Corymbia calophylla
	2. low open woodland of Banksia grandis
	3. medium open shrubland of Daviesia divaricata, Xanthorrhoea preissii and Xylomelum occidentale
	4. low shrubland of Bossiaea ornata, Dasypogon bromeliifolius, Lysiandra calycina

FIRE HISTORY:

Last Fire: Season/Month: Year: **Fire Intensity:** High ☐ Medium ☐ Low ☐ No evidence of fire ☒

Actual Occurrence Landuse:

Please return form to:

communities.data@dpaw.wa.gov.au

or Species and Communities Branch, Department of Parks and Wildlife, Locked Bag 104, Bentley Delivery Centre WA 6983

*Record entered by:*_____ *Date entered:*_____ *Database no:*_____

Threatened and Priority Ecological Community (TEC/PEC) Occurrence Report Form

Version 6.0 July 2013

Adjacent Landuse:

Associated Flora Species:

scattered forbs including Haemodorum laxum and Lomandra sericea and open sedgeland of Lepidosperma squamatum, Mesomelaena tetragona and Morelotia octandra

Associated Fauna Species:

OTHER COMMENTS:

ATTACHED: Map ☐ Mudmap ☐ Photo ☐ GIS data ☐ Field notes ☐

Other:

COPY SENT TO: Regional Office ☐ District Office ☐ Other:

Submitter of record: **Russell Smith** **Role:** **botanist**

Signature: **Russell Smith** **Date submitted:** **23/01/2023**

Please return form to:

communities.data@dpaw.wa.gov.au

or Species and Communities Branch, Department of Parks and Wildlife, Locked Bag 104, Bentley Delivery Centre WA 6983

*Record entered by:*_____ *Date entered:*_____ *Database no:*_____