Reconnaissance Flora and Vegetation Assessment

Part Ferguson Road, Ferguson

Project No: EP22-044(01)

Prepared for Shire of Dardanup
April 2023

Document Control

Doc name:	Reconnaissance Flora and Vegetation Assessment Part Ferguson Road, Ferguson				
Doc no.:	**EP22-044(01)--003A SCM**				
Version	**Date**	**Author**		**Reviewer**	
1	September 2022	Sean Moylan	SCM	Rachel Weber	RAW
	Submitted for client review				
A	April 2023	Sean Moylan	SCM	Tom Atkinson	TAA
	Report updated to include original survey area				

Executive Summary

The Shire of Dardanup engaged Emerge Associates to conduct a reconnaissance flora and vegetation assessment within a portion of the Ferguson Road reserve between Ferguson and Wellington Mill (referred to herein as the 'site').

As part of the assessment a desktop review of relevant background information was completed and a field survey was undertaken on 25 and 26 May 2022. During the field survey an assessment was made on the type, condition and values of vegetation across the site.

Outcomes of the survey include the following:

- Non-native vegetation is present across 5.53 ha of the site.
- Bare road surface comprises 3.36 ha of the site.
- Remnant native vegetation is present across 5.37 ha of the site in varying levels of condition.
- A total of 48 native and 39 non-native (weed) species were recorded in the site.
- No threatened or priority flora species were recorded within the site. The presence or absence of two threatened and eight priority species could not be confirmed, as listed below. Further survey in spring would be required to confirm the presence or absence of these species within the site.
    - *Caladenia procera* (critically endangered under the EPBC Act and threatened under the BC Act)
    - *Caladenia hoffmanii* (endangered under the EPBC Act and threatened under the BC Act)
    - *Gastrolobium sp.* Yoongarillup (S. Dilkes s.n. 1/9/1969) (P1)
    - *Stylidium acuminatum* subsp. *acuminatum* (P2)
    - *Lomandra whicherensis* (P3)
    - *Synaphea polypodioides* (P3)
    - *Acacia semitrullata* (P4)
    - *Chamelaucium erythrochlorum* (P4)
    - *Cyanothamnus tenuis* (P4)
    - *Senecio leucoglossus* (P4).
- The vegetation within the site was classified into the following six plant communities that are present in varying condition:
    - Plant community **CcEmBa** comprises the highest quality vegetation in the site and was present in 'very good' condition.
    - Plant communities **Af**, **Cc** and **CcAf** consist of a canopy of native trees over non-native grasses with occasional native shrubs and were mapped as being in 'degraded' condition.
    - Plant community **AfTl** consists of native trees and shrubs over an understorey dominated by non-native grasses and was mapped as being in 'degraded' condition.
    - **Non-native** vegetation dominated by non-native grass species, with occasional native trees and shrubs and was mapped as being in 'completely degraded' condition.
    - The remainder of the site comprises the road surface and was not assigned to a vegetation condition category.
- No threatened or priority ecological communities occur within the site.

This page has been left blank intentionally.

Table of Contents

List of Tables

List of Plates

Figures

Appendices

Abbreviation Tables

Table A1: Abbreviations – Organisations

Organisations	
DAWE	Department of Agriculture, Water and the Environment
DBCA	Department of Biodiversity, Conservation and Attractions
DWER	Department of Water and Environmental Regulation
EPA	Environmental Protection Authority

Table A2: Abbreviations – General terms

General terms	
IBRA	Interim Biogeographic Regionalisation of Australia
NVIS	National Vegetation Inventory System (ESCAVI 2003)
P1	Priority 1
P2	Priority 2
P3	Priority 3
P4	Priority 4
P5	Priority 5
PEC	Priority ecological community
T	Threatened
TEC	Threatened ecological communities
UFI	Unique feature identifier

Table A3: Abbreviations – Legislation

Legislation	
BAM Act	*Biosecurity and Agriculture Management Act 2007*
BC Act	*Biodiversity Conservation Act 2016*
CALM Act	*Conservation and Land Management Act 1984*
EP Act	*Environmental Protection Act 1986*
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
LA Act	*Land Administration Act 1997*
SCRM Act	*Swan and Canning Rivers Management Act 2006*

Table A4: Abbreviations – Units of measurement

Units of measurement	
cm	Centimetre
DBH	Diameter at breast height
ha	Hectare
m	Metre
m AHD	m in relation to the Australian height datum
mm	Millimetre

1 Introduction

1.1 Project background

Emerge Associates (Emerge) were engaged by the Shire of Dardanup to characterise the flora and vegetation values within a portion of the Ferguson Road reserve between Ferguson and Wellington Mill (referred to herein as the 'site'). The site is located approximately 168 kilometres (km) south of the Perth Central Business District within the Shire of Dardanup.

The site comprises a linear corridor approximately 14.26 hectares (ha) in size. The western portion bounded by rural landholdings to the north and south. The central portion of the site is bounded by the Wellington State Forest, consisting of a pine plantation to the north, and remnant native vegetation and a pine planation to the south. The eastern portion of the site is bounded by rural landholdings to the north and south. The location and extent of the site is shown in **Figure 1**.

1.2 Purpose and scope of work

The scope of work was specifically to undertake a flora and vegetation assessment within the site to the standard required of a reconnaissance survey with reference to the Environmental Protection Authority's (EPA's) technical guidance (EPA 2016).

As part of this scope of work, the following tasks were undertaken:

- Desktop review of relevant background information pertaining to the site and surrounds, including database searches for threatened flora species and ecological communities.
- A field survey to record a comprehensive list of flora species and assess vegetation type and condition.
- Mapping of plant communities, vegetation condition and conservation significant flora and vegetation.
- Identification of potential habitat for conservation significant flora and vegetation and an assessment of likelihood of occurrence.
- Documentation of the desktop assessment, methodology, field survey and results into a report.

2 Environmental Context

2.1 Climate

Climate influences the types of vegetation that grow in a region and the life cycles of the flora present. It is therefore critical for a flora and vegetation survey to respond appropriately to climatic conditions to ensure that surveys are conducted during times when flora species are easiest to detect and identify.

The south-west of Western Australia experiences a Mediterranean climate of hot dry summers and cool wet winters. In Mediterranean type climates some flora species will typically spend part of their lifecycle as either underground storage organs or as seed. This is an adaptation to unfavourable environmental conditions such as excessive heat and drought that occur over the summer period. These species, known as 'geophytes' or 'annuals', tend to re-emerge during winter when favourable conditions return and are most visible during spring, which is the flowering period for a majority of plant species. Therefore, spring is the optimal time to complete flora and vegetation surveys in the south-west of WA.

An average of 907 millimetres (mm) of rainfall is recorded annually from the Ferguson Valley weather station (no. 9912), which is the closest weather station, located approximately at the western end of the site. The majority of this rainfall is received between the months of May and September. Mean maximum temperatures at the Donnybrook weather station (no. 9534), which is the nearest temperature recording station approximately 13 km south-west of the site, range from 16.6°C in July to 30.6°C in January, while mean minimum temperatures range from 5.7°C in July to 14.5°C in February (BoM 2022).

A total of 47 mm of rain was recorded during April 2022 in the month prior to the survey which is similar to the combined long-term average of 50.3 mm for the same month (BoM 2022). Since the survey was undertaken outside of the main flowering period (spring), the amount of rainfall was not considered to affect the survey outcomes.

2.2 Geomorphology and soils

Landform and soils influence vegetation types at regional and local scales.

The site occurs on the Darling Plateau and Darling Scarp which lies to the east of Perth CBD. The Darling Plateau is an ancient erosion surface capped with laterite and dissected by drainage channels (Beard 1990). The eastern part of the Plateau is characterised by flat-topped hills bound by breakaways and more prominent hills (monadnocks) which protrude above the general level of the plateau, while the western part comprises valleys with steep, rocky slopes and narrow, flat floors (Gozzard 2011). The Darling Scarp forms the western edge of the Darling Plateau and comprises former shoreline deposits and colluvial slopes (Gozzard 2007).

Examination of broad scale soil mapping places the site within the Lowdon association (Churchward and McArthur 1980). The Lowdon association comprises steep irregular slopes with shallow red and yellow earths and duplex soils and occasional rock outcrops.

Fine scale soil landscape mapping by the Department of Primary Industries and Regional Development (DPIRD) shows the site occurring within the Balingup subsystem, which is described as "moderately to steeply sloping, deeply incised valleys with loams" (Tille *et al.* 1996). Three separate Balingup subsystem units are mapped as occurring within the site, differentiated on the slopes and relief, as described in **Table 1** and shown in **Figure 2**.

Table 1: Soil landscape mapping units within the site (DPIRD 2019)

Soil landscape unit	Location within site	Description
Balingup moderate slopes Phase	Western and majority of eastern portion	Slopes of 15 - 35%, relief between 60 - 120 m
Balingup upper valleys Phase	Central portion	Slopes of 5 - 15%, relief between 30 - 70 m
Balingup footslopes Phase	Eastern portion	Slopes of 3 - 10%, relief between 5 - 20 m

The site is not known to contain any restricted landforms or unique geological features.

2.3 Topography

The elevation of the site ranges from 100 m in relation to the Australian height datum (mAHD) on the western side of the site to 238 mAHD in the central portion of the site (DPIRD 2020) (**Figure 2**).

2.4 Hydrology and wetlands

Wetlands are areas of seasonally, intermittently or permanently waterlogged land such as poorly drained soils, ponds, billabongs, lakes, swamps, tidal flats, estuaries, rivers and their tributaries (Wetlands Advisory Committee 1977). Wetlands can be recognised by the presence of vegetation associated with waterlogging or the presence of hydric soils such as peat, peaty sand or carbonate mud (Hill *et al.* 1996).

Wetlands of national or international significance may be afforded special protection under Commonwealth or international agreements. The following lists of important wetlands were checked as part of this assessment:

- *Ramsar List of Wetlands of International Importance* (DBCA 2017c)
- *A Directory of Important Wetlands in Australia* (DBCA 2018)

No Ramsar or listed 'important wetlands' are located within or near the site.

Examination of the Department of Water and Environmental Regulation (DWER) hydrography dataset (DWER 2018) shows five minor drainage channels traversing the site.

The Department of Biodiversity, Conservation and Attractions (DBCA) has developed the *Geomorphic Wetlands of the Swan Coastal Plain* dataset (DBCA 2021a). This dataset maps geomorphic wetland features and classifies them based on their landform shape and water permanence. Each feature is assigned to one of three management categories which guides land use and conservation.

A review of the *Geomorphic Wetlands, Swan Coastal Plain* dataset indicated that one artificial wetland feature (unique feature identifier (UFI) 2913) occurs adjacent to the northern boundary of the western portion of the site. This feature assigned a 'multiple use wetland' management category. The location of wetland and water related features are shown in **Figure 2**.

2.5 Regional vegetation

Native vegetation is described and mapped at different scales in order to illustrate patterns in its distribution. At a continental scale the *Interim Biogeographic Regionalisation of Australia* (IBRA) divides Australia into floristic subregions (Environment Australia 2000). The site is contained within the jarrah forest region and within the 'JF2' or southern jarrah forest subregion. The southern forest region subregion is characterised by *Eucalyptus marginata* (jarrah) – *Corymbia calophylla* (marri) forest on laterite gravels with *Eucalyptus wandoo* (wandoo) – marri woodlands in the eastern part (DEC 2002).

Variations in native vegetation can be further classified based on regional vegetation mapping. Heddle *et al.* (1980) mapping shows the site as comprising the 'Lowden' complex which is described as a 'mixture of open forest of *Eucalyptus marginata* - *Corymbia calophylla* and low open forest of *Agonis flexuosa* on the lower valley slopes, fringing woodland of *Eucalyptus rudis* - *Melaleuca rhaphiophylla* in the gullies and a woodland of *Eucalyptus wandoo* on slopes'.

The Lowden complex was determined to have 36.64% of its pre-European extent remaining, of which 11.84% is protected for conservation purposes (Government of Western Australia 2019).

2.6 Historical land use

Review of historical images available from 1996 onwards shows that the site has remained unchanged (WALIA 2022) . The majority of the site and surrounding area was cleared of native vegetation prior to 1966, except the central portion of the site which appears to support native vegetation. A pine plantation is situated adjacent to the central portion of the site.

2.7 Conservation significant values

2.7.1 Threatened and priority flora

Certain flora taxa that are considered to be rare or under threat warrant special protection under Commonwealth and/or State legislation. At a Commonwealth level, flora taxa may be listed as 'threatened' under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Threatened flora species listed under the EPBC Act are assigned a conservation status according to attributes such as population size and geographic distribution. Any action likely to have a significant impact on a taxon listed under the EPBC Act requires Ministerial approval.

In Western Australia flora species may also be classed as 'threatened' under *the Biodiversity Conservation Act 2016* (BC Act). Similarly, it is an offence to 'take' or 'disturb' threatened flora listed under the BC Act without Ministerial approval.

Flora species that do not currently meet the criteria for listing as threatened but are potentially rare or threatened may be added to the DBCA's *Priority Flora List*. These species are classified into 'priority' levels based on threat. Whilst priority species are not under direct statutory protection, they are considered during State approval processes.

Further information on threatened and priority species and their categories is provided in **Appendix A**. An assessment of the likelihood of occurrence of threatened and priority flora within the site was undertaken (refer to **Sections 3.1** and **4.2.1**).

2.7.2 Threatened and priority ecological communities

An ecological community is a naturally occurring group of native plants, animals and other organisms that are interacting in a unique habitat. An ecological community's structure, composition and distribution are influenced by environmental factors such as soil type, position in the landscape, altitude, climate and water availability (DAWE 2021a). 'Threatened ecological communities' (TECs) are ecological communities that are recognised as rare or under threat and therefore warrant special protection.

Selected TECs are afforded statutory protection at a Commonwealth level under the EPBC Act. Similar to flora species, TECs listed under the EPBC Act are assigned a conservation status. Any action likely to have a significant impact on a community listed under the EPBC Act requires Ministerial approval.

TECs are also listed within Western Australia under the BC Act and the BC Regulations. Their significance is also acknowledged through other state environmental approval processes such as 'environmental impact assessment' pursuant to Part IV of *the Environmental Protection Act 1986* (EP Act) and the *Environmental Protection* (Clearing of Native Vegetation) *Regulations 2004*.

An ecological community that is under consideration for listing as a TEC in Western Australia but does not yet meet survey criteria or has not been adequately defined may be listed as a 'priority ecological community' (PEC). Listing as a PEC is similarly considered during State approval processes.

Further information on categories of TECs and PECs is provided in **Appendix A**. An assessment of the likelihood of occurrence of threatened and priority flora within the site was undertaken (refer to **Sections 3.1** and **4.3.1**).

2.8 Weeds and pests

The term 'weed' can refer to any plant that requires some form of action to reduce its effect on the economy, the environment, human health and amenity. Many non-native flora species and some native species are considered to be weeds. The likelihood of weeds occurring is higher in areas disturbed areas, especially areas that have been agricultural or urban landuse.

A particularly invasive or detrimental weed species may be listed as a 'declared pest' pursuant to *Western Australia's Biosecurity and Agriculture Management Act 2007* (BAM Act), indicating that it warrants special management to limit its spread.

The Commonwealth government has further compiled a list of 32 *Weeds of National Significance* (WoNS) (DAWE 2021b). Whilst the WoNS list is non-statutory, many WoNS are also listed under the BAM Act. Further information on weeds and declared pests is provided in **Appendix A**.

2.9 DBCA managed or legislated land

DBCA has tenure of or interests in numerous areas of land across the state for a range of purposes. Tenure categories include national parks, nature reserves, conservation parks, marine parks, marine nature reserves, marine management areas, section 5(1)(g) reserves, state forest and timber reserves. These areas are mapped within the *Legislated Lands and Waters* (DBCA 2017a) and *Lands of Interest* (DBCA 2017b) datasets. The *Legislated Lands and Waters* (DBCA 2017a) dataset includes lands subject to the following legislation; the *Conservation and Land Management Act 1984* (CALM Act 1984), *Swan and Canning Rivers Management Act 2006* (SCRM Act) and lands identified under the *Land Administration Act 1997* (LA Act). The *Lands of Interest* (DBCA 2017b) dataset includes all other lands of which DBCA is recognised as the manager but is not vested under any act. These lands comprise of crown land and freehold land which DBCA has been acknowledged by the Department of Lands as the responsible agency.

The central portion of the site bisects the Wellington State Forest, which is managed under the CALM Act (DBCA 2021b). While the road reserve is not considered DBCA managed or legislated land, the border of the Wellington State Forest slightly overlaps with the site boundary several times as shown in **Figure 3**.

2.10 Ecological linkages

Ecological linkages are linear landscape elements that allow the movement of fauna, flora and genetic material between areas of remnant habitat. This exchange of genetic material between vegetation remnants improves the viability of those remnants by allowing greater access to breeding partners and food sources, refuge from disturbances such as fire and maintenance of genetic diversity of plant communities and populations. Ecological linkages are ideally continuous or near-continuous as the more fractured a linkage is, the less ease flora and fauna have in moving within the corridor (Alan Tingay and Associates 1998).

The Perth Biodiversity Project, supported by the Western Australia Local Government Association (WALGA), have identified and mapped regional ecological linkages within the Perth Metropolitan Region (WALGA and PBP 2004). This study was extended beyond the Perth Metropolitan Region through the South West Biodiversity Project, resulting in the identification and mapping of the South West regional ecological linkages (Molloy *et al.* 2009). There are no mapped ecological linkages within or in close proximity to the site. One regional ecological linkage (No. 203) occurs approximately 430 m east of the site running north-west to south-east. Review of aerial imagery indicates that the site is connected to extensive areas of vegetation within the local area.

2.11 Previous surveys

No previous flora and vegetation surveys are known to have been undertaken over the site.

3 Methods

3.1 Database searches

A search was conducted for threatened and priority flora that may occur or have been recorded within a 10 km radius of the site using the *Protected Matters Search Tool* (DAWE 2022), *NatureMap* (DBCA 2022) and DBCA's threatened and priority flora database (reference no. 37-0522FL).

A search was also conducted for TECs and PECs that may occur or have been recorded within a 10 km radius of the site using the *Protected Matters Search Tool* (DAWE 2022) and the *weed and native flora dataset* (Keighery *et al.* 2012) and a 20 km radius (as recommended by DBCA) of the site using DBCA's threatened and priority ecological communities' databases (reference no. 35_0522EC).

Prior to undertaking the field survey, information on the habitat preferences of threatened and priority flora species and communities identified from database searches was reviewed. This was compared to existing environmental information available for the site, such as geomorphology, soils, regional vegetation and historic land use, to identify species and communities for which habitat may occur in the site.

3.2 Field survey

Two ecologists from Emerge visited the site on 25 and 26 May 2022 to conduct the flora and vegetation field survey.

The site was traversed on foot and the composition and condition of vegetation was recorded. Photographs were taken throughout the field visit to show particular site conditions. Flora species not native to Western Australia are denoted by an asterisk ('*') in text and raw data.

Plant specimens collected during the field survey were dried, pressed and named in accordance with requirements of the Western Australian Herbarium (2022). Identification of specimens occurred through comparison with named material and through the use of taxonomic keys.

3.2.1 Targeted searches

The suitability of habitat within the site for conservation significant flora and communities identified in the desktop assessment was assessed (refer **Section 3.1**). Areas of suitable habitat were traversed along transects and searched for conservation significant species, as required.

3.2.2 Vegetation condition

Vegetation condition was assigned at each sample and changes in vegetation condition were also noted and mapped across the site. The condition of the vegetation was assessed using the Keighery (1994) scale, as shown in **Table 2**.

Table 2: Vegetation condition scale applied during the field assessment

Condition category	Definition (Keighery 1994)
Pristine	Pristine or nearly so, no obvious signs of disturbance.
Excellent	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species.
Very good	Vegetation structure altered obvious signs of disturbance. For example, 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. For example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, 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. For example, disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, 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 or shrubs.

3.3 Mapping and analysis

3.3.1 Conservation significant flora and communities

Based on the database searches and information recorded during the field survey, an assessment of the likelihood of occurrence of threatened and priority flora species and communities within the site was undertaken using the categories outlined in **Table 3**.

Table 3: Likelihood of occurrence assessment categories and definitions

Likelihood	Definition
Recorded	The species was recorded during the current field survey.
Likely	The site contains suitable habitat for the species and it is likely the species may occur based on presence of a recent historical record within or close to the site.
Possible	The site contains suitable habitat for the species but there is no other information to suggest that the species may occur within or close to the site.
Unlikely	The site does not contain suitable habitat for the species or the site contains suitable habitat for the species within which thorough targeted searches were completed and conclusion has been made that the species is unlikely to be present.

3.3.2 Plant community identification and description

The plant communities within the site were identified from the sample data collected during the field survey. The vegetation was described according to the dominant species present using the structural formation descriptions of the *National Vegetation Inventory System* (NVIS) (NVIS Technical Working Group 2017). The identified plant communities were mapped on aerial photography from the sample locations and boundaries were interpreted from aerial photography and notes taken in the field. Vegetation condition was mapped on aerial photography based on the samples and notes recorded during the field survey to define areas with differing condition.

3.3.3 Threatened and priority ecological communities

Areas of native vegetation potentially representing a TEC and/or PEC were assessed against key diagnostic characteristics and, if available, size and/or vegetation condition thresholds.

3.4 Survey limitations

It is important to note the specific constraints imposed on surveys and the degree to which these may have limited survey outcomes. An evaluation of the survey methodology against standard constraints outlined in the EPA document *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016) is provided in **Table 4**.

Table 4: Evaluation of survey methodology against standard constraints outlined in EPA (2016)

Constraint	Degree of limitation	Details
Availability of contextual information	No limitation	The broad scale contextual information described in **Section 2** is adequate to place the site and vegetation in context.
Experience level of personnel	No limitation	This flora and vegetation assessment was undertaken by two ecologists with three and four years of botanical experience in Western Australia. Technical review was undertaken by a senior environmental consultant with over 12 years' experience in undertaking botanical assessments in Western Australia.
Suitability of timing	Limitation	The survey was conducted in June and thus outside of the main flowering season. The site has been subject to historical disturbance but there is still the possibility that annual and geophytic threatened and priority species may occur and would not have been detectable at the time of survey. The survey timing was acceptable for a reconnaissance level survey.
Temporal coverage	Minor limitation	Comprehensive flora and vegetation assessments can require multiple visits, at different times of year, and over a period of a number of years, to enable observation of all species present. The site was only surveyed once (over two days) and outside of the spring main flowering period. Therefore, it is possible that annual and geophytic threatened and priority species may occur and would not have been detectable at the time of survey. However, the survey effort was considered sufficient for a reconnaissance survey.

Table 4: Evaluation of survey methodology against standard constraints outlined in EPA (2016) (continued)

Constraint	Degree of limitation	Details
Spatial coverage and access	No limitation	Site coverage was comprehensive (track logged).
	No limitation	Some areas of the site were unable to be accessed due to being located within private landholdings. These landholdings consisted of agricultural lots and could be assessed from the adjacent road reserve. Given that these areas did not contain native vegetation there is no limitation in being unable to access these lots.
Sampling intensity	No limitation	The site was traversed comprehensively and a total of 86 species was recorded. No formal sampling was undertaken or considered necessary due to the disturbed condition of the site. Opportunistic records of flora, plant communities and vegetation condition were sufficient to accurately characterise the vegetation within the site.
Influence of disturbance	Minor limitation	Time since fire is greater than 26 years as interpreted from aerial imagery and therefore short-lived species more common after fire may not have been visible.
	No limitation	Historical ground disturbance was evident in parts of the site. The disturbance history of the site was considered when undertaking field sampling.
Adequacy of resources	No limitation	All resources required to perform the survey were available.

4 Results

4.1 General site conditions

The majority of the site comprises sealed road surfaces and road reserves. These areas support hardstand, bare ground, non-native vegetation and native vegetation.

Some private lots adjacent to the road reserve fell within the site boundary due to fence placement inconsistencies with the cadastral boundary. However, no private lots were accessed due to the low ecological values present. Where needed, assessment of flora values was made from the road reserve.

4.2 Flora

4.2.1 Desktop assessment

The database search results identified a total of 20 threatened and 28 priority flora species occurring or potentially occurring within a 10 km radius of the site. Information on these species including their habitat preferences and flowering period is provided in **Appendix B**.

Based on background information available for the site, suitable habitat was considered to potentially occur within the site for seven threatened flora species and 11 priority flora species as shown in **Table 5**.

Table 5: Conservation significant flora species considered to have potential to occur in the site based on known habitat preferences

Species	Level of significance		Life strategy	Habitat	Flowering period
	State	EPBC Act			
Caladenia procera	CR	CR	PG	Rich clay loam, alluvial loamy flats with jarrah/marri/peppermint woodland, dense heath, sedges.	Sep-Oct
Synaphea sp. Serpentine (G.R. Brand 103)	CR	CR	P	Seasonally damp areas, loam - sand.	Sep-Oct
Caladenia hoffmanii	EN	EN	PG	Clay, loam, laterite, granite. Rocky outcrops and hillsides, ridges, swamps and gullies.	Aug-Oct
Eleocharis keigheryi	VU	VU	P	Clay or sandy loam in freshwater creeks and transient waterbodies such as seasonally wet clay pans.	Aug-Dec
Banksia squarrosa subsp. argillacea	VU	VU	P	White/grey sand, gravelly clay or loam predominantly in winter-wet areas over ironstone in open to tall shrubland.	Jun-Nov

Table 5: Conservation significant flora species considered to have potential to occur in the site based on known habitat preferences (continued)

Species	Level of significance		Life strategy	Habitat	Flowering period
	State	EPBC Act			
Chamelaucium sp. S coastal plain (R.D.Royce 4872)	VU	VU	P	Flat. Well drained, grey sandy loam.	Jul-Nov
Diuris micrantha	VU	VU	PG	Dark grey-black sandy clay-loam in winter wet depressions or swamps. Often in shallow standing water.	Aug/Sep- early Oct
Gastrolobium sp. Yoongarillup (S.Dilkes s.n. 1/9/1969)	P1	-	P	Unknown.	Unknown
Synaphea odocoileops	P1	-	P	Brown orange loam and sandy clay, granite, in swamps and winter wet areas.	Aug-Oct
Stylidium acuminatum subsp. *acuminatum*	P2	-	P	Brown lateritic loam soils on slopes.	Nov-Jan
Acacia oncinophylla subsp. *oncinophylla*	P3	-	P	Granitic soils	Aug-Oct
Lomandra whicherensis	P3	-	P	Sand and sandy loam with lateritic gravel on slopes and ridges.	Dec
Synaphea polypodioides	P3	-	P	Light brown loam, red-brown sandy loam, gravelly, brown sandy clay over laterite in undulating areas.	Sep-Nov
Acacia semitrullata	P4	-	P	White/grey sand, sometimes over laterite, clay sometimes in sandplains, swampy areas.	May-Oct
Aponogeton hexatepalus	P4	-	P	Mud. Freshwater: ponds, rivers, claypans.	Jul-Oct
Chamelaucium erythrochlorum	P4	-	P	Clay, loam and sandy soils in creeklines, slopes and ridges	Nov-Feb
Cyanothamnus tenuis	P4	-	P	Laterite, stony soils, granite.	Aug-Nov
Senecio leucoglossus	P4	-	A	Gravelly lateritic or granitic soils on outcrops or slopes.	Aug-Dec

CR=critically endangered, EN=endangered, VU=vulnerable, P1-P4=Priority 1-Priority 4, A=annual, P=perennial, PG=perennial geophyte.

4.2.2 Species inventory

A total of 48 native and 39 non-native (weed) species were recorded within the site during the field survey, representing 44 families and 75 genera. The dominant families containing native taxa were Fabaceae (nine native taxa and two weed taxa) and Myrtaceae (six native taxa). The most common genus was *Acacia* with five taxa. The families containing the most taxa were Fabaceae and Poaceae (three native and six non-native species). A complete species list is provided in **Appendix C.**

4.2.3 Threatened and priority flora

No threatened or priority flora species were recorded within the site.

The majority of the threatened and priority flora species identified in the desktop assessment are not considered to occur in the site due to lack of suitable habitat and/or because they were not recorded during the field survey.

The survey was unable to confirm the presence or absence of the following two threatened and eight priority flora species:

- *Caladenia procera* (critically endangered under the EPBC Act and threatened under the BC Act)
- *Caladenia hoffmanii* (endangered under the EPBC Act and threatened under the BC Act)
- *Gastrolobium sp.* Yoongarillup (S. Dilkes s.n. 1/9/1969) (P1)
- *Stylidium acuminatum* subsp. *acuminatum* (P2)
- *Lomandra whicherensis* (P3)
- *Synaphea polypodioides* (P3)
- *Acacia semitrullata* (P4)
- *Chamelaucium erythrochlorum* (P4)
- *Cyanothamnus tenuis* (P4)
- *Senecio leucoglossus* (P4)

An assessment on the likelihood of occurrence of conservation significant species is provided in **Appendix B**.

4.2.4 Locally and regionally significant flora

No locally or regionally significant flora species were recorded within the site.

4.2.5 Declared pests

Two species listed as declared pests (C3) pursuant to the BAM Act, **Asparagus asparagoides* (bridal creeper) and **Gomphocarpus fruticosus* (narrow leaf cotton bush) were recorded within the site.

**Asparagus asparagoides* is also listed as a weed of national significance (WoNS).

4.3 Vegetation

4.3.1 Desktop assessment

The database search results identified 10 TECs and eight PECs occurring or potentially occurring within a 20 km radius of the site. Information on these communities is provided in **Appendix D**.

Based on geomorphology, soils and regional vegetation patterns, no TECs or PECs were considered to have potential to occur within the site.

4.3.2 Plant communities

Six plant communities were identified within the site. Plant community **CcEmBa** represents the most intact native plant community and is present within the central portion of the site. Plant community **Cc** occurs as disparate patches of vegetation across the site, where remnant *Corymbia calophylla* trees have been retained in the road reserve, with a mixture of native and non-native species in the understorey. Plant communities **Af**, **AfTl** and **CcAf** are the predominant plant communities in the eastern portion of the site, and are dominated by *Agonis flexuosa*. **Non-native** vegetation comprises a mixture of non-native grasses and herbs and occasional scattered native species. The remainder of the site comprises the cleared bitumen road surface.

A description and the area of each plant community is provided in **Table 6** and representative photographs of each are provided in **Plate 1** to **Plate 6**. The location of each plant community is shown in **Figure 4**.

Table 6: Description and extent of plant communities identified within the site

Plant community	Description	Area (ha)^
Af	Open forest of *Agonis flexuosa* over non-native grasses and herbs (**Plate 1**).	0.11
AfTl	Open forest of *Agonis flexuosa* over tall shrubland of *Taxandria linearifolia* over non-native grasses and herbs including **Eragrostis curvula* (**Plate 2**).	0.19
Cc	Open forest to woodland of *Corymbia calophylla* over scattered native shrubs including *Acacia urophylla*, *Hibbertia hypericoides*, *Leucopogon capitellatus and Pteridium esculentum a*nd non-native grasses and herbs including **Cynodon dactylon* and **Paspalum dilatatum* (**Plate 3**).	3.61
CcAf	Closed forest to woodland of *Corymbia calophylla* over *Agonis flexuosa* over non-native grasses and herbs (**Plate 4**).	0.94
CcEmBa	Closed forest of *Corymbia calophylla* and *Eucalyptus marginata* over shrubland of *Acacia urophylla*, *Bossiaea aquifolium*, *Hakea amplexicaulis*, *Hibbertia hypericoides*, *Persoonia longifolia* and *Rubus ?ulmifolius* over grassland of *Lepidosperma pubisquameum* (**Plate 5**).	0.52
Non-native	Heavily disturbed areas comprising weeds with occasional scattered native trees and shrubs and planted vegetation in addition to bare areas (**Plate 6**).	5.53

^remainder of the site supports bitumen road surface which comprises 3.36

*Plate 1: Plant community **Af** in 'degraded' condition*

*Plate 2: Plant community **AfTi** in 'degraded' condition*

*Plate 3: Plant community **Cc** in 'degraded' condition*

*Plate 4: Plant community **CcAf** in 'degraded' condition*

*Plate 5: Plant community **CcEmBa** in 'very good' condition*

Plate 6: Non-native vegetation in 'completely degraded' condition

4.3.3 Vegetation condition

The most intact native vegetation exists within the central portion of the site, represented by the **CcEmBa** plant community. This community was mapped as being in 'very good' condition as it retains the structure expected of a jarrah forest community and has high species diversity and low weed cover. Past disturbance of the vegetation was evident through the presence of some weed species and deposition of soil material.

Plant communities **Af**, **AfTl**, **Cc** and **CcAf** were mapped as being in 'degraded' condition as there was low diversity of native understorey species and high weed cover. Some areas of the **Cc** plant community contained reasonable native cover in parts but this vegetation was mapped as being in 'degraded' condition due to the degree of disturbance and alteration of the vegetation structure and low native species diversity.

The remaining areas of vegetation within the site were mapped as being in 'completely degraded' condition as they are dominated by non-native species such as pasture grasses, with scattered occasional native trees and shrubs. The road was mapped as 'not applicable'.

The extent of vegetation by condition category is detailed in **Table 7** and shown in **Figure 5**.

Table 7: Extent of vegetation condition categories within the site

Condition category (Keighery 1994)	Size (ha)
Pristine	0
Excellent	0
Very good	0.52
Good	0
Degraded	4.85
Completely degraded	5.53
N/A	3.36

4.3.4 Threatened and priority ecological communities

No TECs or PECs occur within the site.

4.3.5 Locally and regionally significant vegetation

Native trees within the site may provide habitat for threatened fauna including black cockatoos and western ringtail possum, along with other ecological services. In particular, mature *Corymbia calophylla* and *Eucalyptus marginata* trees may provide breeding, foraging and roosting habitat for black cockatoos breeding habitat for western ringtail possum. *Agonis flexuosa* trees within the site may provide foraging habitat for the western ringtail possum.

5 Discussion

5.1 Threatened and priority flora

No threatened or priority flora species were recorded within the site.

The absence of the majority larger perennial species such as *Acacia oncinophylla subsp. oncinophylla*, *Banksia squarrosa* subsp. *argillacea* and *Isopogon formosus* subsp. *dasylepis* was relatively easy to confirm.

Suitable habitat for seven perennial species was identified within the site including *Gastrolobium sp.* Yoongarillup (S. Dilkes s.n. 1/9/1969), *Stylidium acuminatum* subsp. *acuminatum*, *Lomandra whicherensis*, *Synaphea polypodioides*, *Acacia semitrullata* and *Chamelaucium erythrochlorum* and *Cyanothamnus tenuis*. As the survey was undertaken outside of the main flowering period and targeted searches were not undertaken the presence or absence of these species could not be confirmed.

Due to their size and seasonal lifeform, smaller annual or geophytic species such as *Caladenia procera, Caladenia hoffmanii* and *Senecio leucoglossus* can be more difficult to detect. The current reconnaissance survey was not undertaken in the main flowering season for these species and thus, if present, they would not have been visible at the time of the survey. The **CcEmBa** plant community retains a relatively intact understorey layer of native species and low to moderate weed cover. This vegetation provides suitable habitat for the above three species. Further survey in the main flowering period of these species would be required to confirm their presence or absence within the site.

5.2 Vegetation condition

Assigning condition using a categorical scale is always most difficult when vegetation qualities are close to the boundary between two categories. Categorical schemes may also invariably yield different results when applied by different assessors, because of differences in skill levels or personal bias. Classification of vegetation within the site was straightforward as the vegetation clearly met the criteria outlined in the Keighery (1994) scale.

6 Conclusions

The majority of the site is highly disturbed and modified, with approximately 8.89 ha containing non-native vegetation in 'completely degraded' condition or cleared areas such as roads. The remaining 5.37 ha of the site contains native vegetation that is present in 'degraded' or 'very good' condition.

No threatened or priority flora species were recorded during the survey. The presence or absence of two threatened and eight priority species could not be confirmed:

- *Caladenia procera* (critically endangered under the EPBC Act and threatened under the BC Act)
- *Caladenia hoffmanii* (endangered under the EPBC Act and threatened under the BC Act)
- *Gastrolobium sp.* Yoongarillup (S. Dilkes s.n. 1/9/1969) (P1)
- *Stylidium acuminatum* subsp. *acuminatum* (P2)
- *Lomandra whicherensis* (P3)
- *Synaphea polypodioides* (P3)
- *Acacia semitrullata* (P4)
- *Chamelaucium erythrochlorum* (P4)
- *Cyanothamnus tenuis* (P4)
- *Senecio leucoglossus* (P4).

Further survey in spring within the **CcEmBa** vegetation would be required would be required to confirm the presence or absence of these species within the site.

No threatened or priority ecological communities were present within the site.

Vegetation within the site may provide habitat for conservation significant fauna, particularly black cockatoo species and the western ringtail possum.

7 References

7.1 General references

Alan Tingay and Associates 1998, *A Strategic Plan for Perth's Greenways - Final Report*. December 1998.

Beard, J. S. 1990, *Plant Life of Western Australia*, Kangaroo Press Pty Ltd., Kenthurst, N.S.W.

Bureau of Meteorology (BoM) 2022, *Climate Data Online*, <http://www.bom.gov.au/climate/data/>.

Churchward, H. M. and McArthur, W. M. 1980, *'Landforms and Soils of the Darling System, Western Australia'*, in Department of Conservation and Environment (ed.), *Atlas of Natural Resources Darling System Western Australia*, Department of Conservation and Environment.

Clarke, K. R. and Gorley, R. N. 2006, *PRIMER v6: User Manual/Tutorial*, PRIMER-E, Plymouth.

Department of Agriculture, Water and the Environment (DAWE) 2021a, *Threatened Ecological Communities*, <https://www.awe.gov.au/environment/biodiversity/threatened/communities>.

Department of Agriculture, Water and the Environment (DAWE) 2021b, *Weeds of National Significance (WoNS)*, Centre for Invasive Species Solutions (CISS), <https://weeds.org.au/weeds-profiles/>.

Department of Agriculture, Water and the Environment (DAWE) 2022, *Protected Matters Search Tool*, <https://pmst.awe.gov.au/#>.

Department of Biodiversity, Conservation and Attractions (DBCA) 2017a, *DBCA - Legislated Lands and Waters (DBCA-011)*.

Department of Biodiversity, Conservation and Attractions (DBCA) 2017b, *Lands of Interest (DBCA-012)*.

Department of Biodiversity, Conservation and Attractions (DBCA) 2017c, *Ramsar Sites (DBCA-010)*.

Department of Biodiversity, Conservation and Attractions (DBCA) 2018, *Directory of Important Wetlands in Australia - Western Australia (DBCA-045)*.

Department of Biodiversity Conservation and Attractions (DBCA) 2019, *Vegetation Complexes - South West forest region of Western Australia (DBCA-047)*, Kensington.

Department of Biodiversity Conservation and Attractions (DBCA) 2020, *Priority Ecological Communities for Western Australia Version 30*.

Department of Biodiversity, Conservation and Attractions (DBCA) 2021a, *Geomorphic Wetlands, Swan Coastal Plain (DBCA-019)*, <https://catalogue.data.wa.gov.au/dataset/geomorphic-wetlands-swan-coastal-plain>.

Department of Biodiversity, Conservation and Attractions (DBCA) 2021b, *Legislated Lands and Waters (DBCA-011)*.

Department of Biodiversity, Conservation and Attractions (DBCA) 2022, *NatureMap*, <https://naturemap.dbca.wa.gov.au/>.

Department of Environment and Conservation (DEC) 2002, *A Biodiversity Audit of Western Australia's 53 Biogeographic Subregions in 2002*, Perth.

Department of the Environment and Energy (DoEE) 2016, *Banksia Woodlands of the Swan Coastal Plain in Community and Species Profile and Threats Database*, Canberra.

Department of Primary Industries and Regional Development (DPIRD) 2019, *Soil Landscape Mapping - Best Available (DPIRD-027)*, <https://catalogue.data.wa.gov.au/dataset/soil-landscape-mapping-best-available>.

Department of Primary Industries and Regional Development (DPIRD) 2020, *Contours 2 m and 10 m (DPIRD-072)*, Perth.

Department of Water and Environmental Regulation (DWER) 2018, *Hydrography Linear (Heirarchy) (DWER-031)*, Perth.

Environment Australia 2000, *Revision of the Interim Biogeographic Regionalisation for Australia (IBRA) and Development of Version 5.1 - Summary Report*, Department of Environment and Heritage.

Environmental Protection Authority (EPA) 2016, *Technical Guidance - Flora and Vegetation Surveys for Environmental Impact Assessment* Perth.

Gibson, N., Keighery, B., Keighery, G., Burbidge, A. and Lyons, M. 1994, *A Floristic survey of the southern Swan Coastal Plain*, Department of Conservation and Land Management and the Conservation Council of Western Australia, Perth.

Gotelli, N. J. and Colwell, R. K. 2011, *Estimating species richness*, Oxford University Press, Oxford.

Government of WA 2000, *Bush Forever, Volume 2: Bush Forever Site Descriptions*, Perth.

Government of Western Australia 2019, *2018 South West Vegetation Complex Statistics. Current as of March 2019*, WA Department of Biodiversity, Conservation and Attractions, Perth.

Gozzard, J. 2011, *Sea to scarp - geology, landscape, and land use planning in the southern Swan Coastal Plain*, Geological Survey of Western Australia.

Gozzard, J. R. 2007, *Geology and Landforms of the Perth Region*, Geological Survey of Western Australia, Perth.

Heddle, E. M., Loneragan, O. W. and Havel, J. J. 1980, *'Vegetation Complexes of the Darling System Western Australia'*, in Department of Conservation and Environment (ed.), *Atlas of Natural Resources Darling System Western Australia*, Perth.

Hill, A. L., Semeniuk, C. A., Semeniuk, V. and Del Marco, A. 1996, *Wetlands of the Swan Coastal Plain: Volume 2A - Wetland Mapping, Classification and Evaluation*, Water and Rivers Commission and the Department of Environmental Protection, Perth.

Keighery, B. 1994, *Bushland Plant Survey: A guide to plant community survey for the community*, Wildflower Society of WA (Inc), Nedlands.

Keighery, B. J., Keighery, G. J., Longman, V. M. and Clarke, K. A. 2012, *Weed and Native Flora Data for the Swan Coastal Plain*, Departments of Environmental Protection and Conservation and Land Management, Western Australia.

Molloy, S., Wood, J., Hall, S., Wallrodt, S. and Whisson, G. 2009, *South West Regional Ecological Linkages Technical Report*, Western Australian Local Government Association and Department of Environment and Conservation, Perth.

NVIS Technical Working Group 2017, *Australian Vegetation Attribute Manual: National Vegetation Information System*, Department of the Environment and Energy, Canberra.

Tille, P. J., Wilson, G. and National Landcare Program (Australia) 1996, *Wellington-Blackwood land resources survey*, Department of Primary Industries and Regional Development, Perth.

Western Australian Local Government Association and Perth Biodiversity Project (WALGA and PBP) 2004, *Local Government Biodiversity Planning Guidelines for the Perth Metropolitan Region*, Perth.

Western Australian Land Information Authority (WALIA) 2022, *Landgate Map Viewer*, <https://map-viewer-plus.app.landgate.wa.gov.au/index.html>.

Western Australian Herbarium 2022, *Florabase*, Department of Biodiversity, Conservation and Attractions (DBCA), <https://florabase.dpaw.wa.gov.au/>.

Wetlands Advisory Committee 1977, *The status of reserves in System Six*, Environmental Protection Authority, Perth.

7.2 Online references

The online resources that have been utilised in the preparation of this report are referenced in **Section 7.1**, with access date information provided in **Table R 1**.

Table R 1 Access dates for online references

Reference	Date accessed	Website or dataset name
BoM (2022)	30 May 2022	Climate Data Online
DAWE (2021a)	30 May 2022	Threatened Ecological Communities
DAWE (2021b)	30 May 2022	Weeds of National Significance (WoNS)
DAWE (2022)	30 May 2022	Protected Matters Search Tool
DBCA (2022)	19 May 2022	NatureMap
WALIA (2022)	30 May 2022	Landgate Map Viewer
Western Australian Herbarium (2022)	30 May 2022	Florabase

This page has been left blank intentionally.

Figures

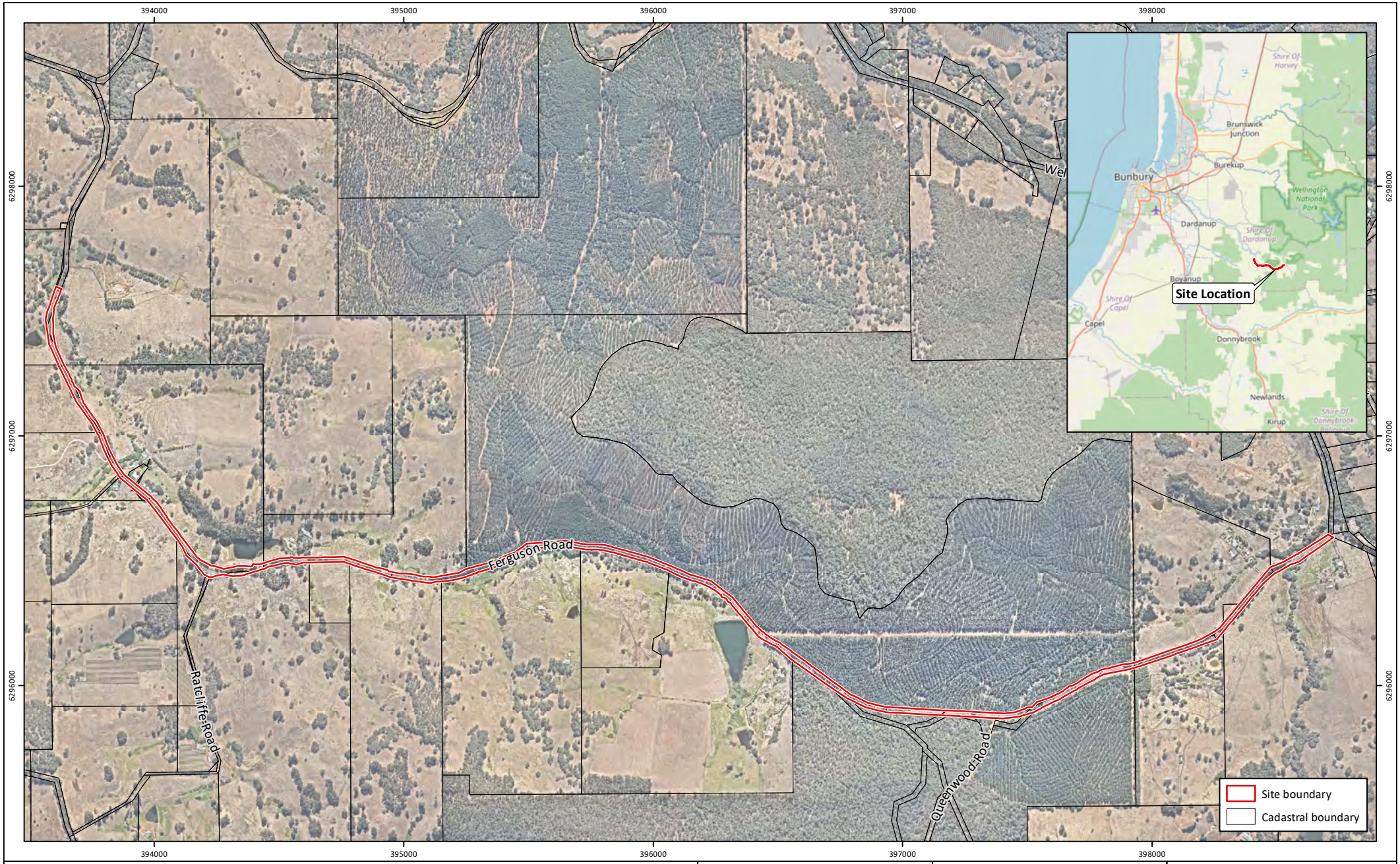

Figure 1: Site Location

Project:	Reconnaissance Flora and Vegetation Assessment Part Ferguson Road, Ferguson
Client:	Shire of Dardanup

Plan Number:
EP22-044(01)--F11a

Drawn:	SCM
Date:	03/04/2023
Checked:	SCM
Approved:	TAA
Date:	03/04/2023

N

0 400 800
Metres

Scale: 1:20,000@A4

GDA 1994 MGA Zone 50

emerge ASSOCIATES

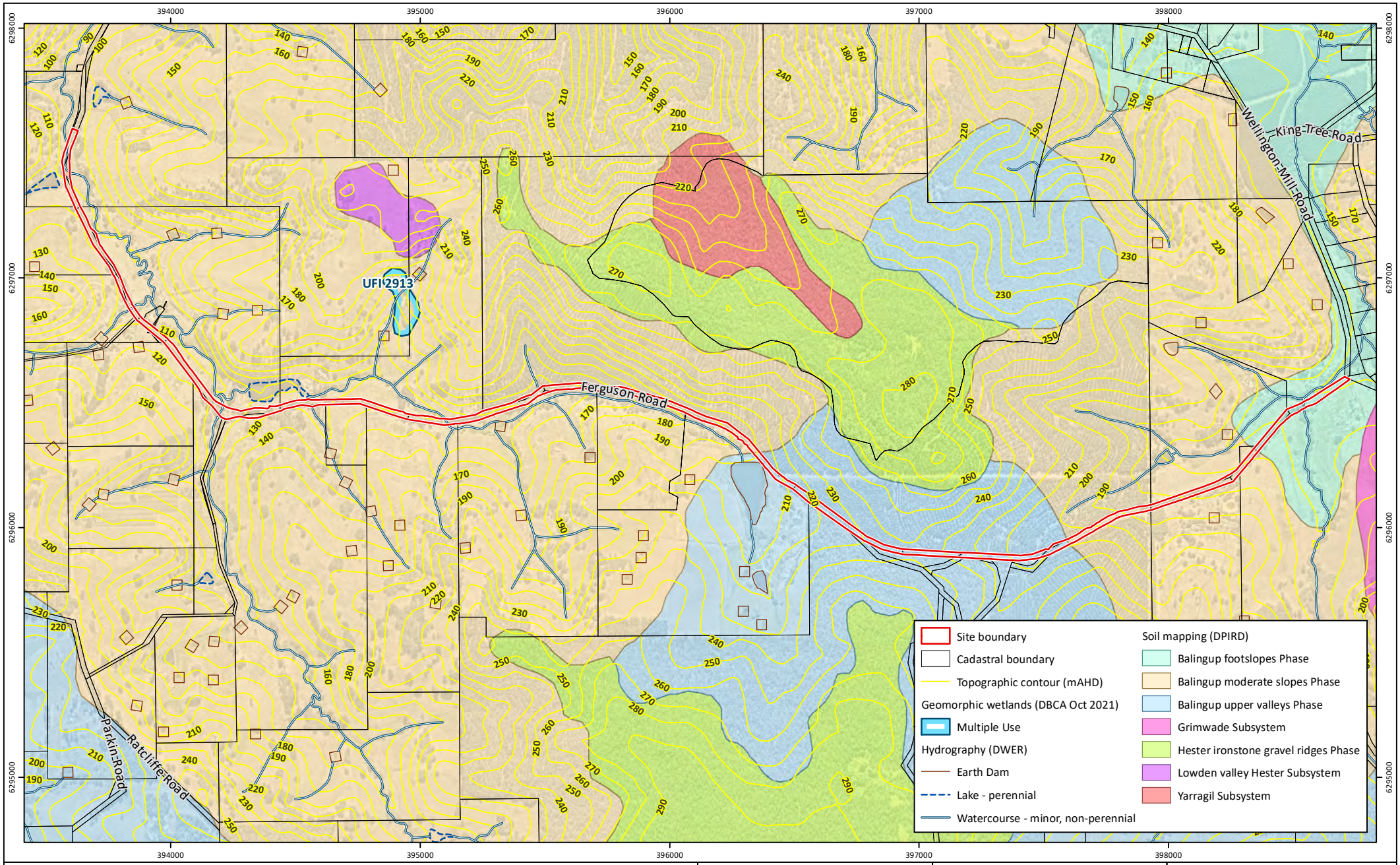

Figure 2: Hydrography, Soils and Topography

Project:	Reconnaissance Flora and Vegetation Assessment Part Ferguson Road, Ferguson
Client:	Shire of Dardanup

Plan Number:
EP22-044(01)--F12a

Drawn:	SCM
Date:	03/04/2023
Checked:	SCM
Approved:	TAA
Date:	03/04/2023

N

0 400 800
Metres
Scale: 1:20,000@A4
GDA 1994 MGA Zone 50

emerge ASSOCIATES

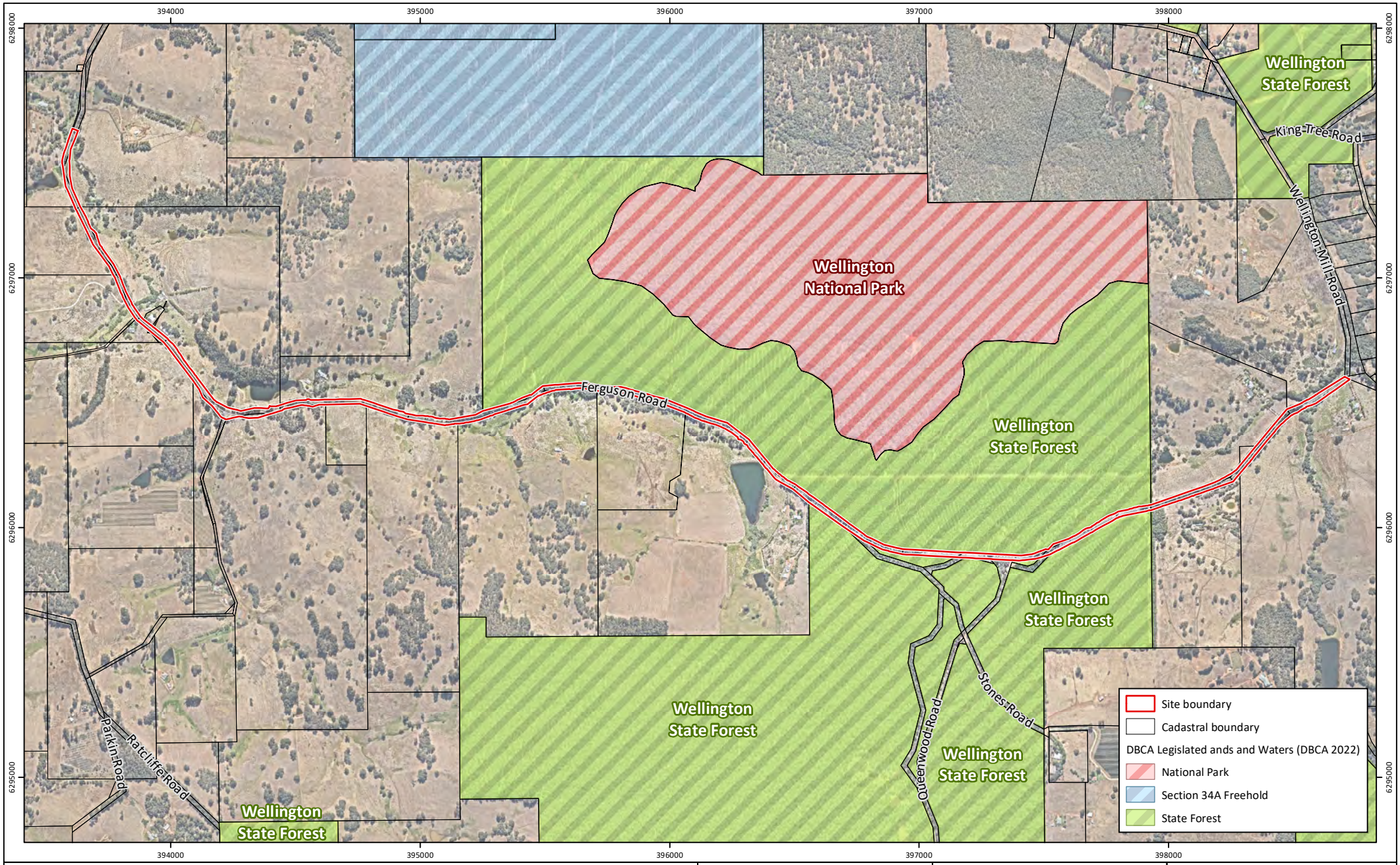

Figure 3: Environmental Features

Project: Reconnaissance Flora and Vegetation Assessment
Part Ferguson Road, Ferguson
Client: Shire of Dardanup

Plan Number:
EP22-044(01)--F13a

Drawn:	SCM
Date:	03/04/2023
Checked:	SCM
Approved:	TAA
Date:	03/04/2023

N

0 400 800
Metres
Scale: 1:20,000@A4
GDA 1994 MGA Zone 50

emerge ASSOCIATES

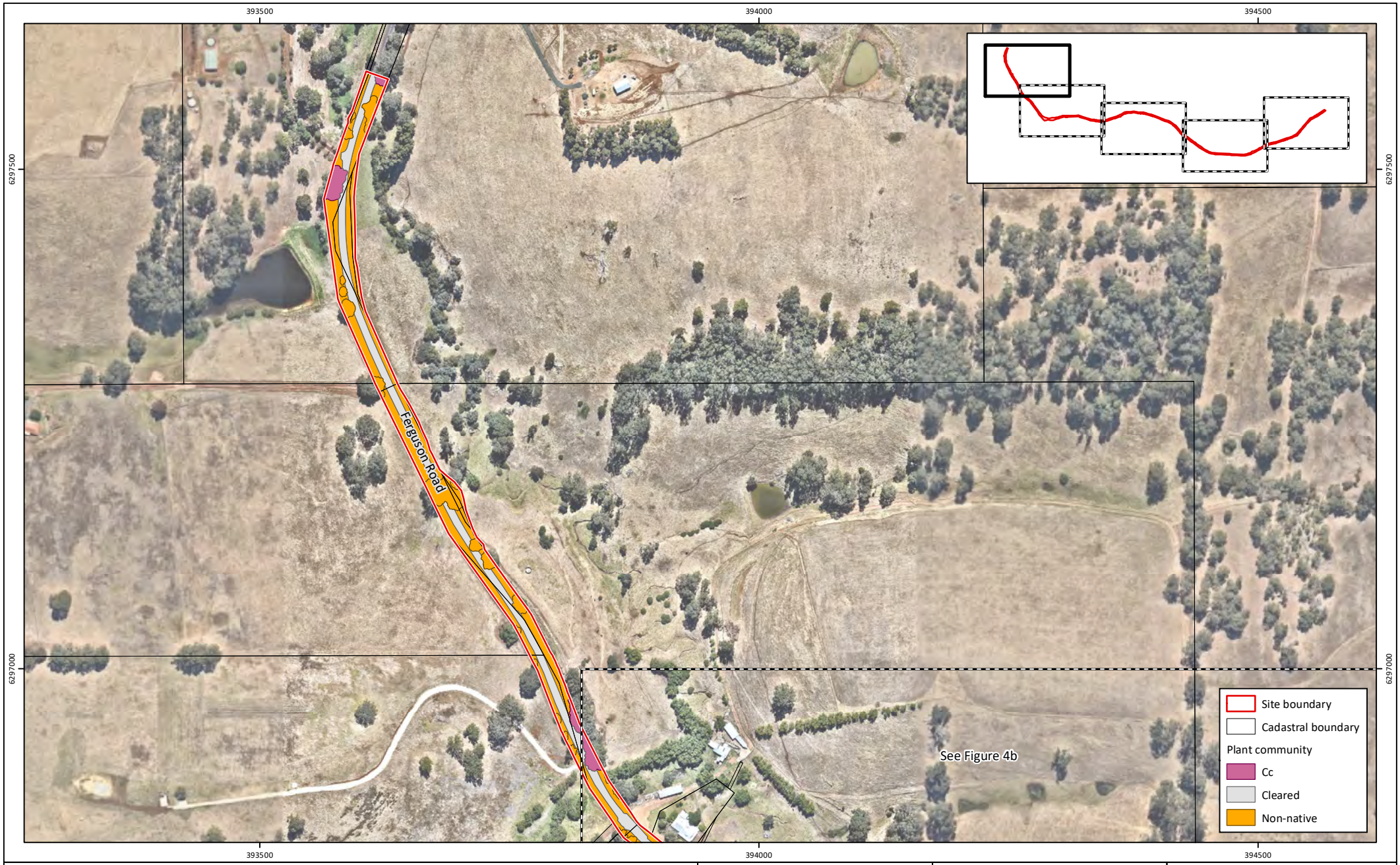

Figure 4a: Plant Communities

Project:	Reconnaissance Flora and Vegetation Assessment Part Ferguson Road, Ferguson
Client:	Shire of Dardanup

Plan Number:
EP22-044(01)--F14a

Drawn:	SCM
Date:	03/04/2023
Checked:	SCM
Approved:	TAA
Date:	03/04/2023

N

0 50 100 150
Metres

Scale: 1:5,000@A4

GDA 1994 MGA Zone 50

emerge ASSOCIATES

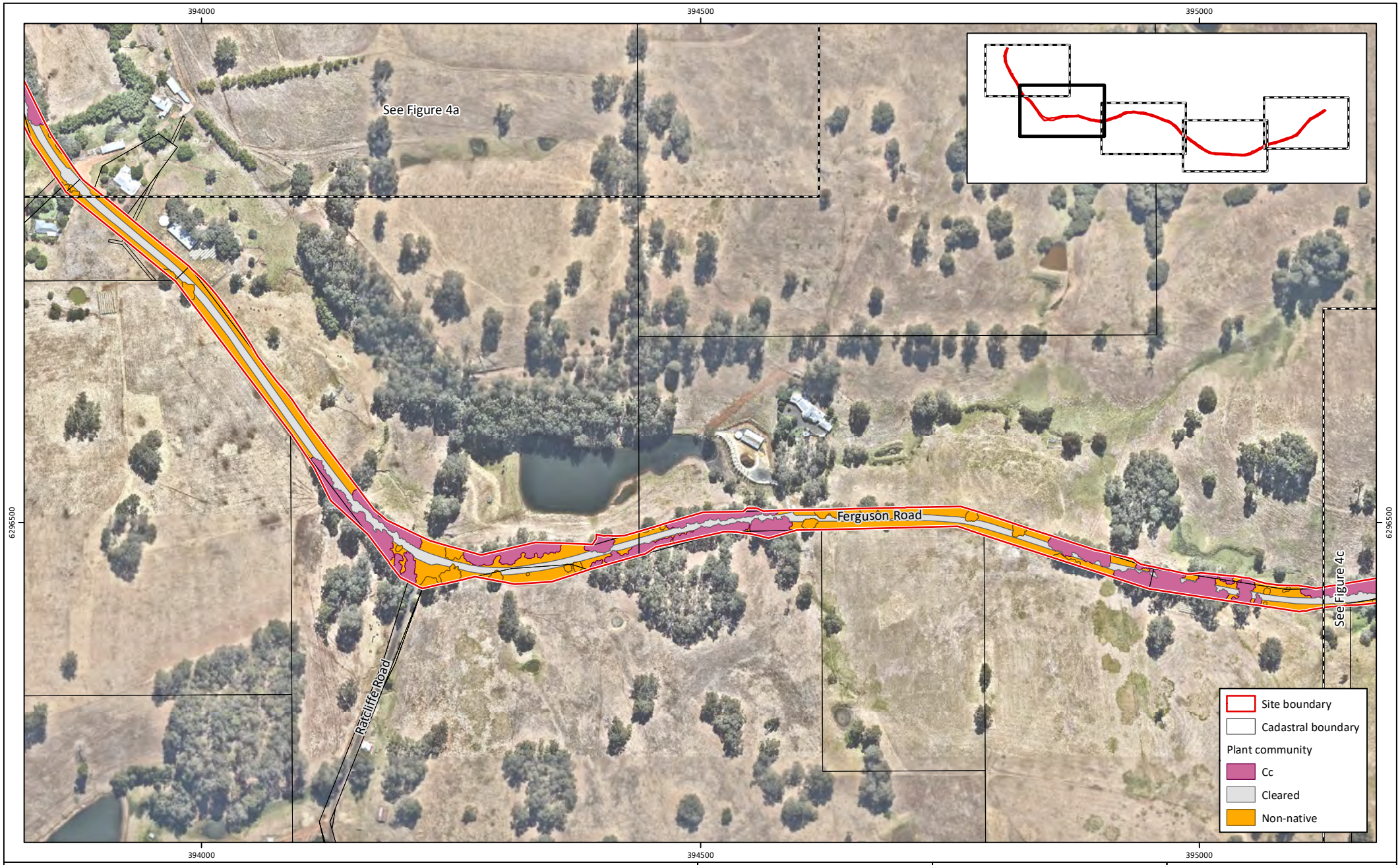

Figure 4b: Plant Communities

Project: Reconnaissance Flora and Vegetation Assessment
Part Ferguson Road, Ferguson
Client: Shire of Dardanup

Plan Number:
EP22-044(01)--F14a
Drawn: SCM
Date: 03/04/2023
Checked: SCM
Approved: TAA
Date: 03/04/2023

N

0 50 100 150
Metres
Scale: 1:5,000@A4
GDA 1994 MGA Zone 50

emerge ASSOCIATES

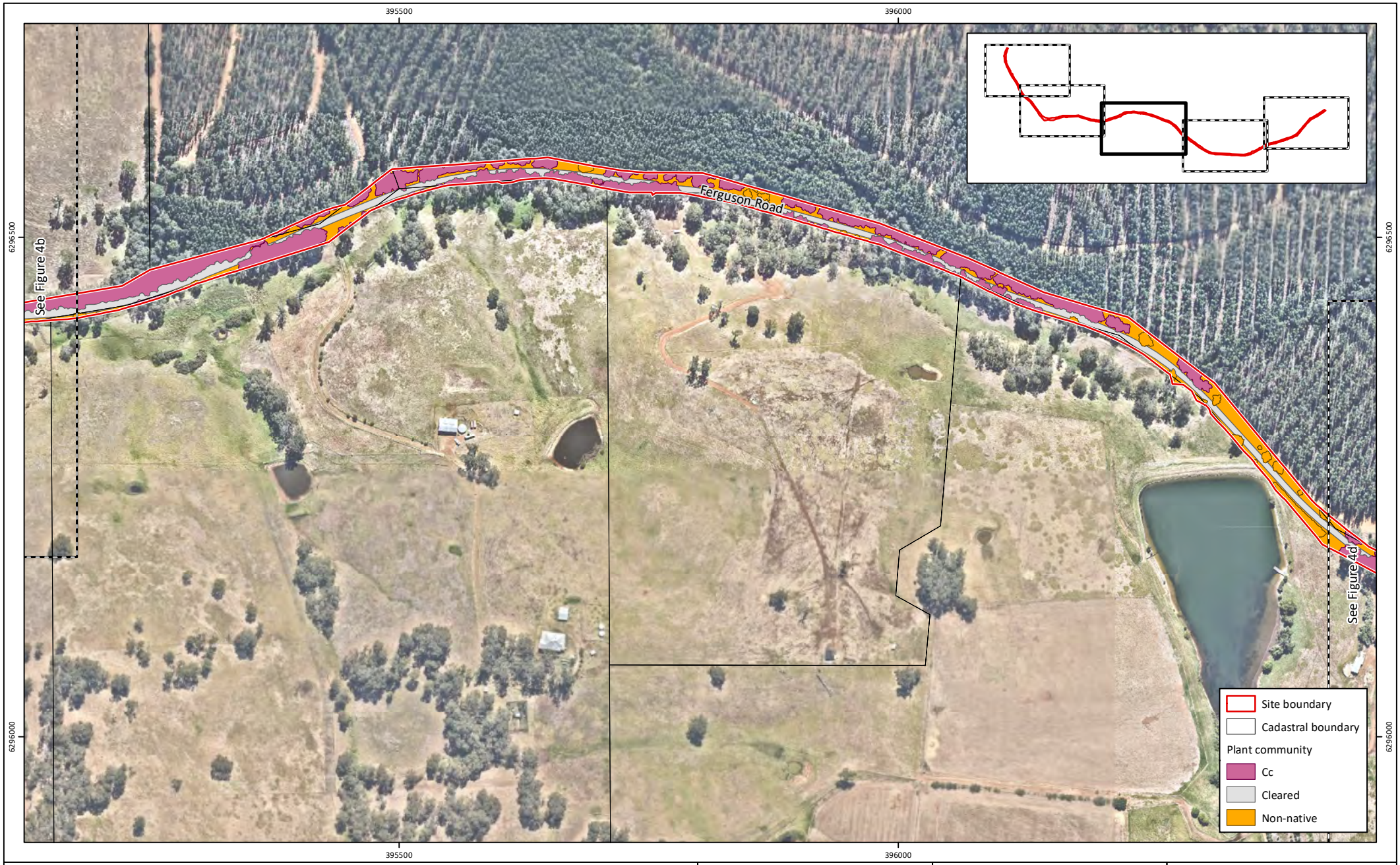

Figure 4c: Plant Communities

Project:	Reconnaissance Flora and Vegetation Assessment Part Ferguson Road, Ferguson
Client:	Shire of Dardanup

Plan Number:
EP22-044(01)--F14a

Drawn:	SCM
Date:	03/04/2023
Checked:	SCM
Approved:	TAA
Date:	03/04/2023

N

0 50 100 150
Metres

Scale: 1:5,000@A4

GDA 1994 MGA Zone 50

emerge ASSOCIATES

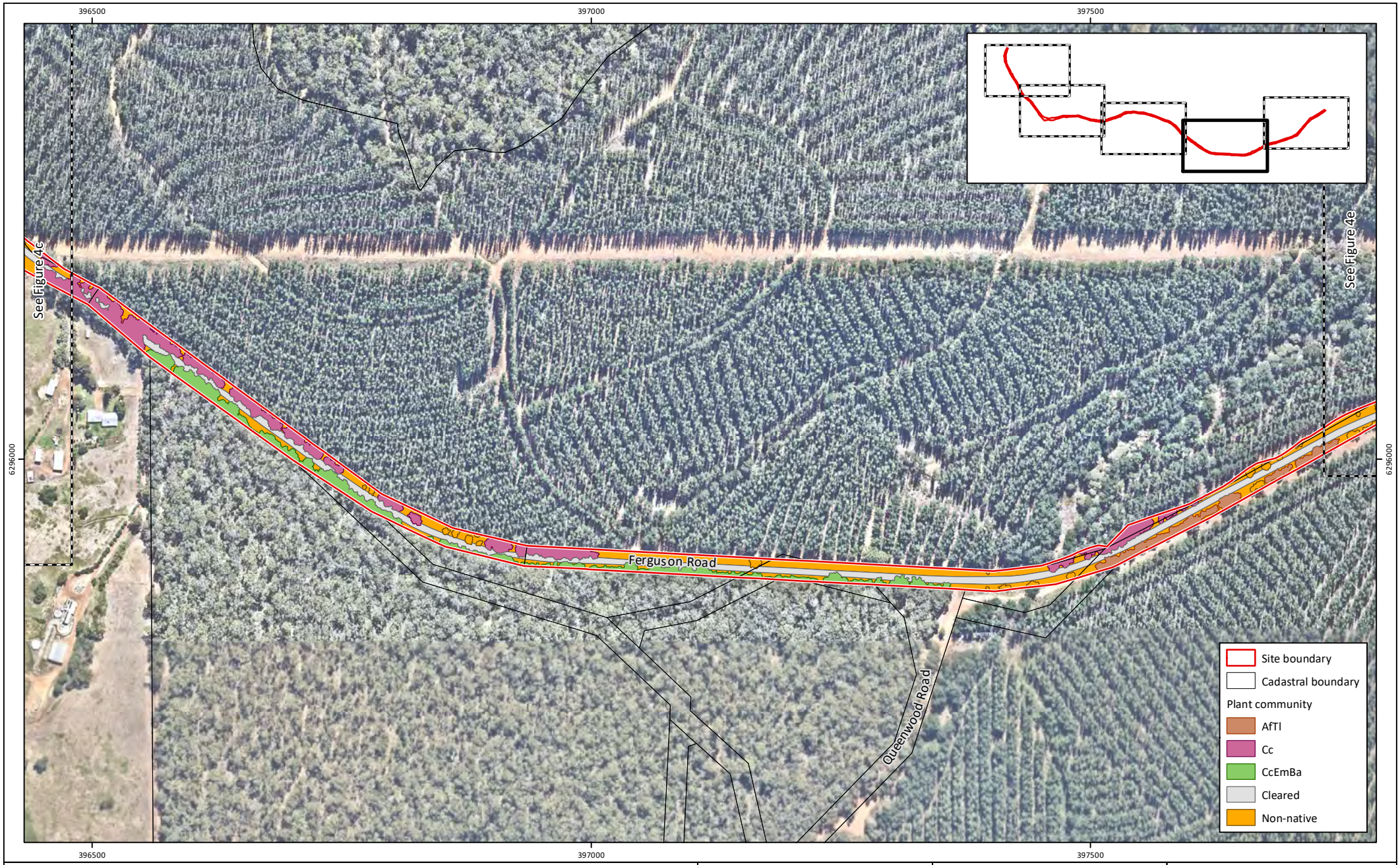

Figure 4d: Plant Communities

Project: Reconnaissance Flora and Vegetation Assessment
Part Ferguson Road, Ferguson
Client: Shire of Dardanup

Plan Number:
EP22-044(01)--F14a
Drawn: SCM
Date: 03/04/2023
Checked: SCM
Approved: TAA
Date: 03/04/2023

N

0 50 100 150
Metres
Scale: 1:5,000@A4
GDA 1994 MGA Zone 50

emerge ASSOCIATES

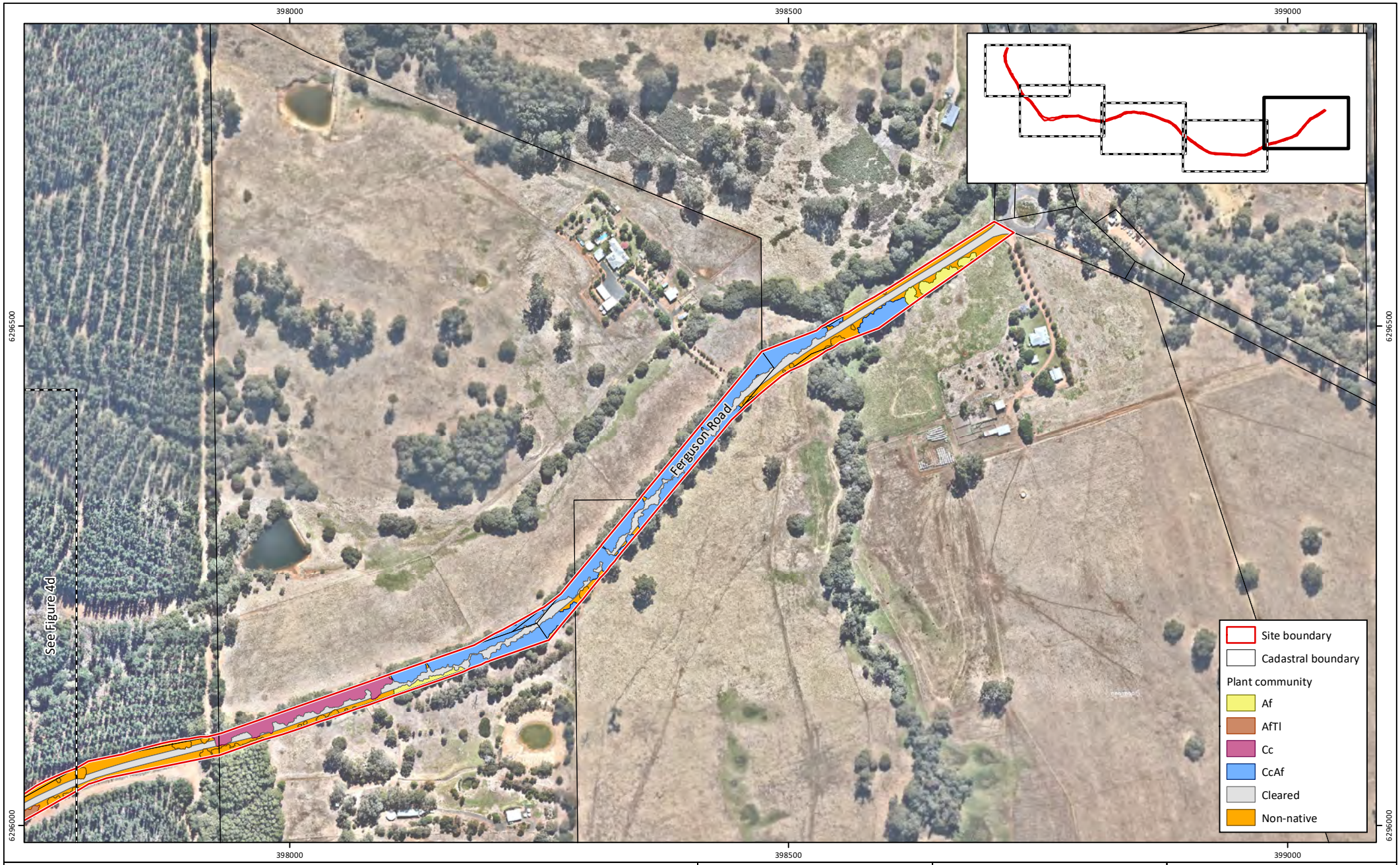

Figure 4e: Plant Communities

Project: Reconnaissance Flora and Vegetation Assessment
Part Ferguson Road, Ferguson
Client: Shire of Dardanup

Plan Number:
EP22-044(01)--F14a

Drawn:	SCM
Date:	03/04/2023
Checked:	SCM
Approved:	TAA
Date:	03/04/2023

N

0 50 100 150
Metres

Scale: 1:5,000@A4

GDA 1994 MGA Zone 50

emerge ASSOCIATES

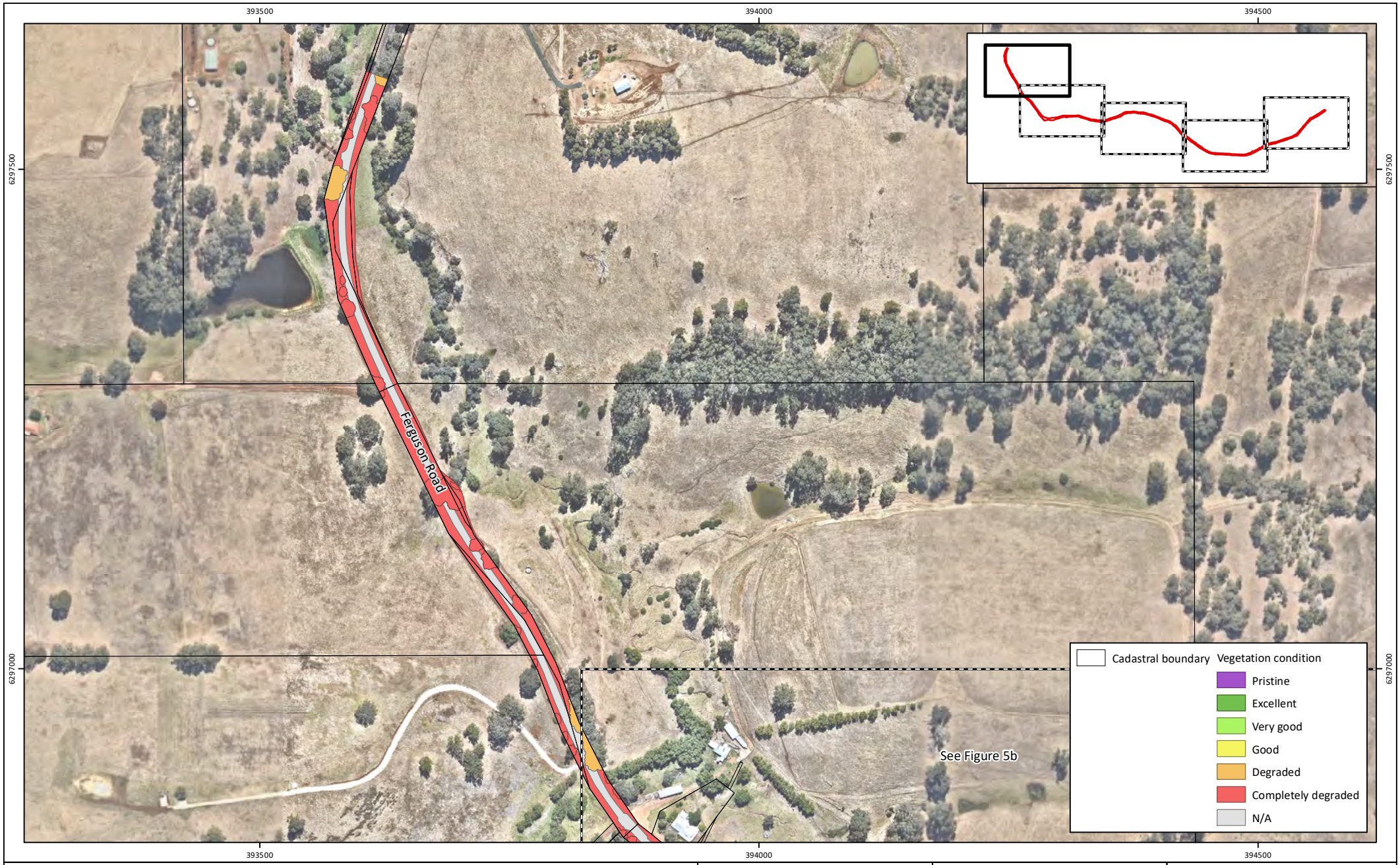

Figure 5a: Vegetation Condition

Project: Reconnaissance Flora and Vegetation Assessment
Part Ferguson Road, Ferguson
Client: Shire of Dardanup

Plan Number:
EP22-044(01)--F15a
Drawn: SCM
Date: 03/04/2023
Checked: SCM
Approved: TAA
Date: 03/04/2023

N

0 50 100 150
Metres
Scale: 1:5,000@A4
GDA 1994 MGA Zone 50

emerge ASSOCIATES

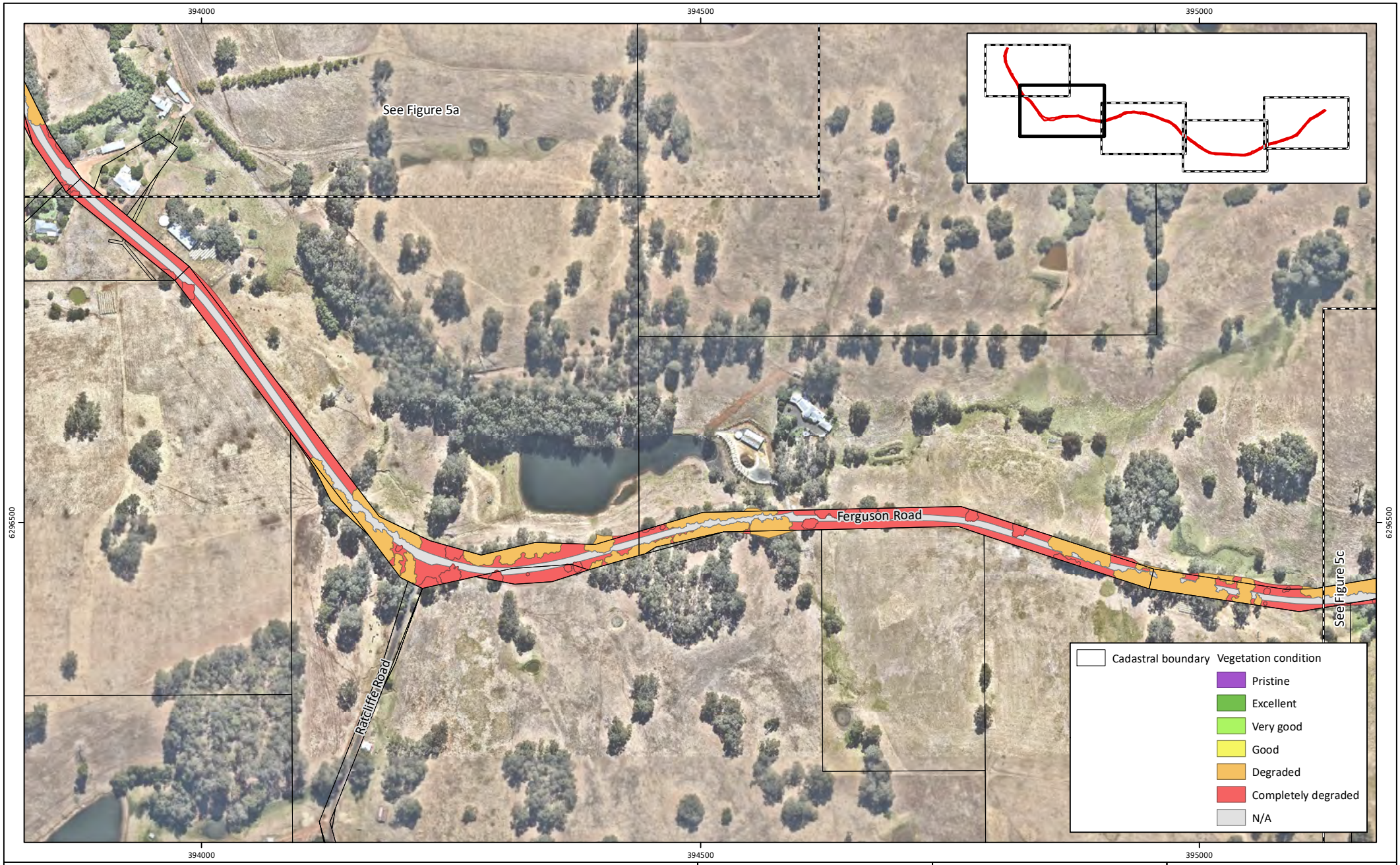

Figure 5b: Vegetation Condition

Project: Reconnaissance Flora and Vegetation Assessment
Part Ferguson Road, Ferguson
Client: Shire of Dardanup

Plan Number:
EP22-044(01)--F15a
Drawn: SCM
Date: 03/04/2023
Checked: SCM
Approved: TAA
Date: 03/04/2023

N

0 50 100 150
Metres
Scale: 1:5,000@A4
GDA 1994 MGA Zone 50

emerge ASSOCIATES

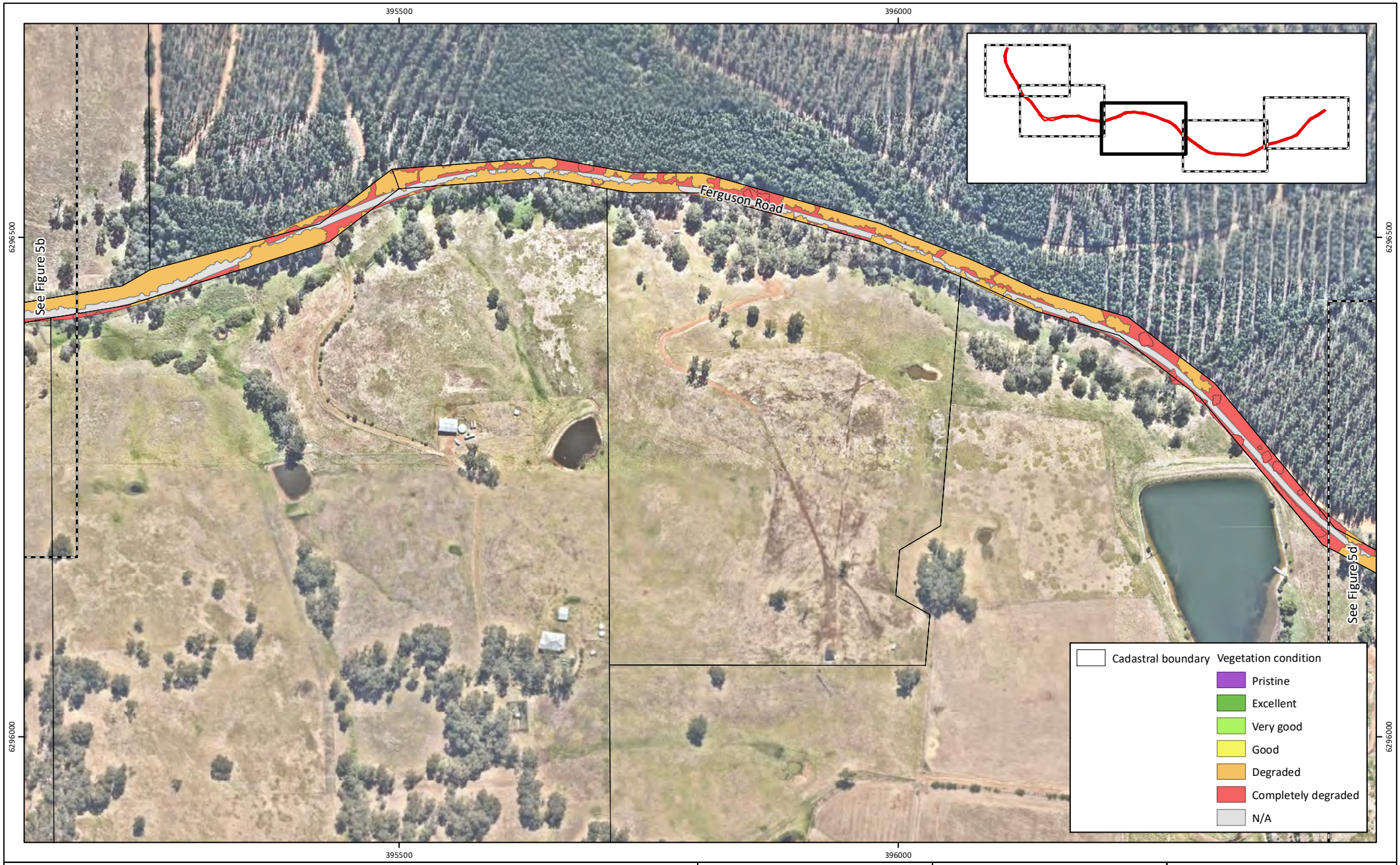

Figure 5c: Vegetation Condition

Project: Reconnaissance Flora and Vegetation Assessment
Part Ferguson Road, Ferguson

Client: Shire of Dardanup

Plan Number:
EP22-044(01)--F15a

Drawn:	SCM
Date:	03/04/2023
Checked:	SCM
Approved:	TAA
Date:	03/04/2023

N

0 50 100 150
Metres

Scale: 1:5,000@A4

GDA 1994 MGA Zone 50

emerge ASSOCIATES

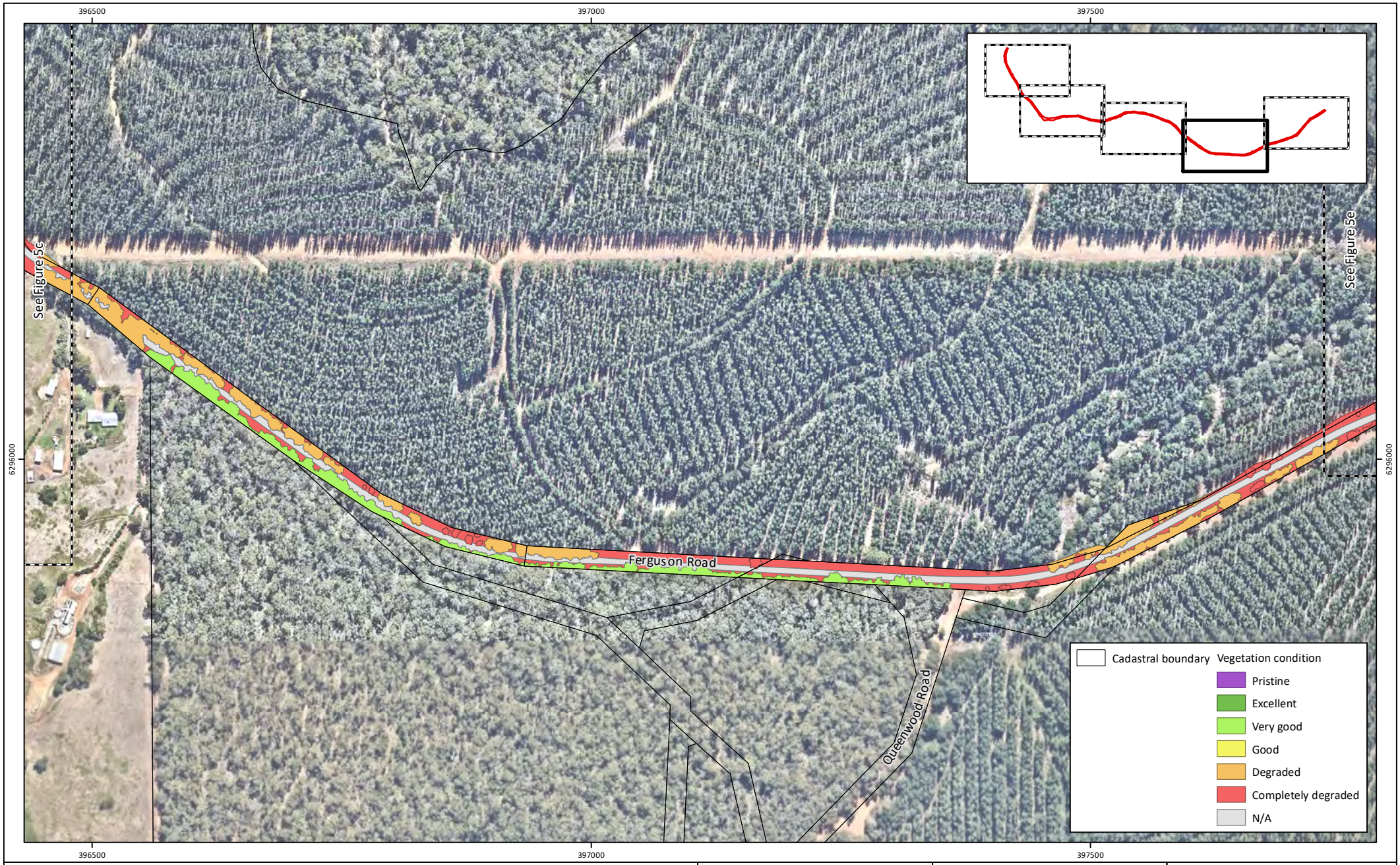

Figure 5d: Vegetation Condition

Project: Reconnaissance Flora and Vegetation Assessment
Part Ferguson Road, Ferguson
Client: Shire of Dardanup

Plan Number:
EP22-044(01)--F15a

Drawn:	SCM
Date:	03/04/2023
Checked:	SCM
Approved:	TAA
Date:	03/04/2023

N

0 50 100 150
Metres
Scale: 1:5,000@A4
GDA 1994 MGA Zone 50

emerge ASSOCIATES

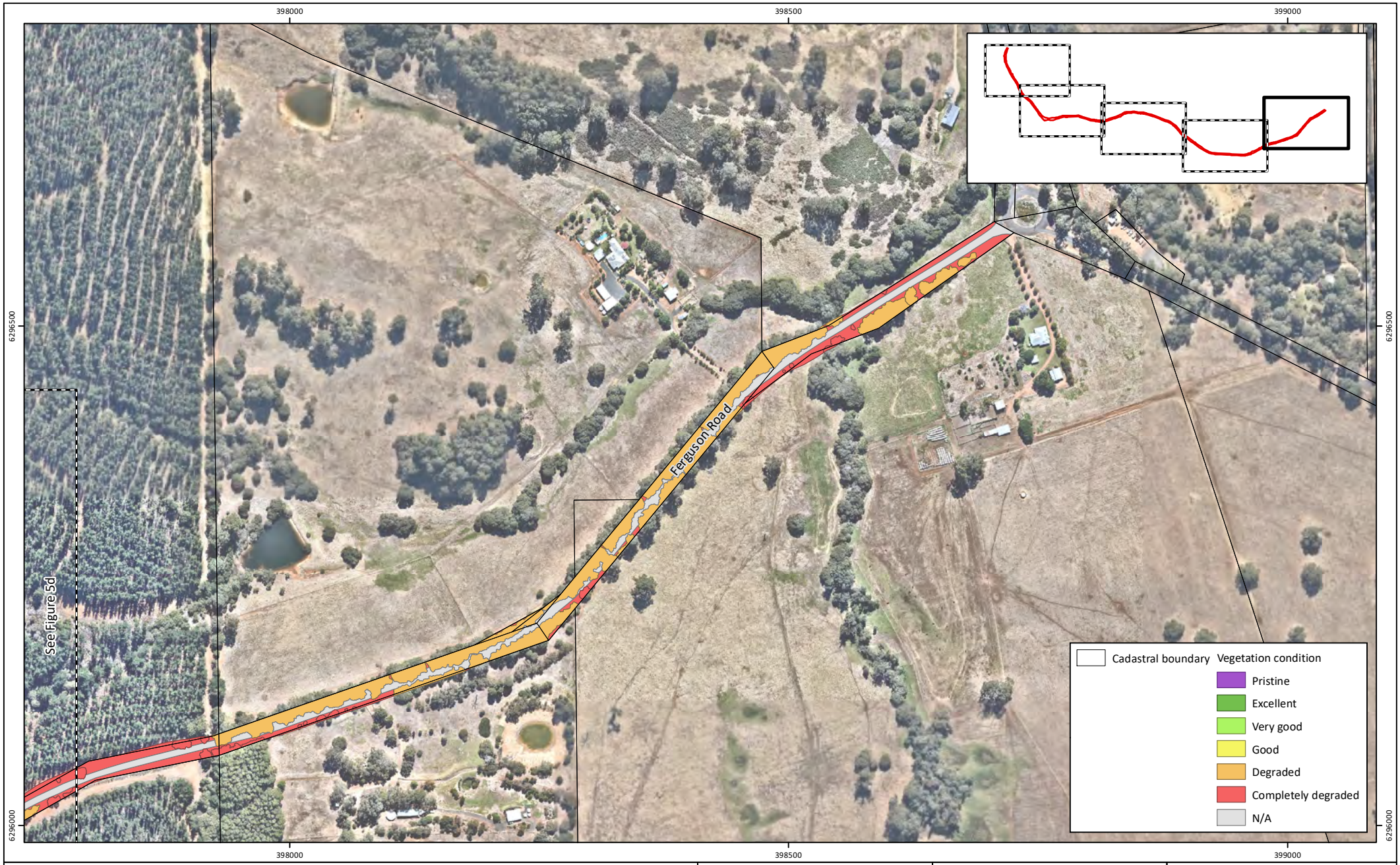

Figure 5e: Vegetation Condition

Project: Reconnaissance Flora and Vegetation Assessment
Part Ferguson Road, Ferguson
Client: Shire of Dardanup

Plan Number:
EP22-044(01)--F15a
Drawn: SCM
Date: 03/04/2023
Checked: SCM
Approved: TAA
Date: 03/04/2023

N

0 50 100 150
Metres
Scale: 1:5,000@A4
GDA 1994 MGA Zone 50

emerge ASSOCIATES

Appendix A

Additional Information

Conservation Significant Flora and Vegetation

Threatened and priority flora

Flora species considered rare or under threat warrant special protection under Commonwealth and/or State legislation. At the Commonwealth level, flora species can be listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Flora species considered 'threatened' pursuant to Schedule 1 of the EPBC Act are assigned categories according to their conservation status, as outlined in **Table 1**.

In Western Australia, plant taxa may be classed as 'threatened' under the *Biodiversity Conservation Act 2016* (BC Act) which is enforced by Department of Biodiversity Conservation and Attractions (DBCA). Threatened flora species are listed under sections 19(1) and 26(2) of the BC Act. It is an offence to 'take' or disturb threatened flora without Ministerial approval. Section 5(1)1 of the Act defines to take as including "… to gather, pluck, cut, pull up, destroy, dig up, remove, harvest or damage flora by any means" or to cause or permit the same to be done. The definition of threatened flora under the BC Act is provided in **Table 1**.

Section 43 of the BC Act requires that an occurrence of a threatened species or threatened ecological community is reported to DBCA where the occurrence has been identified as part of field work completed:

- as part of an assessment under Part IV of the *Environmental Protection Act 1986*; or
- in relation to an application for a clearing permit under the *Environmental Protection Act 1986* section 51E(1)(d).

Penalties apply to individuals and organisations that fail to provide accurate reports of threatened species or communities.

The *Biodiversity Conservation Regulations 2018* (BC Regulations 2018) came into effect on January 1 2019. The BC Regulations include provisions for licencing, charges, penalties and other provisions associated with the BC Act.

Flora species that may be threatened or near threatened but lack sufficient information to be listed under the BC Act may be added to the DBCA's *Priority Flora List* (DBCA 2018c). Priority flora species are considered during State approval processes. Priority flora categories and definitions are listed in **Table 1**.

Table 1: Definitions of conservation significant flora species pursuant to the EPBC Act and BC Act and on DBCA's Priority Flora List (DBCA 2018c)

Conservation code	Description
EX†	Threatened Flora – Presumed Extinct Taxa which have not been collected, or otherwise verified, over the past 50 years despite thorough searching, or of which all known wild populations have been destroyed more recently, and have been gazetted as such.
T^†	Threatened Flora – Extant Taxa which are declared to be likely to become extinct or is rare, or otherwise in need of special protection.
CR^	Threatened Flora – Critically Endangered Taxa which are considered to be facing an extremely high risk of extinction in the wild.
EN^	Threatened Flora – Endangered Taxa which are considered to be facing a very high risk of extinction in the wild.
VU^	Threatened Flora – Vulnerable Taxa which are considered to be facing a high risk of extinction in the wild.
P1	Priority One – Poorly Known Taxa which are known from one or a few (generally <5) populations which are under threat, either due to small population size, or being on lands under immediate threat e.g. road verges, urban areas, farmland, active mineral leases etc., or the plants are under threat, e.g. from disease, grazing by feral animals etc. May include taxa with threatened populations on protected lands. Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey.
P2	Priority Two – Poorly Known Taxa which are known from one or a few (generally <5) populations, at least some of which are not believed to be under immediate threat (i.e. not currently endangered). Such taxa are under consideration for declaration as 'rare flora', but urgently need further survey.
P3	Priority Three – Poorly Known Taxa which are known from several populations, and the taxa are not believed to be under immediate threat (i.e. not currently endangered), either due to the number of known populations (generally >5), or known populations being large, and either widespread or protected. Such taxa are under consideration for declaration as 'rare flora' but needs further survey.
P4	Priority Four – Rare Taxa which are considered to have been adequately surveyed and which, whilst being rare (in Australia), are not currently threatened by any identifiable factors. These taxa require monitoring every 5-10 years.

^pursuant to the EPBC Act, †pursuant to the BC Act, on DBCA's *Priority Flora List*

Threatened and priority ecological communities

'Threatened ecological communities' (TECs) are recognised as ecological communities that are rare or under threat and therefore warrant special protection. Selected TECs are afforded statutory protection at a Commonwealth level under section 181 of the EPBC Act. TECs nominated for listing under the EPBC Act are considered by the Threatened Species Scientific Committee and a final decision is made by the Commonwealth Minister for the Environment. Once listed under the EPBC Act, communities are categorised as either 'critically endangered', 'endangered' or 'vulnerable' as defined in **Table 2**. Any action likely to have a significant impact on a community listed under the EPBC Act requires approval from the Minister for the Environment.

Within Western Australia TECs are determined by the Western Australian Threatened Ecological Communities Scientific Advisory Committee (WATECSAC) and endorsed by the State Minister for the Environment. The WATECSAC is an independent group comprised of representatives from organisations including tertiary institutions, the Western Australian Museum and DBCA. The TECs endorsed by the State Minister are published by DBCA (DBCA 2018b).

TECs are assigned to one of the categories outlined in **Table 2** according to their status (in relation to the level of threat). TECs are afforded direct statutory protection at a State level under the BC Act and BC Regulations. Ecological communities are listed under Section 27(1) and 33 of the BC Act. Their significance is also acknowledged through other state environmental approval processes such as 'environmental impact assessment' pursuant to Part IV of the *Environmental Protection Act 1986* (EP Act) and the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*.

Table 2: Categories of threatened ecological communities (English and Blyth 1997; DEC 2009)

Conservation code	Description
PD	Presumably Totally Destroyed An ecological community that has been adequately searched for but for which no representative occurrences have been located.
CE	Critically Endangered An ecological community that has been adequately surveyed and is found to be facing an extremely high risk of total destruction in the immediate future.
E	Endangered An ecological community that has been adequately surveyed and is not critically endangered but is facing a very high risk of total destruction in the near future.
V	Vulnerable An ecological community that has been adequately surveyed and is not critically endangered or endangered but is facing a high risk of total destruction or significant modification in the medium to long-term future.

An ecological community that is under consideration for listing as a TEC, but does not yet meet survey criteria or has not been adequately defined may be listed as a 'priority ecological community' (PEC). PECs are categorised as priority category 1, 2 or 3 as described in **Table 3**. Ecological communities that are adequately known and are rare but not threatened, or meet criteria for 'near threatened', or that have been recently removed from the threatened list, are placed in 'priority 4'. These ecological communities require regular monitoring. Conservation dependent ecological communities are placed in 'priority 5' (DEC 2013). Listed PECs are published by DBCA (DBCA 2017b).

Table 3: Categories of priority ecological communities (DEC 2013)

Priority code	Description
P1	Priority One: Poorly known ecological 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.
P2	Priority Two: Poorly known ecological 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	Priority Three: Poorly known ecological communities (i) 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: (ii) 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; (iii) 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	Priority Four: 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. (i) Rare. Ecological communities known from few occurrences 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 communities are usually represented on conservation lands. (ii) Near Threatened. Ecological communities that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for a higher threat category. (iii) Ecological communities that have been removed from the list of threatened communities during the past five years.
P5	Priority Five: 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.

Weeds

A number of legislative and policy documents exist in relation to weed management at state and national levels. The *Biosecurity and Agriculture Management Act 2007* (BAM Act) is the principle legislation guiding weed management in Western Australia and lists declared pest species. At a national level, the Australian government has compiled a list of 32 Weeds of National Significance (WoNS) (DoEE 2018), of which many are also listed under the BAM Act.

Declared Pests

Part 2.3.23 of the BAM Act requires a person must not; "*a) keep, breed or cultivate the declared pest; b) keep, breed or cultivate an animal, plant or other thing that is infected or infested with the declared pest; c) release into the environment the declared pest, or an animal, plant or other thing that is infected or infested with the declared pest; or d) intentionally infect or infest, or expose to infection or infestation, a plant, animal or other thing with a declared pest*".

Under the BAM Act, all declared pests are assigned a legal status, as described in **Table 7**. Species assigned to the 'declared pest, prohibited - s12' category are placed in one of three control categories, as described in **Table 8**.

The *Biosecurity and Agriculture Management Regulations 2013* specify keeping categories for species assigned to the 'declared pest - s22(2)' category, which relate to the purposes of which species can be kept, as well as the entities that can keep them. The categories are described in **Table 9**.

The Western Australian Organism List (WAOL) provides the status of organisms which have been categorised under the BAM Act (DPIRD 2020).

Table 4: Legal status of declared pest species listed under the BAM Act (DPIRD 2020)

Category	Description
Declared Pest Prohibited - s12	May only be imported and kept subject to permits. Permit conditions applicable to some species may only be appropriate or available to research organisations or similarly secure institutions.
Declared Pest s22(2)	Must satisfy any applicable import requirements when imported, and may be subject to an import permit if they are potential carriers of high-risk organisms. They may also be subject to control and keeping requirements once within Western Australia

Table 5: Control categories of declared pest species listed under the BAM Act (DPIRD 2020)

Category	Description
C1	Exclusion Not established in Western Australia and control measures are to be taken, including border checks, in order to prevent them entering and establishing in the State.
C2	Eradication Present in Western Australia in low enough numbers or in sufficiently limited areas that their eradication is still a possibility.
C3	Management Established in Western Australia but it is feasible, or desirable, to manage them in order to limit their

Category	Description
	damage. Control measures can prevent a C3 pest from increasing in population size or density or moving from an area in which it is established into an area which currently is free of that pest.

Table 6: Keeping categories of declared pest species listed under the BAM Act (DPIRD 2020)

Category	Description
Prohibited	Can only be kept under a permit for public display and education purposes, and/or genuine scientific research, by entities approved by the state authority.
Exempt	No permit or conditions are required for keeping.
Restricted	Organisms which, relative to other species, have a low risk of becoming a problem for the environment, primary industry or public safety and can be kept under a permit by private individuals.

Wetland Habitat

Geomorphic wetland types

On the Swan Coastal Plain DBCA (2017a) have used the geomorphic wetland classification system developed by Semeniuk (1987) and Semeniuk and Semeniuk (1995) to classify wetlands based on the landform shape and water permanence (hydro-period) as outlined in **Table 10**.

Table 7: Geomorphic Wetlands of the Swan Coastal Plain classification categories (DBCA 2017a)

Level of inundation	Geomorphology			
	Basin	Flat	Channel	Slope
Permanently inundated	Lake	-	River	-
Seasonally inundated	Sumpland	Floodplain	Creek	-
Seasonally waterlogged	Dampland	Palusplain	-	Paluslope

Wetland management categories

DBCA maintains the *Geomorphic Wetland of the Swan Coastal Plain* dataset (DBCA 2018a), which also categorises individual wetlands into specific management categories as described in **Table 11**.

Table 8: Geomorphic Wetlands of the Swan Coastal Plain classification categories (DBCA 2017a)

Management category	Description of wetland	Management objectives
Conservation (CCW)	Support high levels of attributes	Preserve wetland attributes and functions through reservation in national parks, crown reserves and state owned land. Protection provided under environmental protection policies.
Resource enhancement (REW)	Partly modified but still supporting substantial functions and attributes	Restore wetland through maintenance and enhancement of wetland functions and attributes. Protection via crown reserves, state or local government owned land, environmental protection policies and sustainable management on private properties.
Multiple use (MUW)	Few wetland attributes but still provide important hydrological functions	Use, development and management considered in the context of water, town and environmental planning through land care.

The management categories of wetland features are determined based on hydrological, biological and human use features. The DBCA document *A methodology for the evaluation of specific wetland types on the Swan Coastal Plain, Western Australia* (DBCA 2017a) details the methodology by which wetlands on the Swan Coastal Plain are assigned management categories based on a two tiered evaluation system, with preliminary and secondary evaluation stages. The preliminary evaluation aims to identify any features of conservation significance that would immediately place the wetland within the CCW management category. Examples of these significant features include presence on significant wetland lists, presence of TECs or PECs (Priority 1 and 2), presence of threatened flora and

over 90% of vegetation in good or better condition based on the Keighery (1994) scale. If such environmental values are identified the wetland would be categorised as CCW without further evaluation.

Should the preliminary evaluation indicate that no such features occur, the secondary evaluation and site assessment are then applied. In the secondary evaluation, an appropriate management category is determined through the assessment of a range of environmental attributes, functions and values.

Wetland reclassification

DBCA have a protocol for proposing changes to the wetland boundaries and management categories of the existing geomorphic wetland dataset (DEC 2007). The procedure involves a wetland desktop evaluation and site assessment which culminates in a recommended management category. Relevant information should be obtained in the optimal season for vegetation condition and water levels, which is usually spring (DEC 2007). In the case of larger wetlands that have undergone a degree of disturbance, a separate management category may be assigned to parts of the wetland in order to reflect the current values.

References

General references

Department of Biodiversity, Conservation and Attractions (DBCA) 2017a, *A methodology for the evaluation of wetlands on the Swan Coastal Plain*, draft prepared by the Wetlands Section of the Department of Biodiversity, Conservation and Attractions and the Urban Water Branch of the Department of Water and Environmental Regulation, Perth.

Department of Biodiversity Conservation and Attractions (DBCA) 2017b, *Priority Ecological Communities for Western Australia Version 27*, Species and Communities Branch, Department of Biodiversity, Conservation and Attractions.

Department of Biodiversity, Conservation and Attractions (DBCA) 2018a, *Geomorphic Wetlands, Swan Coastal Plain (DBCA-019)*.

Department of Biodiversity, Conservation and Attractions (DBCA) 2018b, *List of Threatened Ecological Communities endorsed by the Western Australian Minister for Environment*, Perth.

Department of Biodiversity, Conservation and Attractions (DBCA) 2018c, *Threatened and Priority Flora List 16 January 2018*, Perth.

Department of Environment and Conservation (DEC) 2007, *Protocol for proposing modifications to the Geomorphic Wetlands Swan Coastal Plain dataset*, Perth.

Department of Environment and Conservation (DEC) 2009, *Definitions, Categories and Criteria for Threatened and Priority Ecological Communities*, Perth.

Department of Environment and Conservation (DEC) 2013, *Definitions, Categories and Criteria for Threatened and Priority Ecological Communities*, Perth.

English, V. and Blyth, J. 1997, *Identifying and Conserving Threatened Ecological Communities in the South West Botanical Province*, ANCA National Reserves System Cooperative Program, Project Number N702, Perth.

Keighery, B. 1994, *Bushland Plant Survey: A guide to plant community survey for the community*, Wildflower Society of WA (Inc), Nedlands.

Semeniuk, C. A. 1987, *Wetlands of the Darling System - a geomorphic approach to habitat classification*, Journal of the Royal Society of Western Australia, 69: 95-112.

Semeniuk, C. A. and Semeniuk, V. 1995, *A Geomorphic Approach to Global Classification for Inland Wetlands*, Vegetatio, 118(1/2): 103-124.

Online references

Department of Environment and Energy (DoEE) 2018, Weeds of National Significance, <http://www.environment.gov.au/biodiversity/invasive/weeds/weeds/lists/wons.html>.

Department of Primary Industries and Regional Development (DPIRD) 2020, The Western Australian Organism List (WAOL), < https://www.agric.wa.gov.au/bam/western-australian-organism-list-waol>.

Appendix B

Conservation Significant Flora Species and likelihood of Occurrence Assessment

Species name	Level of significance		Life strategy	Habitat	Flowering period	Likelihood of occurrence
	WA	EPBC Act				
Caladenia procera	CR	CR	PG	Rich clay loam, alluvial loamy flats with jarrah/marri/peppermint woodland, dense heath, sedges.	Sep-Oct	Possible
Synaphea sp. Fairbridge Farm (D. Papenfus 696)	CR	CR	P	Low woodland on grey, clayey sand with lateritic pebbles (Pinjarra Plain) near winter wet flats.	Sep-Nov	Unlikely
Synaphea sp. Serpentine (G.R. Brand 103)	CR	CR	P	Seasonally damp areas, loam - sand.	Sep-Oct	Unlikely
Brachyscias verecundus	CR	CR	A	Granite outcrops.	Dec	Unlikely
Synaphea sp. Pinjarra Plain (A.S. George 17182)	EN	CR	P	White grey clayey sand on edges of seasonally inundated low lying areas.	Sep-Oct	Unlikely
Andersonia gracilis	VU	EN	P	Seasonally damp, black sandy clay flats near or on the margins of swamps.	Sep-Nov	Unlikely
Banksia nivea subsp. *uliginosa*	EN	EN	P	Clay over laterite in thick scrub, in winter wet ironstones.	Aug-Sep	Unlikely
Caladenia hoffmanii	EN	EN	PG	Clay, loam, laterite, granite. Rocky outcrops and hillsides, ridges, swamps and gullies.	Aug-Oct	Possible
Darwinia whicherensis	CR	EN	P	Winter-wet area of shrubland on shallow red clay over ironstone under a tall shrubland of Banksia squarrosa (known from one wild population).	Oct-Nov	Unlikely
Diuris purdiei	EN	EN	PG	Sand to sandy clay soils in areas subject to winter inundation.	late September to mid-October, but only after a summer or early autumn fire	Unlikely
Drakaea elastica	CR	EN	PG	Bare patches of sand within otherwise dense vegetation in low-lying areas alongside winter-wet swamps. Typically in banksia woodland or thickets of Kunzea glabrescens.	late Sep-Oct/Nov, survey Jul-Aug	Unlikely

Species name	Level of significance		Life strategy	Habitat	Flowering period	Likelihood of occurrence
	WA	EPBC Act				
Gastrolobium papilio	CR	EN	P	Sandy clay over ironstone and laterite. Flat plains.	Oct-Dec	Unlikely
Lambertia echinata subsp. *occidentalis*	CR	EN	P	White sandy soils over laterite, orange/brown-red clay over ironstone. Flats to foothills, winter-wet sites.	Feb, Apr or Dec	Unlikely
Synaphea stenoloba	CR	EN	P	Sandy or sandy clay soils. Winter-wet flats, granite.	Aug-Oct	Unlikely
Banksia squarrosa subsp. *argillacea*	VU	VU	P	White/grey sand, gravelly clay or loam predominantly in winter-wet areas over ironstone in open to tall shrubland.	Jun-Nov	Unlikely
Chamelaucium sp. S coastal plain (R.D.Royce 4872)	VU	VU	P	Flat. Well drained, grey sandy loam.	Jul-Nov	Unlikely
Diuris drummondii	VU	VU	PG	In low-lying depressions in peaty and sandy clay swamps.	Nov-Jan	Unlikely
Diuris micrantha	VU	VU	PG	Dark grey-black sandy clay-loam in winter wet depressions or swamps. Often in shallow standing water.	Aug/Sep-early Oct	Unlikely
Drakaea micrantha	EN	VU	PG	Open sandy patches often adjacent to winter-wet swamps.	Sept- early Oct	Unlikely
Eleocharis keigheryi	VU	VU	P	Clay or sandy loam in freshwater creeks and transient waterbodies such as seasonally wet clay pans.	Aug-Dec	Unlikely
Gastrolobium sp. Yoongarillup (S.Dilkes s.n. 1/9/1969)	P1	-	P	Unknown.	Unknown	Possible
Orianthera wendyae	P1	-	P	Brown lateritic sandy clay.	Oct	Unlikely
Stylidium perplexum	P1	-	P	Grey-brown lateritic sand on slopes.	Nov-Dec	Unlikely
Synaphea odocoileops	P1	-	P	Brown orange loam and sandy clay, granite, in swamps and winter wet areas.	Aug-Oct	Unlikely
Gastrolobium whicherense	P2	-	P	Red-grey sandy clay over quartzite on steep westerly slopes.	Oct	Unlikely
Grevillea rosieri	P2	-	P	Sandy soils.	Jul or Sep	Unlikely
Stylidium acuminatum subsp. *acuminatum*	P2	-	P	Brown lateritic loam soils on slopes.	Nov-Jan	Possible
Thelymitra variegata	P2	-	P	Sandy clay, sand, laterite.	Jun-Sep	Unlikely
Acacia oncinophylla subsp. *oncinophylla*	P3	-	P	Granitic soils	Aug-Oct	Unlikely

Species name	Level of significance		Life strategy	Habitat	Flowering period	Likelihood of occurrence
	WA	EPBC Act				
Carex tereticaulis	P3	-	P	Black peaty sand.	Sep-Oct	Unlikely
Caustis sp. Boyanup (G.S. McCutcheon 1706)	P3	-	P	White or grey sand.	Jan-Feb	Unlikely
Cyathochaeta teretifolia	P3	-	P	Grey sand, sandy clay in swamps and creek edges.	Oct-Jan	Unlikely
Isopogon formosus subsp. *dasylepis*	P3	-	P	Sand, sandy clay, gravelly sandy soils over laterite, often in swampy areas.	Jun-Dec	Unlikely
Lasiopetalum laxiflorum	P3	-	P	Sand and/or clay with laterite.	Sep-Dec	Unlikely
Lomandra whicherensis	P3	-	P	Sand and sandy loam with lateritic gravel on slopes and ridges.	Dec	Possible
Stylidium paludicola	P3	-	P	Peaty sand over clay. Winter wet habitats. Marri and Melaleuca woodland, Melaleuca shrubland	Oct-Dec	Unlikely
Synaphea hians	P3	-	P	Sandy soils on rises.	Jul/Sep-Nov	Unlikely
Synaphea polypodioides	P3	-	P	Light brown loam, red-brown sandy loam, gravelly, brown sandy clay over laterite in undulating areas.	Sep-Nov	Possible
Tetratheca parvifolia	P3	-	P	Dry, brown or grey sand over rocky outcrops of granite or laterite.	Oct	Unlikely
Acacia flagelliformis	P4	-	P	Sandy soils in winter-wet areas.	May-Sep	Unlikely
Acacia semitrullata	P4	-	P	White/grey sand, sometimes	May-Oct	Possible
Aponogeton hexatepalus	P4	-	P	Mud. Freshwater: ponds, rivers, claypans.	Jul-Oct	Unlikely
Chamelaucium erythrochlorum	P4	-	P	Clay, loam and sandy soils in creeklines, slopes and ridges	Nov-Feb	Possible
Cyanothamnus tenuis	P4	-	P	Laterite, stony soils, granite.	Aug-Nov	Possible
Franklandia triaristata	P4	-	P	White or grey sand.	Aug-Oct	Unlikely
Ornduffia submersa	P4	-	A	Sandy clay in inundated	Aug-Nov	Unlikely
Pultenaea skinneri	P4	-	P	Sandy or clayey soils in winter-wet depressions.	Jul-Sep	Unlikely
Senecio leucoglossus	P4	-	A	Gravelly lateritic or granitic soils on outcrops or slopes.	Aug-Dec	Possible

Note: CE=critically endangered, EN=endangered, VU=vulnerable, P1=Priority 1, P2=Priority 2, P3=Priority 3, P4=Priority 4, P=perennial, PG=perennial geophyte, A=annual. Species considered to potentially occur within the site are shaded green

Appendix C

Species List

Family	Status	Species
Apiaceae		
		Platysace tenuissima
		Xanthosia candida
Apocynaceae		
	*DP	*Gomphocarpus fruticosus*
Asparagaceae		
	*DP,WoNS	*Asparagus asparagoides*
		Lomandra pauciflora
		Sowerbaea laxiflora
Asteraceae		
	*	*Erigeron sumatrensis*
	*	*Hypochaeris glabra*
	*	*Hypochaeris radicata*
Caryophyllaceae		
	*	*Stellaria media*
Convolvulaceae		
	*	*Ipomoea indica*
Cucurbitaceae		
	*	*Cucumis myriocarpus*
Cyperaceae		
	*	*Cyperus eragrostis*
		Lepidosperma leptostachyum
		Lepidosperma pubisquameum
		Machaerina articulata
		Morelotia octandra
Dennstaedtiaceae		
		Pteridium esculentum
Dilleniaceae		
		Hibbertia hypericoides
Droseraceae		
		Drosera sp. (sterile)
Ericaceae		
		Leucopogon capitellatus
		Leucopogon verticillatus
		Styphelia pallida
		Styphelia propinqua
Euphorbiaceae		
	*	*Euphorbia maculata*
Fabaceae		
	*	*Acacia longifolia*
	*	*Acacia podalyriifolia*
		Acacia pulchella var. glaberrima
		Acacia saligna
		Acacia urophylla
		Bossiaea aquifolium
		Bossiaea eriocarpa
		Chorizema cordatum
		Daviesia divaricata

Family	Status	Species
		Gastrolobium ?capitatum
		Kennedia prostrata
Gentianaceae		
	*	*Centaurium tenuiflorum*
Geraniaceae		
	*	*Erodium botrys*
Goodeniaceae		
		Scaevola calliptera
Haemodoraceae		
		Haemodorum sp.
Iridaceae		
	*	*Gladiolus sp.*
	*	*Watsonia sp.*
Juncaceae		
	*	*Juncus sp.*
Lamiaceae		
		Hemigenia pritzelii
	*	*Lavandula stoechas*
Lauraceae		
	*	*Cinnamomum camphora*
Malvaceae		
	*	*Malva sp.*
Meliaceae		
	*	*Melia azedarach*
Moraceae		
	*	*Ficus sp.*
Myrtaceae		
		Agonis flexuosa
		Corymbia calophylla
		Eucalyptus marginata
		Eucalyptus patens
		Eucalyptus rudis
		Taxandria linearifolia
Oleaceae		
	*	*Olea europaea*
Orobanchaceae		
	*	*Orobanche minor*
Oxalidaceae		
	*	*Oxalis glabra*
	*	*Oxalis pes-caprae*
Papaveraceae		
	*	*Fumaria capreolata*
Phyllanthaceae		
		Lysiandra calycina
Pittosporaceae		
		Billardiera variifolia
Plantaginaceae		
	*	*Plantago lanceolata*

Family	Status	Species
Poaceae		
		Amphipogon amphipogonoides
	*	*Briza maxima*
	*	*Cortaderia selloana*
	*	*Cynodon dactylon*
	*	*Eragrostis curvula*
	*	*Paspalum dilatatum*
	*	*Phalaris minor*
		Rytidosperma ?pilosum
		Tetrarrhena laevis
Polygalaceae		
	*	*Polygala myrtifolia*
Polygonaceae		
	*	*Rumex conglomeratus*
Proteaceae		
		Banksia dallanneyi
		Grevillea trifida
		Hakea amplexicaulis
		Persoonia longifolia
Pteridaceae		
		Adiantum aethiopicum
Rosaceae		
	*	*Rosa ?rubiginosa*
	*	*Rubus ?ulmifolius*
Rubiaceae		
		Opercularia ?echinocephala
Solanaceae		
	*	*Solanum nigrum*
Stylidiaceae		
		Stylidium ?neurophyllum
Thymelaeaceae		
		Pimelea ?ciliata
Xanthorrhoeaceae		
		Xanthorrhoea preissii
Zamiaceae		
		Macrozamia riedlei

*=non-native, DP=declared pest, Pl=planted, WoNS=weed of national significance

Appendix D

Conservation Significant Communities and Likelihood of Occurrence Assessment

Code	Community name	TEC/ PEC	Level of significance		Likelihood of occurrence
			State	EPBC Act	
SCP08	Herb rich shrublands in clay pans (floristic community type 8 as originally described in Gibson et al. (1994))	TEC	VU	CR	Unlikely
SCP09	Dense shrublands on clay flats (floristic community type 9 as originally described in Gibson et al. (1994))	TEC	VU	CR	Unlikely
SCP3c	Corymbia calophylla - Xanthorrhoea preissii woodlands and shrublands, Swan Coastal Plain (floristic community type 3c as originally described in in Gibson et al. (1994))	TEC	CR	EN	Unlikely
SCP1b	Corymbia calophylla woodlands on heavy soils of the southern Swan Coastal Plain (floristic community type 1b as originally described in Gibson et al. (1994))	TEC	VU	-	Unlikely
Tuart woodlands	Tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain	TEC/ PEC	P3	CR	Unlikely
Whicher Scarp A1	Central Whicher Scarp Mountain Marri woodland	TEC/ PEC	P1	EN	Unlikely
West Whicher Scarp B2	West Whicher Scarp Banksia attenuata woodland (Swan Coastal Plain centred woodlands of grey/white sands community B2)	TEC/ PEC	P1	EN	Unlikely
Whicher Scarp C2	Whicher Scarp Jarrah woodland of deep coloured sands	TEC/ PEC	P1	EN	Unlikely
Banksia WL SCP	Bankisa woodlands of the Swan Coastal Plain	TEC/ PEC	P3	EN	Unlikely
SCP21b	Southern Banksia attenuata woodlands	TEC/ PEC	P3	EN	Unlikely
Whicher Scarp C5	Dardanup Jarrah and Mountain Marri woodland on laterite	PEC	P1	-	Unlikely
Whicher Scarp Paluslope Wetlands	Swan Coastal Plain Paluslope Wetlands	PEC	P1	-	Unlikely

Note: TEC=threatened ecological community, PEC=priority ecological community, CR=critically endangered, EN=endangered, VU=vulnerable, P1=priority 1, P3=priority 3