FLYNN DRIVE FLORA AND VEGETATION SURVEY 2020

City of Wanneroo

ecoscape

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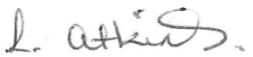
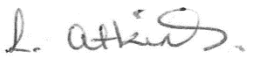
Draft	Terri Jones Kyla Pannell	 LYN ATKINS PRINCIPAL ECOLOGIST	 LYN ATKINS PRINCIPAL ECOLOGIST	30/11/2020
Draft rev1	Terri Jones	 LYN ATKINS PRINCIPAL ECOLOGIST	 LYN ATKINS PRINCIPAL ECOLOGIST	11/12/2020
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Direct all inquiries to:
Ecoscape (Australia) Pty Ltd
9 Stirling Highway • PO Box 50 NORTH FREMANTLE WA 6159
Ph: (08) 9430 8955

This document should be cited as 'Ecoscape (Australia) Pty Ltd (2021) *Flynn Drive Flora and Vegetation Survey 2020,* prepared for City of Wanneroo'

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EXECUTIVE SUMMARY

The City of Wanneroo (the City) engaged Ecoscape to undertake biological survey of a portion of Flynn Drive in Neerabup (between Travertine Vista and Pinjar Road) to gain a detailed understanding of the environmental values of the site. The survey consisted of a two-phase Detailed flora and vegetation survey. The survey was undertaken during spring 2020.

The desktop assessment identified the following relevant aspects:

- the DBCA communities database search identified four Threatened Ecological Communities (TECs) as intersecting with the survey area
- the combined database searches identified 22 conservation-listed vascular flora taxa, none of which are located within the survey area. Of these, 12 were Threatened Flora (TF) species, four were Priority 1 (P1) species, seven were Priority 2 (P2), 12 were Priority 3 (P3) and three were Priority 4 (P4). A likelihood assessment identified that two of these species had a likelihood of occurring within the survey area.

The field survey undertaken during 1-2 September and 6-7 October 2020 identified the following:

- 175 vascular flora species recorded from six quadrats and opportunistic observations
- one Threatened Flora taxon (*Grevillea thelemanniana*) was recorded from a likely planted specimen
- three confirmed Priority Flora taxa:
  - *Conostylis bracteata* (P3)
  - *Grevillea olivacea* (P4)
  - *Jacksonia sericea* (P4)
- one likely Priority Flora taxon:
  - *Conostylis pauciflora* subsp. *pauciflora* (P4)
- 46 introduced species (weeds) were recorded, one of which (**Asparagus asparagoides* – Bridal Creeper) is a Weed of National Significance
- two vegetation types:
  - **EmBaAf** – *Eucalyptus marginata*, *Banksia attenuata* and *Allocasuarina fraseriana* mid woodland
  - **EgBsJs** – *Eucalyptus gomphocephala* mid open woodland over *Banksia sessilis* and *Jacksonia sternbergiana*
- one vegetation type (**EmBaAf**) is considered to represent the EPBC-listed *Banksia Woodlands of the Swan Coastal Plain* TEC and Western Australian *Banksia attenuata woodland over species rich dense shrublands* TEC.

ACRONYMS AND ABBREVIATIONS

Table 1: Acronyms and abbreviations

Acronyms and abbreviations	
BAM Act	Western Australian *Biosecurity and Agriculture Management Act 2007*
BC Act	Western Australian *Biodiversity Conservation Act 2016*
BoM	Bureau of Meteorology
C1, C2, C3	Declared Pest categories under the BAM Act
CR	Critically Endangered (listed under Commonwealth EPBC Act and/or Western Australian BC Act)
DAWE	Commonwealth Department of Agriculture, Water and Environment (2020-)
DBCA	Western Australian Department of Biodiversity, Conservation and Attractions
DEC	Western Australian Department of Environment and Conservation (2006-2013, now DBCA)
DEWHA	Commonwealth Department of the Environment, Water, Heritage and the Arts (2007-2010, now DAWE)
DMIRS	Western Australian Department of Mines, Industry Regulation and Safety
DPaW	Western Australian Department of Parks and Wildlife (2013-2017, now DBCA)
DoE	Commonwealth Department of the Environment (2013-2016, now DAWE)
DotEE	Commonwealth Department of the Environment and Energy (2016-2020)
DPIRD	Western Australian Department of Primary Industries and Rural Development
EN	Endangered (listed under Commonwealth EPBC Act and/or Western Australian BC Act)
Ecoscape	Ecoscape (Australia) Pty Ltd
EP Act	Western Australian *Environmental Protection Act 1986*
EPA	Western Australian Environmental Protection Authority
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
GDA 94	Geographic Datum of Australia 1994
GIS	Geographic Information System
GPS	Global Positioning System
ha	hectare/hectares
IBRA	Interim Biogeographic Regionalisation for Australia
km	kilometre/kilometres
m	metre/metres
MGA	Map Grid of Australia
NVIS	National Vegetation Inventory System
MNES	Matters of National Environmental Significance
P; P1, P2, P3, P4, P5	Priority Flora and Fauna species rankings (P1-P4) or Priority Ecological Communities (P1-P5)
PEC	Priority Ecological Community
PF	Priority Flora
PMST	Protected Matters Search Tool (hosted by DAWE, used to search for MNES)
sp.	Species (generally referring to an unidentified taxon or when a phrase name has been applied)
subsp.	Subspecies (infrataxon)
TEC	Threatened Ecological Community
T	Threatened species listing by DBCA
TF	Threatened Flora (formerly termed Declared Rare Flora, DRF, in Western Australia)
var.	Variety (infrataxon)
WAH	Western Australian Herbarium
WAOL	Western Australian Organism List
WONS	Weeds of National Significance
*****	Introduced flora species (i.e. weed)

1 INTRODUCTION

1.1 BACKGROUND

The City of Wanneroo (the City) is a local government authority located within the Perth metropolitan area, approximately 25 km north of the CBD. The City includes a number of natural areas for which it has management responsibility.

The City engaged Ecoscape to undertake a biological survey of a portion of Flynn Drive in Neerabup (between Travertine Vista and Pinjar Road) to gain a detailed understanding of the environmental values of the site. The flora and vegetation component of the survey consisted of a two-phase Detailed flora and vegetation survey. The survey is required to support clearing permits for proposed road upgrade works; inform any permit amendments due to design changes; and inform an environmental impact assessment of the proposed clearing between Mather Drive and Pinjar Road.

1.2 SURVEY AREA

The project area, known as the 'survey area' in this report, is located in Neerabup, within the City of Wanneroo on the Swan Coastal Plain, approximately 30 km north of Perth (**Figure 1**). The survey area approximates 20.55 ha in size and forms a linear corridor of vegetation adjacent to a busy roadway. A portion of the survey area abuts the Mather Reserve conservation area.

Figure 1: Survey area location

1.3 SURVEY REQUIREMENTS

The biological survey was to be undertaken in spring of 2020, and in compliance with the *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016).

The requirements of the survey were to undertake a Detailed flora and vegetation survey conducted over two events, incorporating multiple quadrats at representative points within each preliminary vegetation type, opportunistic collections, systematic transects and targeted searches for conservation-listed flora.

1.4 COMPLIANCE

This environmental assessment was conducted in accordance with Commonwealth and State legislation and guidelines:

- Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)
- Western Australian *Environmental Protection Act 1986* (EP Act)
- Western Australian *Biodiversity Conservation Act 2016* (BC Act)
- Western Australian *Biodiversity Conservation Regulations 2018*
- Department of Environment, Water, Heritage and the Arts (DEWHA 2009) *Matters of National Environmental Significance. Significant impact guidelines 1.1 - Environment Protection and Biodiversity Conservation Act 1999*
- Threatened Species Scientific Committee (TSSC 2016) *Approved conservation advice (incorporating listing advice) for the Banksia Woodlands of the Swan Coastal Plain ecological community*
- Department of the Environment and Energy (DotEE 2019) *Approved Conservation Advice (incorporating listing advice) for the Tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain ecological community*.

As well as those listed above, the assessment complied with EPA requirements for environmental survey and reporting in Western Australia, as outlined in:

- EPA (2016) *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment*, known herein as the Flora and Vegetation Technical Guidance
- EPA (2020) *Statement of Environmental Principles, Factors and Objectives*.

1.4.1 COMMONWEALTH ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999

The EPBC Act is a legal framework to protect and manage matters of national environmental significance (MNES) including important flora, fauna, ecological communities and heritage areas listed under the Act. Threatened taxa (flora and fauna) are protected under the EPBC Act, which lists species and ecological communities that have been assessed as meeting the criteria to be listed as Critically Endangered, Endangered, Vulnerable, Conservation Dependant, Extinct, or Extinct in the Wild, as detailed in **Table 14** in **Appendix One**. Threatened Ecological Communities are categorised as Critically Endangered, Endangered or Vulnerable, also detailed in this table.

1.4.2 WESTERN AUSTRALIAN ENVIRONMENTAL PROTECTION ACT 1986

The Western Australian EP Act was created to provide for an Environmental Protection Authority (the EPA) that has the responsibility for:

- prevention, control and abatement of pollution and environmental harm

- conservation, preservation, protection, enhancement and management of the environment
- matters incidental to or connected with the above.

The EPA is responsible for providing the guidance and policy under which environmental assessments are conducted. It conducts environmental impact assessments (based on the information provided by the proponent), initiates measures to protect the environment and provides advice to the Minister responsible for environmental matters.

1.4.3 WESTERN AUSTRALIAN BIODIVERSITY CONSERVATION ACT 2016

The Western Australian BC Act provides for the conservation, protection and ecologically sustainable use of biodiversity and biodiversity components in Western Australia.

Threatened species (both flora and fauna) and ecological communities that meet the categories listed within the BC Act are protected under this legislation and require authorisation by the Minister to take or disturb. These are known as Threatened Flora, Threatened Fauna and Threatened Ecological Communities. The conservation categories of Critically Endangered, Endangered and Vulnerable are detailed in **Table 15** in **Appendix One**; these categories align with those of the EPBC Act.

Flora and fauna species may be listed as being of special conservation interest if they satisfy at least one of the following criteria, and the Minister considers that taking of individuals may result in depletion of the species:

- have a naturally low population
- have a restricted natural range
- are subject to, or recovering from, a significant population decline or reduction of range
- are of special interest.

Migratory species and those subject to international agreement are also listed under the Act. These are known as specially protected species in the BC Act.

The most recent flora and fauna listings were published in the *Government Gazette* on 11 September 2018 (Government of Western Australia 2018a).

1.5 FLORA

1.5.1 THREATENED AND PRIORITY FLORA

Conservation significant flora species are those that are listed as Threatened Flora (TF) and (within Western Australia) as Priority Flora (PF). TF species are listed as Threatened by the Western Australian DBCA and protected under the provisions of the BC Act. Some State-listed TF are provided with additional protection as they are also listed under the Commonwealth EPBC Act (see **Table 14** in **Appendix One** for conservation status category descriptions).

Flora are listed as PF where populations are geographically restricted or threatened by local processes, or where there is insufficient information to formally assign them to TF categories. Whilst PF are not specifically listed in the BC Act, some may qualify as being of special conservation interest and thereby have a greater level of protection than unlisted species.

There are seven categories covering Western Australian-listed TF and PF species, which are outlined in **Table 15** in **Appendix One**. PF for Western Australia are regularly reviewed by the DBCA whenever new

information becomes available, with species status altered or removed from the list when data indicates that they no longer meet the requirements outlined in **Table 15**.

1.5.2 OTHER SIGNIFICANT FLORA

According to the Flora and Vegetation Technical Guidance (EPA 2016) other than being listed as Threatened or Priority Flora, a species can be considered as significant if it is considered to be:

- locally endemic or association with a restricted habitat
- a new species or has anomalous features that indicate a potential new species
- at the extremes of range, recently discovered range extensions (generally considered greater than 100 km or in a different bioregion), or isolated outliers of the main range)
- unusual species, including restricted subspecies, varieties or naturally occurring hybrids
- relictual status, being representative of taxonomic groups that no longer occur widely in the broader landscape.

1.5.3 INTRODUCED FLORA

Introduced plant species, known as weeds, are plants that are not indigenous to an area and have been introduced either directly or indirectly (unintentionally) through human activity. Species are regarded as introduced if they are listed as 'alien' on *FloraBase* (Western Australian Herbarium [WAH] 1998-2020) and are designated with an asterisk (*) in this document.

1.5.3.1 Weeds of National Significance

At a national level there are 36 weed species listed as Weeds of National Significance (WoNS) (Weeds Australia & Centre for Invasive Species Solutions 2020). The Commonwealth *Australian Weeds Strategy 2017-2027* (Invasive Plants and Animals Committee 2016) describes broad goals and objectives to manage these species.

1.5.3.2 Declared Pest Plants

The Western Australian Organism List (WAOL) details organisms listed as Declared Pests under the *Biosecurity and Agriculture Management Act 2007* (BAM Act). Under the BAM Act, Declared Pests are listed as one of the three categories, or exempt:

- C1 (exclusion), that applies to pests not established in Western Australia; control measures are to be taken to prevent their entry and establishment
- C2 (eradication), that applies to pests that are present in Western Australia but in low numbers or in limited areas where eradication is still a possibility
- C3 (management), that applies to established pests where it is not feasible or desirable to manage them in order to limit their damage
- exempt (no category).

1.6 ECOLOGICAL COMMUNITIES/VEGETATION

Most, although not all, conservation-listed ecological communities are defined by vegetation, usually within the context of a defined landform or unique habitat. Although 'vegetation' and 'ecological communities' are not interchangeable terms, this assessment describes the vegetation of the survey area with conservation status taking into consideration the interactions of the vegetation with the biological and physical environment within which it occurs (i.e. the ecological community as a whole).

1.6.1 EPBC-LISTED THREATENED ECOLOGICAL COMMUNITIES

Ecological communities are naturally occurring biological assemblages associated with a particular type of habitat (DBCA 2020). At Commonwealth level, Threatened Ecological Communities (TECs) are protected under the Commonwealth EPBC Act. Ecological communities are categorised as Critically Endangered, Endangered and Vulnerable as described in **Table 14** in **Appendix One**.

1.6.2 WESTERN AUSTRALIAN THREATENED ECOLOGICAL COMMUNITIES

Western Australian TECs are protected under the BC Act. TECs are categorised much like those of the EPBC Act, shown in **Table 16** in **Appendix One**.

Currently described TECs are listed on the DBCA website, with the most recent list endorsed by the Minister for Environment in June 2018 (DBCA 2018a).

1.6.3 WESTERN AUSTRALIAN PRIORITY ECOLOGICAL COMMUNITIES

DBCA maintains a list of Priority Ecological Communities (PECs). PECs include potential TECs that do not meet survey criteria, or that are not adequately defined. They are not protected under legislation but are taken into consideration as part of the environmental approvals process.

Currently described PECs are listed on the DBCA website, with the most recent list dated 28 July 2020 (Species and Communities Program; DBCA 2020).

1.6.4 OTHER SIGNIFICANT VEGETATION

According to the Flora and Vegetation Technical Guidance (EPA 2016), other than being listed as a TEC or PEC, vegetation can be considered as significant if it is considered to have:

- restricted distribution
- a degree of historical impact from threatening processes
- a role as a refuge
- provides an important function required to maintain ecological integrity of a significant ecosystem.

1.7 ENVIRONMENTALLY SENSITIVE AREAS

There are a number of areas around Western Australia identified as being of environmental significance within which the exemptions to the Native Vegetation Clearing Regulations do not apply. These are referred to as Environmentally Sensitive Areas (ESAs), and are declared under section 51B of the EP Act and described in the *Environmental Protection (Environmentally Sensitive Areas) Notice*.

1.8 CONSERVATION ESTATE

The National Reserve System is a network of protected areas managed for conservation under international guidelines. The objective of placing areas of bushland into the Conservation Estate is to achieve and maintain a comprehensive, adequate and representative reserve system for Western Australia. The Conservation and Parks Commission is the vesting body for conservation lands, forest and marine reserves that are managed by DBCA (Government of Western Australia 2018b).

2 EXISTING ENVIRONMENT (DESKTOP ASSESSMENT)

2.1 PHYSICAL ENVIRONMENT

2.1.1 CLIMATE

The southwest of Western Australia is generally described as having a Mediterranean-type climate of mild, wet winters and warm to hot, dry summers. The climate of the region is strongly influenced by the position of a band of high pressure known as the sub-tropical ridge. For much of the year the ridge is located to the south allowing the east or south easterly winds to prevail. During the cooler months the ridge periodically moves to the north allowing cold fronts to pass over the west coast and deliver much of the annual rainfall (Beard 1990). The survey area borders on the arid zone.

According to the Köppen-Geiger climate classification, the survey area has a temperate climate with hot, dry summers (Class Csa) (Peel, Finlayson & McMahon 2007). This classification is considered to represent a Mediterranean climate, where average summer maximum temperatures exceed 22°C; the average coldest month maximum is between 18° and -3°C; and summer rainfall is less than one third of winter rainfall.

The closest Bureau of Meteorology (BoM) station with long term records for rainfall is Wanneroo (station no: 9105), which is located approximately 5 km from the survey area (BoM 2020). The mean annual rainfall is 794.9 mm with the highest rainfall occurring in the winter months from June to August. The rainfall in the 6-month period preceding the survey in October 2020 was drier than typical, recording approximately 68% of the long-term mean for the April to September period.

The closest BoM station with long term records for temperature is Pearce RAAF (station no: 9053), located approximately 22 km from the survey area. January is the hottest month with a mean maximum temperature of 33.3°C and minimum of 17.6°C. July is the coldest month with a mean maximum of 17.9°C and minimum of 8.4°C.

Figure 2 shows the average rainfall and temperatures of the survey area, with rainfall for the year preceding the field survey.

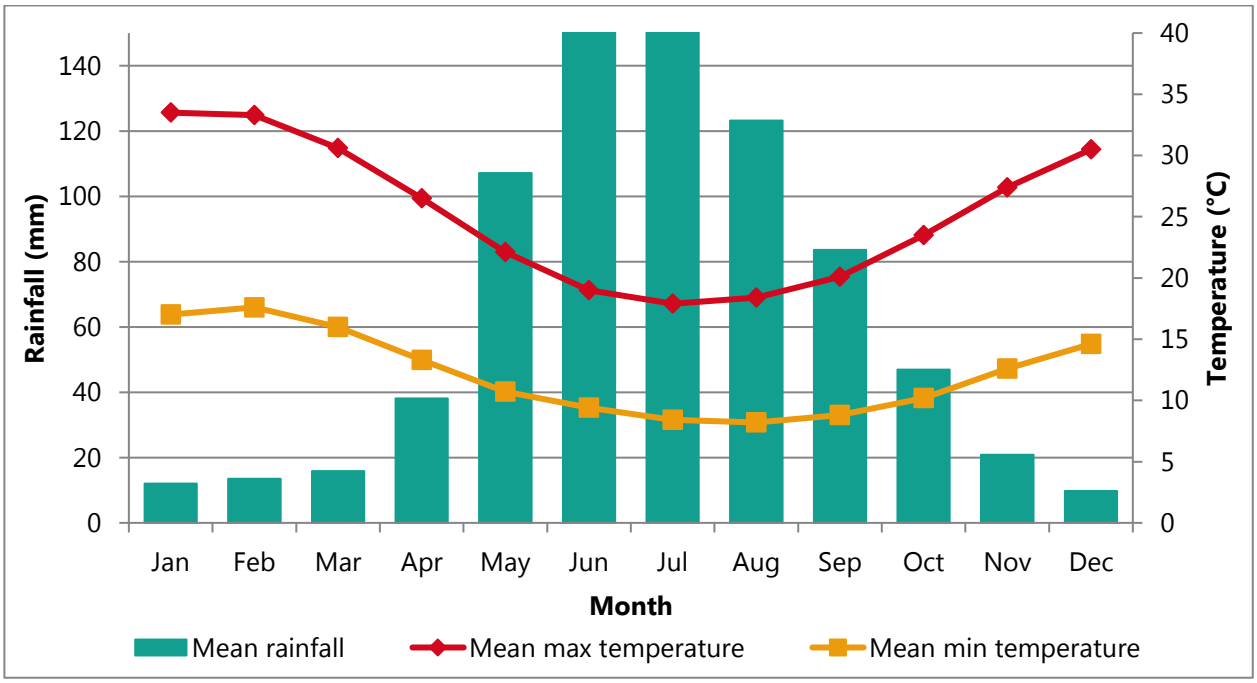

Figure 2: Rainfall and temperature data for the survey area

2.1.2 LAND SYSTEMS

According to the Department of Primary Industries and Rural Development (DPIRD 2020) soil landscape mapping, the following two land systems intersect the survey area (**Table 2** and **Map 1**).

Table 2: Land systems (DPIRD 2020)

Mapping unit	Land system	Description	Extent (ha)	%
211Sp	Karrakatta shallow soils Phase	Low hills and ridges. Bare limestone or shallow siliceous or calcareous sand over limestone. Dense low shrub dominated by *Banksia sessilis*, *Melaleuca huegelii* and species of *Grevillea*.	3.33	16.22
211Sp	Karrakatta Sand Yellow Phase	Low hilly to gently undulating terrain. Yellow sand over limestone at 1-2 m. *Banksia* spp. woodland with scattered emergent *E. gomphocephala* and *E. marginata* and a dense shrub layer.	17.20	83.78

2.1.3 GEOLOGY

Geological mapping covering the survey area is associated with the Muchea map sheet (20341) of the Department of Mines Industry Regulation and Safety (DMIRS) map series 1:50,000 Geological Series of Western Australia (2018). According to this mapping, three geological units intersect the survey area, as shown in **Table 3** and **Map 1**.

Table 3: Geology of the survey area (DMIRS 2018)

Code	Description	Extent (ha)	%
LS1	LIMESTONE - pale yellow-brown fine-grained angular and medium-grained rounded quartz and calcite cross-bedding, minor heavy minerals.	7.93	38.43
LS2	LIMESTONE - as LS1 abundant karstic phenomena including caves, swallows, dolines.	4.72	38.59
S7	SAND - pale and olive-yellow medium to coarse-grained sub-angular quartz, moderately sorted, of residual origin, modified by marine inundation.	7.90	22.99

2.1.4 WETLANDS AND DRAINAGE

The survey area is in the Wanneroo Coastal Lakes catchment, in the river region of Swan Coast – Avon River (Landgate 2020). The survey area does not intersect with any wetlands or drainage lines. The nearest wetland is Neerabup Lake located approximately 0.3 km to the north west. The nearest significant river is the Swan River located approximately 23 km south east of the survey area.

2.1.5 ENVIRONMENTALLY SENSITIVE AREAS

The survey area partially intersects a Bush Forever site in the west and two TECs in the east, *Banksia Woodlands of the Swan Coastal Plain* ecological community and *Banksia attenuata* woodland over species rich dense shrublands (Department of Water and Environmental Regulation 2020).

2.1.6 CONSERVATION LANDS

The survey area does not intersect any conservation lands (i.e. National Parks, Nature Reserves and other areas vested for conservation). The nearest conservation land is Neerabup National Park located approximately 0.5 km west of the survey area.

2.2 BIOLOGICAL ENVIRONMENT

2.2.1 BIOGEOGRAPHIC REGION

Biogeographic regions are delineated on the basis of similar climate, geology, landforms, vegetation and fauna and are defined in the Interim Biogeographical Regionalisation for Australia (IBRA) (Department of Agriculture Water and the Environment 2020).

The survey area is located in the Swan Coastal Plain IBRA region in the Perth subregion (SWA2), described as (Mitchell, Williams & Desmond 2002):

> *…a low lying coastal plain, mainly covered with woodlands. It is dominated by Banksia or Tuart on sandy soils, Casuarina obesa on outwash plains, and paperbark in swampy areas. In the east, the plain rises to duricrusted Mesozoic sediments dominated by Jarrah woodland. The climate is Warm Mediterranean. Three phases of marine sand dune development provide relief. The outwash plains, once dominated by C. obesa-marri woodlands and Melaleuca shrublands, are extensive only in the south. The Perth subregion is composed of colluvial and aeolian sands, alluvial river flats, coastal limestone. Heath and/or Tuart woodlands on limestone, Banksia and Jarrah-Banksia woodlands on Quaternary marine dunes of various ages, Marri on colluvial and alluvials. Includes a complex series of seasonal wetlands and also includes Rottnest, Carnac and Garden Islands etc. Rainfall ranges between 600 and 1000 mm annually and the climate is Mediterranean. The subregional area is 1,333,901 ha.*

2.2.2 PRE-EUROPEAN VEGETATION

During the 1970s, John Beard and associates conducted a systematic survey of native vegetation, describing the vegetation systems in Western Australia at a scale of 1:250 000 in the south-west and at a scale of 1:1 000 000 in less developed areas.

Beard's vegetation maps attempted to depict the native vegetation as it was presumed to be at the time of settlement and is known as the pre-European vegetation type and extent. Beard's vegetation maps have since been developed in digital form by Shepherd, Beeston & Hopkins (2002) and updated by DPIRD (2019). Extents are updated every two years by DBCA (2019a). This mapping indicates that the survey areas intersects three pre-European vegetation units, as shown in **Table 4**.

Table 4: Pre-European vegetation corresponding with the survey area

Association	Code	Description	% of survey area
Spearwood System	6	Low woodland or open low woodland	78.20
Spearwood System	949	Woodland southwest	14.89
Spearwood System	998	Woodland southwest	6.91

The pre-European vegetation associations identified from the survey area (DPIRD 2019) and their pre-European and current extents are listed in **Table 5** (DBCA 2019a) and shown on **Map 2**.

Table 5: Pre-European vegetation association representation (DBCA 2019a)

Region	Vegetation association	Original extent (ha)	Current extent (ha)	% remaining
Western Australia	6	56,343.01	13,362.25	23.72
	949	218,193.94	123,104.02	23.72
	998	51,015.33	18,492.63	36.25
IBRA biographic region (Swan Coastal Plan)	6	56,343.01	13,362.25	23.72
	949	209,983.26	120,287.93	57.28
	998	50,867.50	18,492.32	36.35
IBRA biographic subregion (Perth)	6	56,343.01	13,362.25	23.72
	949	184,475.82	104,128.96	56.45
	998	50,867.50	18,492.32	36.35
LGA (City of Wanneroo)	6	12,662.10	2,777.67	21.94
	949	37,138.40	17,196.34	46.30
	998	4,635.30	2,787.40	60.13

2.2.3 VEGETATION COMPLEXES

The relationship between vegetation and the various combinations of landforms, soils and rainfall (known as vegetation complexes) has been mapped for the Swan Coastal Plain at a scale of 1:250 000 (DBCA 2018b). The mapping shows the pre-1750 distribution of vegetation complexes and is available in digital form. According to the mapping available, the survey area corresponds with three vegetation complexes **(Table 6)**. Their original and current extents in the Swan Coastal Plain are shown in **Table 7**.

Table 6: Vegetation complexes corresponding with the survey area

Vegetation Complex	System 6 Code	Landform	Description	% of Survey Area
Cottesloe Complex – Central and South	52	Swan Coastal Plain – Aeolian deposits	Mosaic of Tuart woodland and Tuart-Jarrah-Marri open forest; closed heath on the Limestone outcrops.	78.20
Herdsman Complex	53	Swan Coastal Plain – Aeolian deposits	Sedgelands and fringing woodland of *Eucalyptus rudis-Melaleuca* species.	6.91
Karrakatta Complex – Central and South	49	Swan Coastal Plain – Aeolian deposits	Predominantly open forest of Tuart-Jarrah-Marri and woodland of Jarrah-*Banksia* species. *Agonis flexuosa* is co-dominant south of the Capel River.	14.89

Table 7: Vegetation complex extents in the Swan Coastal Plain

Vegetation Complex	Pre-European extent (ha)	Current extent (ha)	% Remaining	Proportion within the LGA[1]
Cottesloe Complex – Central and South	45,299.61	14,567.87	32.16	29.39
Herdsman Complex	9,665.15	3,103.70	32.11	18.20
Karrakatta Complex – Central and South	53,080.99	12,467.20	23.49	19.85

2.2.4 THREATENED AND PRIORITY ECOLOGICAL COMMUNITIES

The Protected Matters Search Tool (PMST) search (Australian Government and DAWE 2020; search reference QIIVSQ) identified two EPBC-listed TECs likely to occur within a 5 km buffer around a point approximating the centre of the survey area:

- *Banksia Woodlands of the Swan Coastal Plain ecological community*
- *Tuart (Eucalyptus gomphocephala) Woodlands and Forests of the Swan Coastal Plain ecological community*.

The DBCA database search (search reference 20145, using a 5 km buffer) identified a total of eight Western Australian TECs and PECs within the search area buffer, shown in **Table 8**. Of these, four ecological communities correspond with the survey area:

- *Tuart (Eucalyptus gomphocephala) Woodlands and Forests of the Swan Coastal Plain*
- *Banksia Woodlands of the Swan Coastal Plain*
- *Northern Spearwood shrublands and woodlands*
- *Banksia attenuata woodland over species rich dense shrublands*.

Table 8: Summary of DBCA TEC/PEC results

Name	TEC	PEC	Code (WA)	Code (EPBC Act)
Acacia shrublands on taller dunes	-	x	P3	-
Banksia Woodlands of the Swan Coastal Plain	x	x	P3	EN
Banksia attenuata woodland over species rich dense shrublands	x	-	EN	-
Banksia ilicifolia woodlands (a component of the Endangered Banksia Woodlands of the Swan Coastal Plain EPBC-listed TEC)	x	x	P3	EN
Melaleuca huegelii – Melaleuca systena shrublands on limestone	x	-	EN	-
Northern Spearwood shrublands and woodlands (can be a component of the Endangered Banksia Woodlands of the Swan Coastal Plain EPBC-listed TEC)	x	x	P3	EN
Southern Swan Coastal Plain Eucalyptus gomphocephala – Agonis flexuosa woodlands (can be a component of the Endangered *Banksia Woodlands of the Swan Coastal Plain* EPBC-listed TEC or the *Tuart woodlands and forests of the Swan Coastal Plain* EPBC-listed TEC)	x	x	P3	EN
Tuart (Eucalyptus gomphocephala) Woodlands and Forests of the Swan Coastal Plain ecological community	x	x	P3	CR

Map 3 shows the locations of ecological communities identified by the DBCA database search.

Some TECs listed under the EPBC Act have detailed assessment methodologies to determine if vegetation is representative. The following are applicable to known communities within the survey area:

Banksia Woodlands of the Swan Coastal Plain TEC

In September 2016, the Commonwealth Minister for the Environment and Energy endorsed a new TEC for protection under the EPBC Act; the Endangered Banksia Woodlands of the Swan Coastal Plain, known as the Banksia Woodlands TEC (Threatened Species Scientific Committee 2016).

The Banksia Woodlands TEC occurs on the SCP between Jurien Bay and Dunsborough (including the Dandaragan Plateau), extending inland into immediately adjacent areas on the Darling and Whicher escarpments. The key characteristics for and threshold criteria for vegetation to be included in this TEC are detailed in **Table 20** and text in **Appendix Two**.

Tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain TEC

In July 2019, the Commonwealth Minister for the Environment and Energy endorsed a new TEC for protection under the EPBC Act; the Critically Endangered Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain TEC (Department of the Environment and Energy 2019). The key characteristics for and threshold criteria for vegetation to be included in this TEC are detailed in **Table 21** and text in **Appendix Two**.

2.2.5 THREATENED AND PRIORITY FLORA

A search of the PMST applying a 10km buffer (search reference PMST_19BJ8C) identified 13 EPBC-listed TF: three TF known to occur, four likely to occur and six that may occur within the search area buffer. These are listed in **Table 22** in **Appendix Three.**

A search of DBCA's databases (TPFL List, taken from Threatened and Priority Flora Report Forms and DBCA surveys, and WA Herb, taken from vouchered specimens held in the Western Australian Herbarium) was conducted using a 10 km buffer around the supplied shapefile (search reference 07-0720FL). The DBCA database searches identified the following State-listed flora taxa:

- TF:
  - *Eucalyptus argutifolia*
  - *Marianthus paralius*
  - *Melaleuca* sp. Wanneroo (G.J. Keighery 16705)
- P1:
  - *Baeckea* sp. Limestone (N. Gibson & M.N. Lyons 1425)
  - *Drosera patens*
  - *Drosera x sidjamesii*
  - *Grevillea* sp. Ocean Reef (D. Pike Joon 4)
- P2:
  - *Acacia benthamii*
  - *Calectasia elegans*
  - *Lecania turicensis* var. *turicensis*
  - *Poranthera moorokatta*
  - *Stenanthemum sublineare*
  - *Tetraria* sp. Chandala (G.J. Keighery 17055)
  - *Thelymitra variegata*
- P3:
  - *Austrostipa mundula*
  - *Conostylis bracteata*
  - *Cyathochaeta teretifolia*
  - *Hibbertia leptotheca*
  - *Jacksonia gracillima*
  - *Leucopogon* sp. Yanchep (M. Hislop 1986)
  - *Pimelea calcicola*
  - *Pithocarpa corymbulosa*
  - *Sarcozona bicarinata*
  - *Stylidium maritimum*
  - *Stylidium paludicola*
  - *Styphelia filifolia*
- P4:
  - *Jacksonia sericea*
  - *Stylidium longitubum*
  - *Tripterococcus* sp. Brachylobus (A.S. George 14234).

Map 3 shows the locations of conservation-listed flora identified by the DBCA database search.

The combined database searches identified the species listed in **Table 22** and **Table 23** in **Appendix Three**, consisting of 12 TF (three from records known to occur within the database search buffer and a further nine from the PMST), four P1, seven P2, 12 P3 and three P4.

2.2.5.1 Threatened and Priority Flora Likelihood Assessment

Ecoscape conducted a likelihood assessment to identify TF and PF species that have potential to occur within the survey area. The likelihood of a species occurring is based on the following attributes, as listed on *FloraBase* (WAH 1998-2020, 2020, including specimen collection information):

- broad soil type usually associated with the species
- broad landform usually associated with the species
- usual vegetation (characteristic species) with which the species is usually associated
- species having previously been recorded from within approximately 2 km of the survey area (considered as 'nearby') taking locational accuracy into account
- time since recorded (i.e. within the previous 25 years), taking into consideration land use changes since collection.

The likelihood rating is assigned using the categories listed in **Table 9**.

Table 9: Categories for likelihood of occurrence of TF and PF

Likelihood	Category
Known	Species recorded within the survey area.
Likely	May occur within the survey area (but has not been recorded); broadly, 2-4 of the required attributes (but always including records from nearby) are present in the survey area.
Unlikely	Could occur but is not expected; 1-3 of the required attributes are present in the survey area but: • it is not known from nearby, or • it is known from nearby but has no other required attributes, or • it is known from nearby but has at least one well-defined attribute that does not occur in the survey area (e.g. it is associated with a specific landform or soil type that does not occur in the survey area), or • it is known from nearby but: o the record is old (>25 years), or o the locational data is highly likely to be inaccurate, or o the area has been significantly cleared at and around the location of the record and survey area and as such the habitat almost certainly no longer occurs within the survey area.
Highly unlikely	The species characteristics include only one or none of the required attributes of soil, landform, associated vegetation and having previously been recorded nearby, or a critical element (often landform) is not within the survey area and as such it almost certainly does not occur.

The likelihood assessment is available in **Table 23** in **Appendix Three**. No species were identified as having been recorded previously within the survey area. One P2 and one P4 were identified as having a 'Possible' likelihood of occurring and were prioritised for survey.

The likelihood of occurrence was re-evaluated following the field survey, when actual survey area characteristics (vegetation types, vegetation condition, visibility for individual species) were better understood, and the level of survey effort was considered. The post-survey likelihood is also incorporated into **Table 23** and discussed further in **Section 5.1.1.1**.

2.3 LITERATURE REVIEW

The following documents were reviewed for relevance to the survey area:

- Coffey (2008) *Spring Flora and Vegetation Survey – Flynn Drive Re-Alignment, Neerabup*, corresponds with the western portion of the survey area
- EcoLogical (2013) *Targeted Flora and Fauna Assessment Lot 4 Flynn Drive Neerabup*, partially corresponds with the eastern portion of the survey area
- Ecoscape (2019) *Vegetation Assessment, Mather Reserve Neerabup and Lot 24 Mary Street Wanneroo*, the survey of Mather Reserve partially corresponds with the survey area
- Ecoscape (2009) *Lot 21 Flynn Drive, Neerabup Spring Flora and Vegetation Survey*, partially corresponds with the survey area
- Valentine *et al*. (2009) *Floristic Biodiversity and Vegetation Condition*, broadly corresponds with the survey area
- Wilson *et al.* (2009) *Habitat Loss and Fragmentation*, broadly corresponds with the survey area
- Wilson *et al.* (2012) *Terrestrial mammals of the Gnangara Groundwater System, Western Australia: history, status, and the possible impacts of a drying climate,* partially corresponds with the survey area and provides information on vegetation types present over the Gnangara Groundwater System.

Review of the relevant literature indicates that some of the largest intact areas of vegetation within the Swan Coastal Plain IBRA region overlay the Gnangara Groundwater System (GGS), over which the current survey area is situated (Wilson *et al.* 2009). Vegetation overlying the GGS is dominated by *Banksia* woodlands with stands of *Eucalyptus* and *Allocasuarina*, over mixed understorey shrubs of Myrtaceae, Proteaceae and Fabaceae (Valentine *et al.* 2009; Wilson *et al.* 2012). Scattered wetlands and damplands with *Melaleuca* are also present.

Banksia species are prominent canopy species within the region of the survey area, along with Tuart, Jarrah, Marri, Coastal Blackbutt and *Melaleuca* tree species. *Banksia* woodlands are particularly species rich, with high diversity particularly in the lower vegetation strata (understorey to 0.4 m). Species richness in the GGS area is typically next greatest in Jarrah woodland, followed by Tuart woodland and then *Melaleuca* dominated vegetation (Valentine *et al.* 2009).

Vegetation adjacent to the eastern portion of the current survey area consists primarily of open woodland to low woodland of *Banksia* spp. and *Allocasuarina fraseriana* with Jarrah, over *Xanthorrhoea preissii* (EcoLogical 2013; Ecoscape 2019). Areas of the *Banksia attenuata woodlands over species rich dense shrublands* TEC were identified from the survey along Flynn Drive by EcoLogical (2013). *Banksia* woodland vegetation in the adjacent Mather Reserve was assessed by Ecoscape in 2019 as being in Very Good to Excellent condition. Vegetation partially overlying the western portion of the current study area has previously been characterised as woodland of Tuart, or Jarrah and Marri, over shrubs including *Banksia sessilis* and *Xanthorrhoea preissii*, with condition ratings of Very Good to Degraded (Coffey 2008). A number of conservation significant flora species known from the vicinity of the current survey area are locally or regionally endemic (Valentine *et al.* 2009).

3 METHODS

3.1 GUIDING PRINCIPLES

The flora and vegetation survey was conducted as a detailed survey according to the Flora and Vegetation Technical Guidance (EPA 2016). The EPA considers that a detailed survey requires:

- a comprehensive survey design, including giving consideration to the survey timing that should be conducted during the primary season of survey for the bioregion and disturbance events, and the potential requirement for supplementary surveys
- a minimum of three quadrats (in proportion to the extent of the vegetation unit), located throughout each preliminary vegetation types sampled throughout its geographic range, with additional quadrats and rescoring during supplementary surveys to clarify vegetation unit boundaries
- regional surveys if there is insufficient information available (identified during the desktop assessment) to provide local and regional context
- the survey may include a number of sampling techniques including quadrats, relevés, transects and traverses, as well as opportunistic observations
- the flora inventory should be comprised of data collected from quadrats and relevés, supplemented by opportunistic observations, systematic surveys and targeted inspections of various habitat areas
- it may be appropriate to increase survey effort in areas of unusual habitat
- sampling sites that are placed at representative locations throughout the survey area considering landform, geology, elevation, slope, aspect, surface or groundwater expression and soil type, as well as vegetation structure, composition and condition.

Targeted flora searches were also conducted in areas of habitat suitable for TF and PF identified during the desktop assessment and previous surveys as having potential to occur.

3.2 FLORA AND VEGETATION FIELD SURVEY

3.2.1 FIELD SURVEY METHODS

The methods utilised during the field survey followed those outlined in the Flora and Vegetation Technical Guidance (EPA 2016), conducted as a two phase Detailed survey.

Conservation criteria used in this assessment are included in **Table 14**, **Table 15** and **Table 16** in **Appendix One**.

Survey method details are outlined below.

3.2.1.1 Floristic Quadrats

Floristic quadrat ('quadrat') locations were selected using aerial photography, environmental values and field observations to represent the vegetation values existing at the site. The unmarked quadrats were 10 m x 10 m in dimension, as required according to the Flora and Vegetation Technical Guidance (EPA 2016). Where the vegetation consisted of a narrow linear corridor, quadrats were linear but of the same overall size i.e. 100 m^2.

The following information was collected from within each quadrat:

- observer
- date(s) of assessment

- quadrat/site number
- GPS location (GDA94) of the northwest corner
- digital photograph (spatially referenced with a reference number), taken from the northwest corner, looking diagonally across the quadrat
- broad soil type and colour
- topography
- list of flora species recorded with the average height and total cover within the quadrat for each species
- vegetation description (as per below)
- vegetation condition
- disturbances
- evidence of feral animal activity.

At least three quadrats per vegetation type were recorded for the detailed survey where there was sufficient extent. All quadrat locations are displayed in the **Map 4** series.

3.2.1.2 Targeted Searches

Threatened and Priority Flora identified during the desktop analysis and previous surveys as known or having potential to occur were targeted for searches in areas of potential habitat. Due to the shape and extent of the survey area searches were conducted in potentially suitable habitat of target species, with the remainder of the site opportunistically searched during site traverses.

The locations of all targeted taxa collected were recorded using a handheld GPS with the following data recorded:

- observer, date and time
- reproductive status and other features such as health of plants, percentage flowering and fruiting
- local abundance/population size and/or population boundary, including outside the development envelopes where possible
- landform
- brief vegetation community description
- representative photos of each species and habitat
- collection of representative specimens.

3.2.1.3 Introduced Species

Introduced species (weeds) were recorded during the collection of the overall flora inventory.

3.2.1.4 Vegetation Description and Classification

Vegetation was described from each of the quadrats using the height and estimated cover of dominant and characteristic species of each stratum based on the National Vegetation Information System, recorded at Level V (NVIS Technical Working Group & DotEE 2017) (**Table 17** and **Table 18** in **Appendix One**). Up to three species per stratum from each stratum (upper, mid and ground) were used to formulate vegetation descriptions for each quadrat and each vegetation type.

Vegetation type descriptions were created by combining quadrat descriptions and modifying, where necessary, based on the wider vegetation. Vegetation codes for these were formulated using the most dominant characteristic species within the vegetation type that had >2% cover (i.e. not scattered) if present, with the first series of letter codes referring to the component species (upper case first letter referring to the genus, lower

case one or two letters referring to the species, with the upper case letters at the end referring to the stratum structure e.g. **EmXpHh** refers to ***E****ucalyptus* ***m****arginata,* ***X****anthorrhoea* ***p****reissii* and ***H****ibbertia* ***h****ypericoides* vegetation.

3.2.1.5 Vegetation Condition Assessment

Vegetation condition was assessed broadly and continuously throughout the survey area and at each quadrat using the Vegetation Condition Scale for the Southwest Botanical Province (EPA 2016) (**Table 19** in **Appendix One**). As quadrats are located in the best condition parts of a vegetation type, the condition rating of the quadrat may not match that of the broader vegetation type due to the scale of mapping.

3.2.1.6 Field Survey Timing

The flora and vegetation survey was conducted in two stages, with the initial field survey undertaken 1-2 September and secondary survey conducted 6-7 October 2020. This is within the optimal period for a primary survey within the bioregion according the Flora and Vegetation Technical Guidance (EPA 2016).

3.2.2 STATISTICAL ANALYSIS

3.2.2.1 Post-survey Likelihood Assessment

Following the field survey, a post-survey likelihood assessment was conducted to identify conservation-listed species that have potential to occur on site. This assessment was based on survey effort and habitat known to occur in the survey area, and updated the desktop likelihood assessment.

3.2.2.2 Floristic Analysis

PATN© software (Belbin & Collins 2006) was used to undertake statistical analysis to generate floristic groups using the data collected from the quadrats, in order to better understand local significance of floristic units. PATN analysis has been used for several local floristic analyses including Gibson *et al.* (1994) for the Swan Coastal Plain.

PATN is a multivariate analysis tool that generates estimates of association (resemblance, affinity, distance) between sets of objects described by a suite of variables (attributes), and classifies the objects into groups and condenses the information and displays the patterns in the data graphically. It offers a choice of data transformations prior to multivariate analysis.

Floristic groups, identified using a dendrogram output of the analysis, are used as a tool to inform vegetation type groups at various levels and scales. Interpretation of these purely floristic groups into recognisable and mappable on-ground units is a tool used to identify broad vegetation types. Generally, quadrats that are closely floristically related on the dendrogram form identifiable vegetation units, however, interpretation is frequently required for imperfect results. Vegetation types are therefore determined as a combination of floristic analysis and on-ground interpretation using dominant and characteristic species.

3.2.2.3 Adequacy of Sampling

In order to demonstrate adequacy of sampling, a species accumulation curve was generated by the software Species Diversity and Richness IV (Pisces Conservation Ltd 2010) using random selections of sample order, using quadrat data only. However, for a survey with low intensity sampling, the species inventory is not anticipated to be comprehensive.

4 FIELD SURVEY RESULTS

The flora and vegetation survey was conducted by Terri Jones (Senior Ecologist, Flora Collecting Permit FB62000191; Threatened Flora Collecting Permit TFL 8-2021) and Kyla Pannell (Environmental Scientist, Flora Collecting Permit FB62000261) during 1-2 September and 6-7 October 2020.

4.1 FLORA

Six floristic quadrats were recorded from within the survey area. A total of 175 vascular flora taxa were recorded from 118 genera and 44 families from the quadrats, opportunistic observations and searches for conservation-listed flora. Of these, 46 were introduced (26.2%) and seven taxa (4%) could not be confidently identified to species level due to insufficient diagnostic reproductive material.

The most commonly represented families were Fabaceae (22 taxa), Proteaceae (19) and Myrtaceae (17). The genera recorded most frequently were *Banksia* with six taxa, *Conostylis* (six) and *Acacia* (five).

The number of species per quadrat ranged from 19 in quadrat FD06 to 50 in quadrat FD01, with an average species diversity per quadrat of 35.5 taxa. The most commonly recorded native species within quadrats were *Xanthorrhoea preissii* (recorded from five quadrats), *Mesomelaena pseudostygia*, *Hibbertia hypericoides*, *Hardenbergia comptoniana* and *Desmocladus flexuosus* (each recorded from four quadrats). A number of introduced flora taxa (weed species) were observed across multiple locations, with **Briza maxima*, **Gladiolus caryophyllaceus* and **Hypochaeris glabra* each recorded from four quadrats, and **Ehrharta calycina*, **Euphorbia terracina*, **Sonchus oleraceus, *Lysimachia arvensis* and **Ursinia anthemoides* subsp. *anthemoides* each recorded from three quadrats.

The combined flora inventory is presented in **Table 24** in **Appendix Four**. Quadrat data is presented in **Appendix Five**.

4.1.1 CONSERVATION-LISTED FLORA

Threatened Flora

One Threatened Flora species listed under the Commonwealth EPBC Act and Western Australian BC Act was recorded during the field survey:

- *Grevillea thelemanniana* (T - Critically Endangered [CR] under both the EPBC Act and BC Act).

Locations of TF are indicated on **Map 4B** and described in more detail in **Table 10**.

Priority Flora

Three confirmed species of Priority-listed flora were recorded during the field survey:

- *Conostylis bracteata* (P3)
- *Grevillea olivacea* (P4)
- *Jacksonia sericea* (P4).

A further specimen collected during survey is thought to represent the following Priority-listed species, however presence could not be conclusively confirmed due to the absence of mature flowering material required for diagnostic taxonomic assessment.:

- *Conostylis pauciflora* subsp. *pauciflora* (P4).

Locations of PF are indicated on the **Map 4** series and described in more detail in **Table 10**.

Table 10: TF and PF recorded during the field survey

***Grevillea thelemanniana* (TF)**	
Description: Spreading, lignotuberous shrub, 0.3-1.5 m high. Fl. pink-red, May to Nov. Sand, sandy clay. Winter-wet low-lying flats. (WAH 2020) Within the survey area this species was observed as a dense, low, spreading shrub.  **Photo: L Anderson (WAH 2020)**	**Habitat:** Gentle slope on brown sandy loam, within landscape plantings adjacent to disturbed open Tuart woodland. **Location:** The species was observed opportunistically in an area of what appeared to be landscape plantings. **Survey results**: 1 location record in survey area. **Populations:** A small number of shrubs were present, however, did not appear to be a naturally occurring population based on the density and defined boundary of the population, proximity to developed infrastructure and examination of aerial imagery dated 2010-2013 (Google LLC 2020). The survey site does not fall in the known distribution for the species, however, the taxon is available commercially and commonly used for landscape plantings. **Known records and distribution**: According to *NatureMap* (DBCA 2007-2020) there are 58 records of this species from the Swan Coastal Plain and Jarrah Forest IBRA bioregions, with a narrow distribution extending approximately 75 km south-east of Perth, and isolated records east of Jurien Bay.
***Conostylis bracteata* (P3)**	
Description: Rhizomatous, tufted or shortly proliferous perennial, grass-like or herb, 0.2-0.45 m high. Fl. yellow, Aug to Sep. Sand, limestone. Consolidated sand dunes. Within the survey area this species was observed as a low, tufted herb.  **Photo: Friends of Queens Park Bushland (2011)**	**Habitat:** Flat on pale yellow sandy soils in Jarrah and *Banksia attenuata* woodland. **Location:** Observed in the eastern portion of the survey area, east of Mather Drive on the northern side of Flynn Drive. **Survey results**: 1 record in survey area. **Populations:** Additional individuals are suspected to occur in the vicinity based on availability of habitat and known distribution, likely forming part of a single, naturally-occurring population. **Known records and distribution**: According to *NatureMap* (DBCA 2007-2020) there are 19 records of this species from the Swan Coastal Plain, with a distribution between Perth and 15 km south of Lancelin, extending only 10 km inland from the coast.

***Conostylis pauciflora subsp. pauciflora* (P4)**	
Description: Rhizomatous, stoloniferous perennial, grass-like or herb, 0.1-0.35 m high. Fl. yellow, Aug to Oct. Grey sand, limestone. Hillslopes, consolidated dunes (WAH 2020). Within the survey area individuals believed to represent this species were observed as a small tufted herb. 	**Habitat:** Gentle slope on brown sandy loam, within open Tuart woodland with shrubs and grasses. **Location:** Likely representative specimens were observed at three quadrats across the western half of the survey area. **Survey results**: 3 records in survey area. **Populations:** Additional individuals may occur in the vicinity based on availability of habitat, likely forming part of a single, naturally-occurring population. **Known records and distribution**: According to *NatureMap* (DBCA 2007-2020) there are 22 records of this species extending 180 km along the western Swan Coastal Plain from Two Rocks to Yalgorup, inland as far as Waroona.
***Grevillea olivacea* (P4)**	
Description: Erect, non-lignotuberous shrub, 1-4.5 m high. Fl. red/red-pink, Jun to Sep. White or grey sand. Coastal dunes, limestone rocks (WAH 2020). Within the survey area this species was observed as a tall, spreading shrub.  **Photo: M Brundrett & SD Hopper (WAH 2020)**	**Habitat:** Gentle slope on brown sandy loam, within open Tuart woodland with shrubs and grasses. **Location:** Observed in an area of woodland with apparent supplementary plantings in the western third of the survey area, on the southern side of Flynn Drive. **Survey results**: 1 record in survey area. **Populations:** The record is thought to be a planted individual and not representative of a natural population as the survey site does not fall in the known distribution for the species and individuals of other taxa utilised for revegetation plantings were observed nearby. The taxon is available commercially and commonly used for landscape plantings, and property immediately adjacent to the survey boundary appeared to have been managed for aesthetic enhancement as evidenced by weed control and evenly spaced presence of common landscape/rehabilitation species. An occurrence of this taxon observed in the vicinity during previous survey by Coffey (2008) was also identified as being planted for beautification purposes. **Known records and distribution**: According to *NatureMap* (DBCA 2007-2020) there are 29 records of this species from the Swan Coastal Plain between Geraldton and Regan's Ford approximately 90 km north of Wanneroo.

***Jacksonia sericea* (P4)**	
Description: Low spreading shrub, to 0.6 m high. Fl. orange, usually Dec or Jan to Feb. Calcareous & sandy soils (WAH 2020). Within the survey area this species was observed as a prostrate, mat-like shrub to 0.3 m high and 1 m wide.  	**Habitat:** Gentle slope on brown sandy loam, within open Tuart woodland with shrubs and grasses. **Location:** Individuals were recorded from bushland and adjacent to fence and firebreak in the central third of the survey area, both north and south of Flynn Drive. **Survey results**: 6 location records in survey area. **Populations:** The individuals are likely to form part of a single, naturally-occurring population. **Known records and distribution**: According to *NatureMap* (DBCA 2007-2020) there are 88 records of this species from the Swan Coastal Plain between Mandurah, Armadale and Carabooda.

4.1.2 OTHER SIGNIFICANT FLORA

No flora taxa having other significance according to the Flora and Vegetation Technical Guidance (EPA 2016) were recorded during the field survey.

4.1.3 INTRODUCED FLORA

A total of 46 introduced flora species (weeds) were recorded during the field survey (**Table 25**, **Appendix Four**), representing 26.2% of the overall flora inventory. Weed taxa were recorded at varying densities within the survey area, with low cover (<1%) of weed species recorded at quadrats FD01, FD02 and FD03, however high cover (25-95%) observed at quadrats FD04, FD05 and FD06. The dominant weeds noted at the latter quadrats were **Avena barbata* (Bearded Oat), **Ehrharta calycina* (Perennial Veldt), **Euphorbia terracina* (Geraldton Carnation Weed), **Euphorbia peplus* (Petty Spurge), **Eragrostis curvula* (African Lovegrass) and **Oxalis pes-caprae* (Soursob). The high burden of these species, along with presence of the Weed of National Significance (WoNS) Bridal Creeper (**Asparagus asparagoides*) at multiple locations west of quadrat FD05 contributed significantly to vegetation condition assessment. Photographic examples of weeds observed on site are shown in **Images 1** and **2.**

Image 1: ***Ehrharta calycina*** **(Perennial Veldt) and** ****Euphorbia terracina*** **(Geraldton Carnation Weed)**

Image 2: ****Asparagus asparagoides*** **(Bridal Creeper) within native vegetation**

4.2 VEGETATION

4.2.1 VEGETATION TYPES

Two distinct vegetation types were recorded from within the survey area based on a combination of structural vegetation type as identified in the field, floristic analysis (see **Section 4.2.2**) and subsequent desktop review. These vegetation units (**Table 11**, **Map 4** series) are broadly described as:

- **EmBaAf** - *Eucalyptus marginata*, *Banksia attenuata* and *Allocasuarina fraseriana* mid woodland
- **EgBsJs** - *Eucalyptus gomphocephala* mid open woodland over *Banksia sessilis* and *Jacksonia sternbergiana* shrubs.

Table 11: Vegetation types

Landform	Mapping unit	Vegetation type	Floristic quadrats	Representative photograph	Other characteristic species	Area (ha) and extent (%)
Undulating Plain	**EmBaAf**	*Eucalyptus marginata*, *Banksia attenuata* and *Allocasuarina fraseriana* mid woodland over *Xanthorrhoea preissii* mid open shrubland over *Hibbertia hypericoides* and *Mesomelaena pseudostygia* low sparse shrubland and sedges.	FD01 FD02 FD03		*Alexgeorgea nitens, Adenanthos cygnorum, Allocasuarina fraseriana, Banksia attenuata, Banksia menziesii, Burchardia congesta, Caladenia flava* subsp. *flava, Conostephium pendulum, Daviesia triflora, Desmocladus flexuosus, Drosera erythrorhiza, Drosera macrantha, Eucalyptus marginata, Hibbertia hypericoides, Lepidobolus preissianus, Lomandra preissii, Mesomelaena pseudostygia, Petrophile linearis, Pimelea sulphurea, Rytidosperma occidentale, Stirlingia latifolia, Stylidium androsaceum, Stylidium piliferum, Thysanotus* sp. Coastal plain (N.H. Brittan 66/63), *Xanthorrhoea preissii*.	3.41 ha 16.61%
Undulating Plain	**EgBsJs**	*Eucalyptus gomphocephala* mid open woodland over *Banksia sessilis, Jacksonia sternbergiana* and *Xanthorrhoea preissii* tall open shrubland over exotic grassland.	FD04 FD05 FD06		*Acacia saligna, Acanthocarpus preissii, Banksia sessilis, Caladenia latifolia, Conostylis ? pauciflora* subsp. *pauciflora, Corynotheca micrantha, Dianella revoluta, Eucalyptus gomphocephala, Hardenbergia comptoniana, Jacksonia sternbergiana, Phyllanthus calycinus Styphelia propinqua, Tricoryne elatior, Xanthorrhoea preissii.*	6.59 ha 32.10%
		Cleared / Not Vegetated			9.64 ha	46.95%
		Revegetation / Landscape Planting			0.89 ha	4.34%
		TOTAL EXTENT			**20.54 ha**	**100%**

4.2.2 VEGETATION SIGNIFICANCE

4.2.2.1 TECs and PECs

Vegetation observed within the survey area was found to correspond at least in part with several TEC/PECs identified during desktop assessment, namely:

- *Banksia woodlands of the Swan Coastal Plain* (Priority 3(iii) PEC; Endangered TEC)
- *Banksia attenuata woodland over species rich dense shrublands* (Endangered TEC).

Structure and species assemblages from the **EmBaAf** vegetation unit north of Flynn Drive and east of Mather Drive were observed during the survey to be general consistent with criteria defined for these TEC/PECs, specifically:

- upper storey generally dominated or co-dominated by *Banksia attenuata* with emergent Jarrah and *Allocasuarina fraseriana*
- assessed to be in Very Good or Excellent condition and in excess of the 1 ha minimum patch size
- containing a species-rich understorey including characteristic species *(Adenanthos cygnorum, Bossiaea eriocarpa, Conostephium pendulum, Daviesia* spp.*, Eremaea pauciflora, Hibbertia hypericoides, Jacksonia* spp.*, Kunzea glabrescens, Petrophile linearis, Phlebocarya ciliata, Philotheca spicata, Stirlingia latifolia, and Xanthorrhoea preissii).*

Of note, the general dominance of *Banksia attenuata* within the vegetation was observed by field botanists during the survey, however, this is not clearly reflected in foliage cover data recorded for all quadrats in this vegetation unit, likely due to quadrat placement.

No further TECs were recorded during the survey. Although the key dominant canopy species characteristic of the EPBC-listed *Tuart (Eucalyptus gomphocephala) Woodlands and Forests of the Swan Coastal Plain* TEC was present throughout much of the survey area, vegetation recorded during the field survey was assessed to be of lesser condition rating and patch size than is required in order to satisfy inclusion criteria for this TEC (**Table 21**). Similarly, despite presence of some key species, vegetation in the survey area is not considered to be the *Northern Spearwood shrublands and woodlands* PEC as the heath vegetation structure described as a requirement (Species and Communities Programs; DBCA 2020) was not observed within the survey area.

4.2.2.2 Other Significant Vegetation

No other presence of significant vegetation was recorded during field survey.

4.2.3 FLORISTIC ANALYSIS

The floristic analysis dendrogram (**Figure 3**) indicates two distinct floristic groups based on the quadrats surveyed. The grouping of quadrats in analysis aligns with vegetation units observed in the field. The first grouping (QFD01-03) corresponds with *Banksia attenuata* woodland, with the second grouping (QRD04-06) corresponding with *Eucalyptus gomphocephala* (Tuart) woodland.

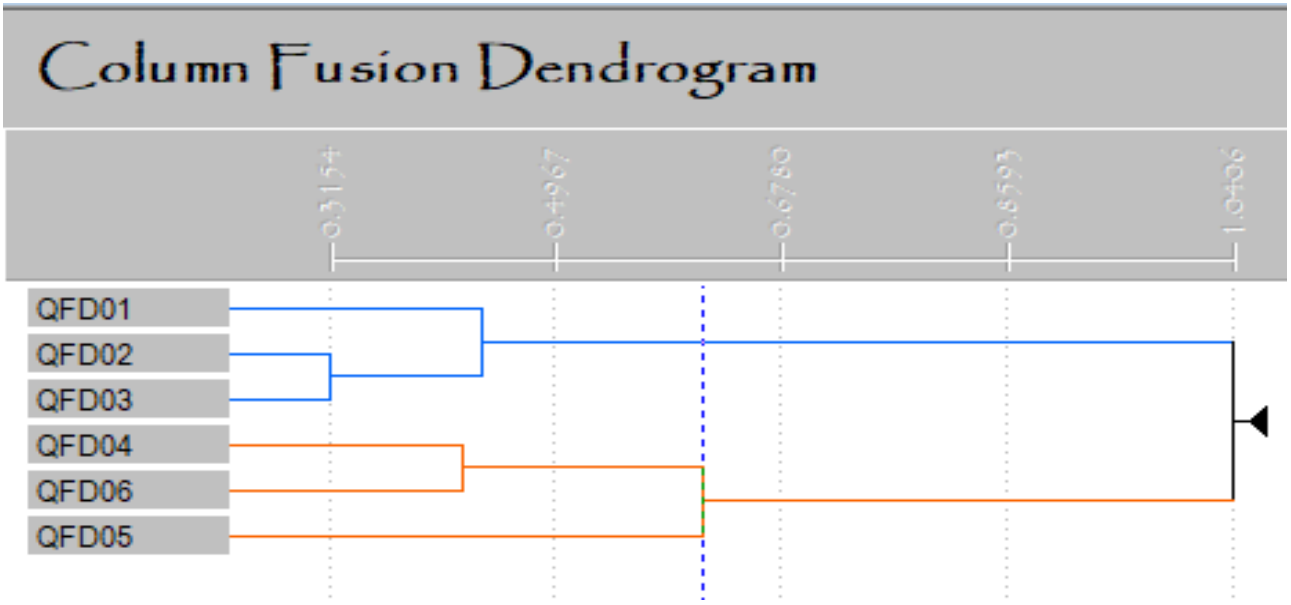

Figure 3: Floristic analysis dendrogram

4.2.4 VEGETATION CONDITION

The vegetation condition within the survey area ranged from Degraded to Excellent condition, with the majority of vegetation unit **EmBaAf** in Excellent condition and vegetation type **EgBsJs** predominantly in Degraded to Good condition (**Table 12**). The main factors affecting vegetation condition were weed burden and type, and degradation through human disturbance with the presence of rubbish.

Table 12: Vegetation condition

Vegetation condition	Extent (ha)	Proportion (%)
Pristine	0.00	0.00
Excellent	1.18	5.74
Very Good	1.34	6.52
Good	3.93	19.13
Degraded-Good	3.06	14.90
Degraded	1.35	6.57
Completely Degraded	0.00	0.00
Cleared/Not vegetated	9.64	46.93

4.2.5 ADEQUACY OF SURVEY

Adequacy of survey can be demonstrated using a species accumulation curve; if the curve has reached (or almost reached) an asymptote it is considered that most species are likely to have been recorded from the survey area. However, it should not be expected that a low intensity flora and vegetation survey would record a complete flora inventory.

A species accumulation curve was generated using quadrat data (**Figure 4**). Opportunistic observations, which increase the number of species recorded, are not included in the analysis.

The species accumulation curve suggests that additional quadrats would be required to reach an asymptote. However, the Bootstrap estimation of total species richness based on this data is calculated as 133.3 species when applied to the *Species Diversity and Richness IV* software (Pisces Conservation Ltd 2010). When

opportunistic records are included, a total of 175 taxa were recorded from the survey area which exceeds the Bootstrap estimation of species richness. Therefore, the survey area is considered to have been adequately sampled.

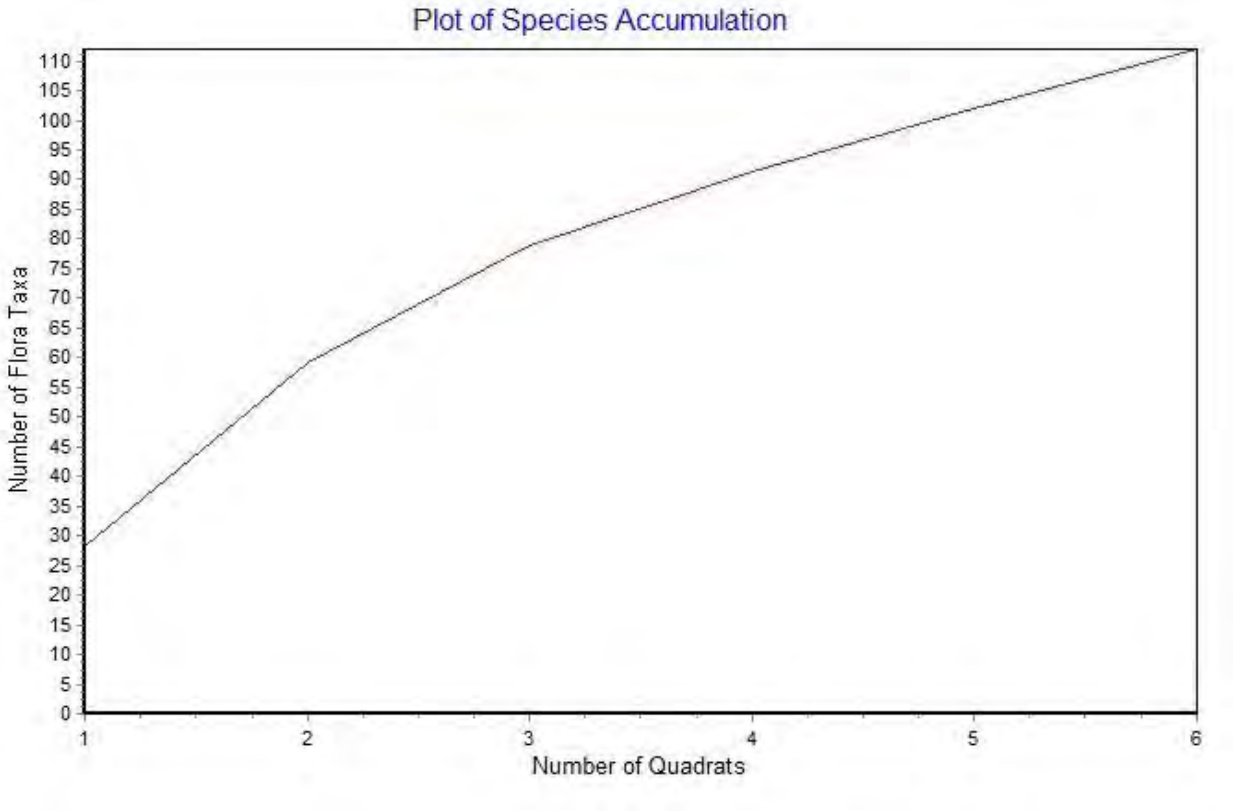

Figure 4: Species accumulation curve

Quadrat species richness may also indicate adequacy of survey. The average species richness from the quadrats recorded during this survey was 35.5 taxa per quadrat. Quadrat species richness may be influenced by factors including vegetation type, condition, season, rainfall, and landform, therefore provides only a broads frame of reference. The quadrat species richness from this survey is comparable with that recorded from similar vegetation in nearby Wanneroo reserves previously, including Mather Reserve and Lot 24 Mary Street which were surveyed in 2016 and 2018 and found to have average diversity of between 27.6 and 37.6 species over the two survey periods (Ecoscape 2019).

Quadrat species richness within the Banksia woodland vegetation unit of the current survey ranged from 44 to 53 taxa per quadrat, which is slightly lower than the average of 55.2 reported for this vegetation community by Gibson *et al.* (1994), potentially due to the low rainfall experienced for this area in the period prior to survey (**Figure 5**). The Tuart woodland sections of the survey area were more degraded and variable in level of disturbance, and are thus less comparable with Gibson *et al.*, however, richness results (ranging from 19 to 37 taxa per quadrat) are not unexpected given vegetation type, condition and position adjacent to a major roadway.

4.2.6 BOTANICAL LIMITATIONS

Survey design: Quadrat-based flora and vegetation survey with traverses searching for conservation significant flora. Results from previous surveys were considered as part of survey design and the desktop assessment.

Survey type: Detailed flora and vegetation survey conducted over two sampling phases, incorporating searches for significant flora. All areas were adequately surveyed through the use of floristic quadrats to sample vegetation types, and searches for conservation significant flora.

Type of vegetation classification system: Vegetation was classified at NVIS Level V (NVIS Technical Working Group & DotEE 2017) using largely structural vegetation types, defined using dominant and characteristic species and vegetation structure as recorded during the field surveys. Floristic analysis was used to identify major floristic groups.

Survey timing was within the optimal period for the bioregion, however poor seasonal conditions preceding the field survey as a consequence of below average rainfall were considered to be a minor constraint.

A full summary of botanical limitations is presented in **Table 13**.

Table 13: Botanical limitations

Possible limitations	Constraints (yes/no): Significant, moderate or negligible	Comment
Availability of contextual information at a regional and local scale	No	A number of previous studies have been conducted in the vicinity of the survey area in similar habitat, providing contextual information for interpretation of survey findings.
Competence/experience of the team conducting the survey, including experience in the bioregion surveyed	No	The ecologist leading the botanical field survey has over 10 years' experience with flora and vegetation surveys, including numerous surveys on the Swan Coastal Plain bioregion.
Proportion of the flora recorded and/or collected, and any identification issues	Negligible	175 vascular flora taxa were recorded during the field survey of which 4% could not be identified with certainty to species level due to the lack of diagnostic reproductive material. This is considered to be adequate identification for a Detailed level of flora and vegetation survey.
Was the appropriate area fully surveyed (effort and extent)	No	The survey area was covered sufficiently to develop a thorough understanding of the flora and vegetation. The area was traversed on foot within narrow corridors at two separate stages of survey.
Access restrictions within the survey area	No	The entire survey area was easily accessible on foot.
Survey timing, rainfall, season of survey	Moderate	The field survey was conducted during September and October, which is considered within the optimal period for botanical survey in the Swan Coastal Plain Bioregion. The rainfall in the six months prior to the field survey was below average at 68% of long-term average rainfall levels for the period (**Figure 2, Figure 5**). The seasonal conditions may represent a constraint for the number of annual or ephemeral taxa recorded.
Disturbance that may have affected the results of the survey e.g. fire, flood, clearing	No	There were no recent disturbances that would have affected the results of the survey. None of the survey area had been recently burnt.

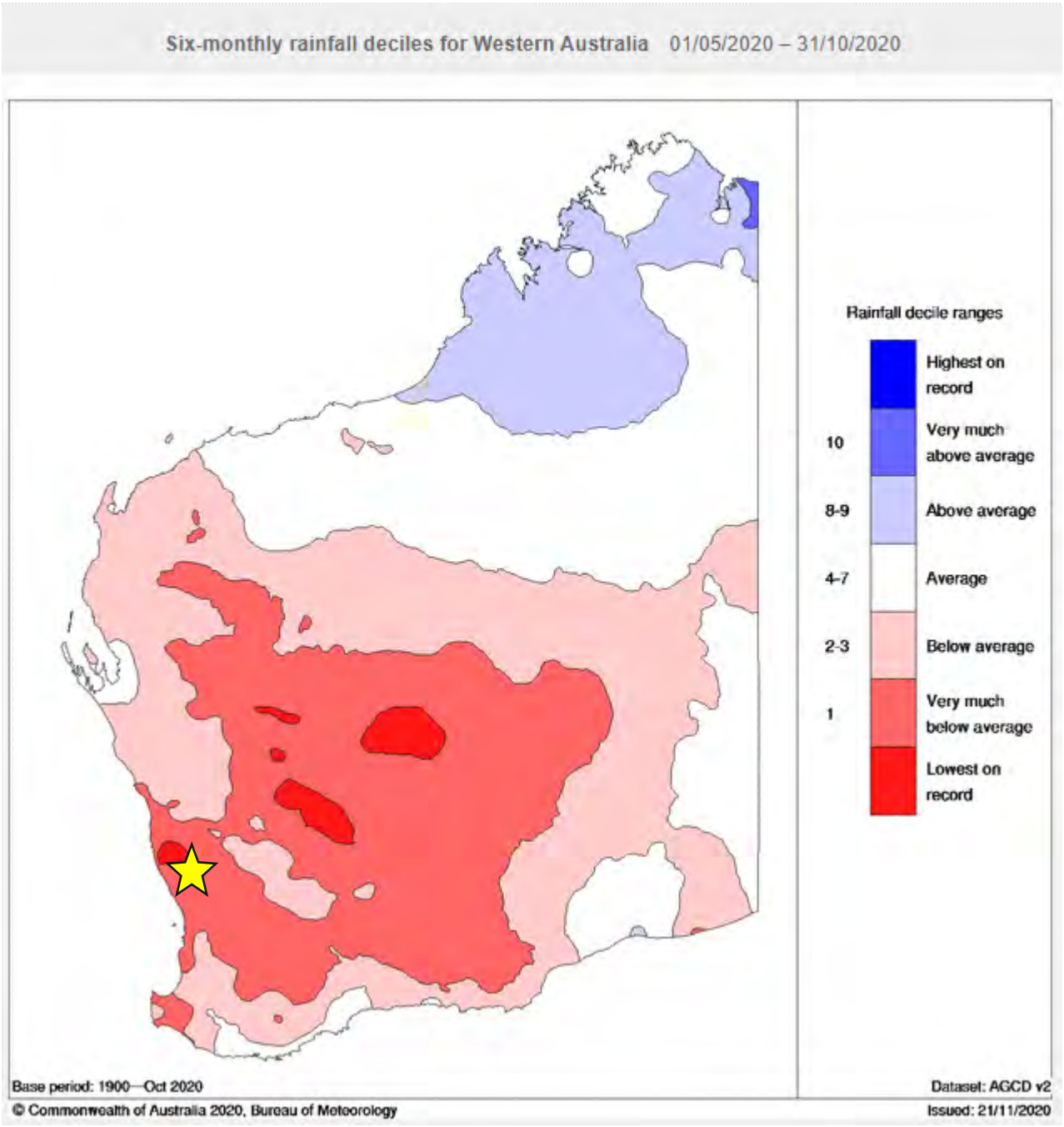

Figure 5: Rainfall deciles for the 6 months prior to the field survey (the star indicates the approximate survey area location)

5 DISCUSSION

5.1 FLORA SIGNIFICANCE

Overall, 175 vascular flora species were recorded from within the survey area during the field survey. The species accumulation curve, when taking opportunistic observations into account, indicates that the survey area was adequately surveyed.

5.1.1 CONSERVATION-LISTED FLORA

Threatened Flora

One Threatened Flora species listed under the Commonwealth EPBC Act and Western Australian BC Act was recorded during the field survey:

- *Grevillea thelemanniana* (Critically Endangered under both the EPBC Act and BC Act).

The species was observed opportunistically in an area of what appeared to be landscape plantings. The survey area does not fall within the typical natural distribution for this species and cultivated plants of this taxa are commonly used in commercial landscaping and revegetation plantings, therefore, it is likely that this occurrence is due to aesthetic or vegetation enhancement works undertaken.

Priority Flora

Collections of four species of Priority-listed flora (or potential Priority-listed flora) were recorded during the field survey:

- *Conostylis bracteata* (P3)
- *Conostylis pauciflora* subsp. *pauciflora* (P4)
- *Grevillea olivacea* (P4)
- *Jacksonia sericea* (P4).

Both *Conostylis bracteata* and *Conostylis pauciflora* subsp. *pauciflora* are known from similar habitats to those observed during field survey, with 19 and 22 existing DBCA records respectively, and the survey area falls within the distribution range for the taxa. These taxa have been recorded from the Gnangara Groundwater System area and are considered locally endemic to the Perth IBRA subregion of the Swan Coastal Plain (Valentine et al. 2009; WAH 2020). The survey record for *Conostylis bracteata* is likely to represent a population not yet recognised on *NatureMap* (DBCA 2007-2020), however, does not represent a range extension and given suitability of habitat it is likely that further individuals exist within the adjacent reserve. Individuals of *Conostylis ?pauciflora* subsp. *pauciflora* recorded during the current survey could not be identified to species level with certainty as confirmation requires the presence of diagnostic flowering material not available at the time of survey, however, suitability of habitat and the scattered distribution of plants recorded during survey would suggest a population extends into adjacent woodland.

The *Grevillea olivacea* recorded from field survey was observed as a large, single shrub situated in an area of Tuart woodland with evidence of supplementary planting, likely for revegetation or enhancement purposes. As the taxa is not known to be naturally distributed within 90 km of the survey area and the taxon is readily available through tree stockists and nurseries, it is considered likely that this record represents a planted individual or garden escapee. An occurrence of this taxon observed in the vicinity during previous survey by Coffey (2008) was also identified as being planted for beautification purposes.

Records of *Jacksonia sericea* during survey were located north and south of Flynn Drive in the central third of the survey area. A total of 136 plants were recorded across six locations, with the plants potentially forming part of a larger population contiguous with a previous record from 2001 (identified from DBCA database search results **Section 2.2.5**) located approximately 300 m from the survey area. This taxon is known from the Gnangara Groundwater System area and is considered locally endemic to the Perth IBRA subregion of the Swan Coastal Plain (Valentine et al. 2009; WAH 2020).

5.1.1.1 Post-survey Likelihood Assessment

The likelihood of conservation significant flora occurring in the survey area was revised following the field survey. This revised likelihood, that took into account vegetation condition, grazing and other disturbances, actual habitat availability and search effort, is included in **Table 23** in **Appendix Three**. No further PF or TF species identified by the database searches, other than those recorded during field survey, are considered likely to occur.

5.1.1.2 Introduced Flora

A total of 46 weed taxa were recorded from field survey. One of these (**Asparagus asparagoides* – Bridal Creeper) is a WoNS and was recorded at multiple locations within Tuart woodland. Several other species (see **Section 4.1.3**), whilst not WoNS taxa, present a heavy weed burden in sections of the survey area and are likely contributing to degradation of in vegetation in these areas.

5.2 VEGETATION SIGNIFICANCE

Based on a combination of species composition and vegetation structure, two native vegetation types were identified as occurring in the survey area:

- **EmBaAf** - *Eucalyptus marginata*, *Banksia attenuata* and *Allocasuarina fraseriana* mid woodland
- **EgBsJs** - *Eucalyptus gomphocephala* mid open woodland over *Banksia sessilis* and *Jacksonia sternbergiana.*

Floristic analysis confirmed the distinction of these vegetation types.

5.2.1 LOCAL AND REGIONAL ASSESSMENT OF VEGETATION SIGNIFICANCE

Interrogation of the Approved conservation advice for the *Banksia woodlands of the Swan Coastal Plain* TEC (TSSC 2016) describes the requirements for inclusion in this TEC **(Appendix Two)**. Vegetation of the **EmBaAf** vegetation type positioned east of Mather Drive and north of Flynn Drive is considered to represent the Banksia Woodlands TEC based on these requirements in conjunction with characteristics observed in the field. The **EmBaAf** vegetation type is also considered representative of the *Banksia attenuata woodland over species rich dense shrublands* TEC/PEC.

The **EmBaAf** vegetation type was mapped across 3.14 ha of the survey area, however only a 1.09 ha patch (as shown on **Map 4**) is considered to fulfil the TEC criteria for condition and patch size, representing 5.3% of the total survey area.

5.2.2 VEGETATION CONDITION

The vegetation of the survey area ranged in condition from Degraded, in areas of Tuart woodland close to roads and informal access tracks, to Excellent with no obvious signs of disturbance in wider portions of *Banksia* and Jarrah woodland (**Map 6**).

Much of the Tuart woodland was impacted by high weed burden, with presence of significant weeds in some locations. Areas of disturbance and rubbish deposition were also observed. This is reflected in the condition ratings as mapped. Several areas of sandy soils which appeared to have been previously cleared were essentially devoid of vegetation and are mapped as such.

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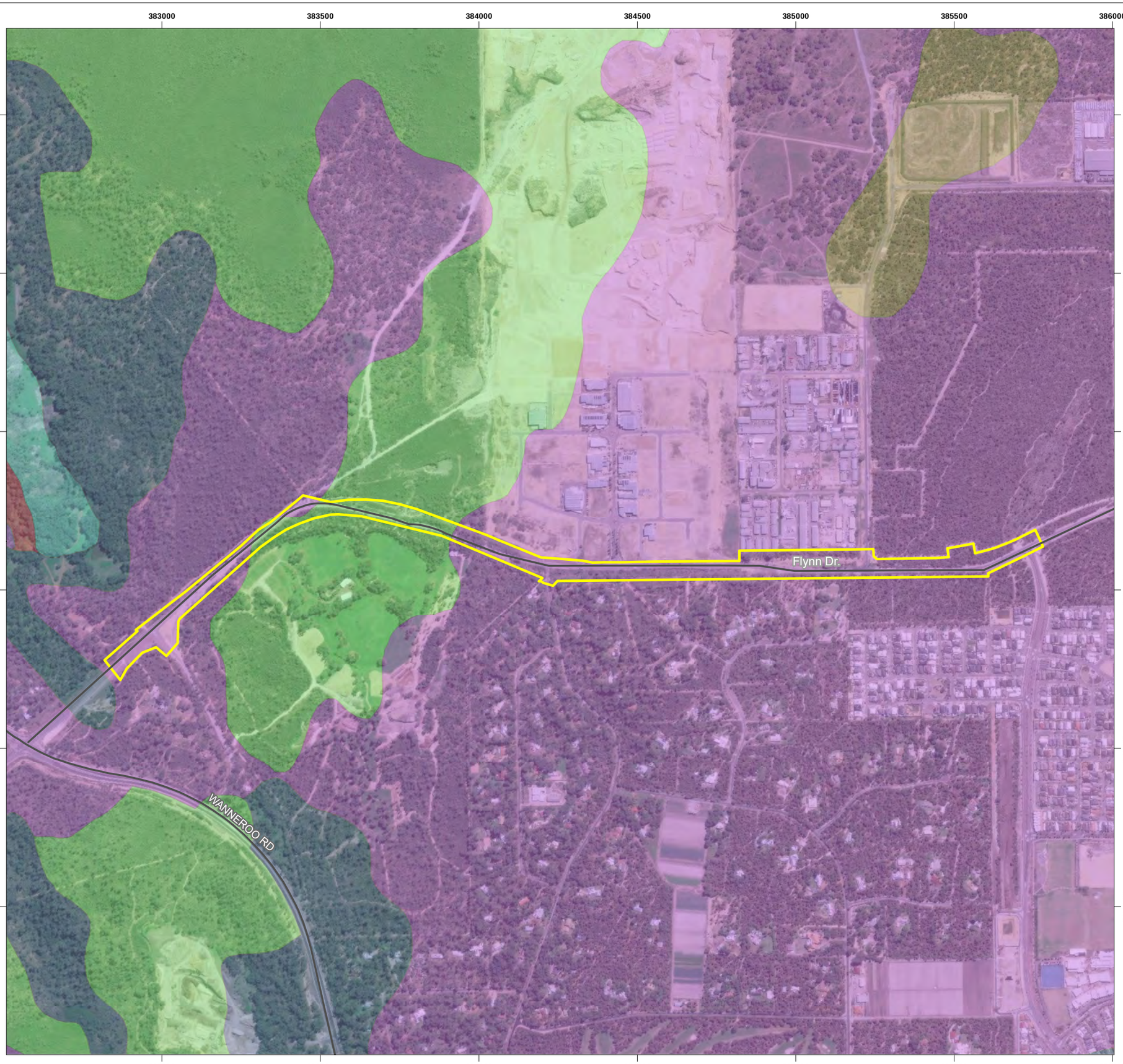
MAPS



LEGEND

- Survey Area
- Roads

Land System

- Karrakatta Sand Grey Phase: Low hilly to gently undulating terrain. Iron podzols. *Banksia* spp woodland with *E. todtiana* and *depauperata*, *E. marginata*; dense shrub layer.
- Karrakatta Sand Yellow Phase: Low hilly to gently undulating terrain. Yellow sand over limestone at 1-2 m. *Banksia* spp. woodland with scattered emergent *E. gomphocephala* and *E. marginata* and a dense shrub layer.
- Karrakatta shallow soils Phase: Low hills and ridges. Bare limestone or shallow siliceous or calcareous sand over limestone. Dense low shrub dominated by *Dryandra sessilis*, *Melaleuca huegellii* and species of *Grevillea*.
- Spearwood Sand Phase: Irregular banks of karst depressions. Some limestone outcrop. Shallow brown sands. *Banksia* spp. woodland with emergent *E. gomphocephala* and *E. marginata*; dense shrub layer.
- Spearwood wet, lake Phase: Lake
- Spearwood, Beonaddy Sand Phase: Flat terrain fringing water in base of karst depressions; light grey sand with water table within 2m; *E rudis, B. littoralis* and *Melaleuca* spp; *Typha* spp. near waters edge.

DATASOURCES:
SOURCE DATA: SOIL LANDSCAPE MAPPING - BEST AVAILABLE (DPIRD-027)
AERIAL: ESRI BASEMAP (2019)
BASEMAP: GEOSCIENCE AUSTRALIA
SERVICE LAYERS: SOURCE: ESRI, MAXAR, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRID, IGN, AND THE GIS USER COMMUNITY

ecoscape

SOIL LANDSCAPE MAPPING

FLYNN DRIVE SPRING BIOLOGICAL SURVEY 2020

City of Wanneroo

COORDINATE SYSTEM: GDA 1994 MGA ZONE 50
PROJECTION: TRANSVERSE MERCATOR
DATUM: GDA 1994
UNITS: METER

N

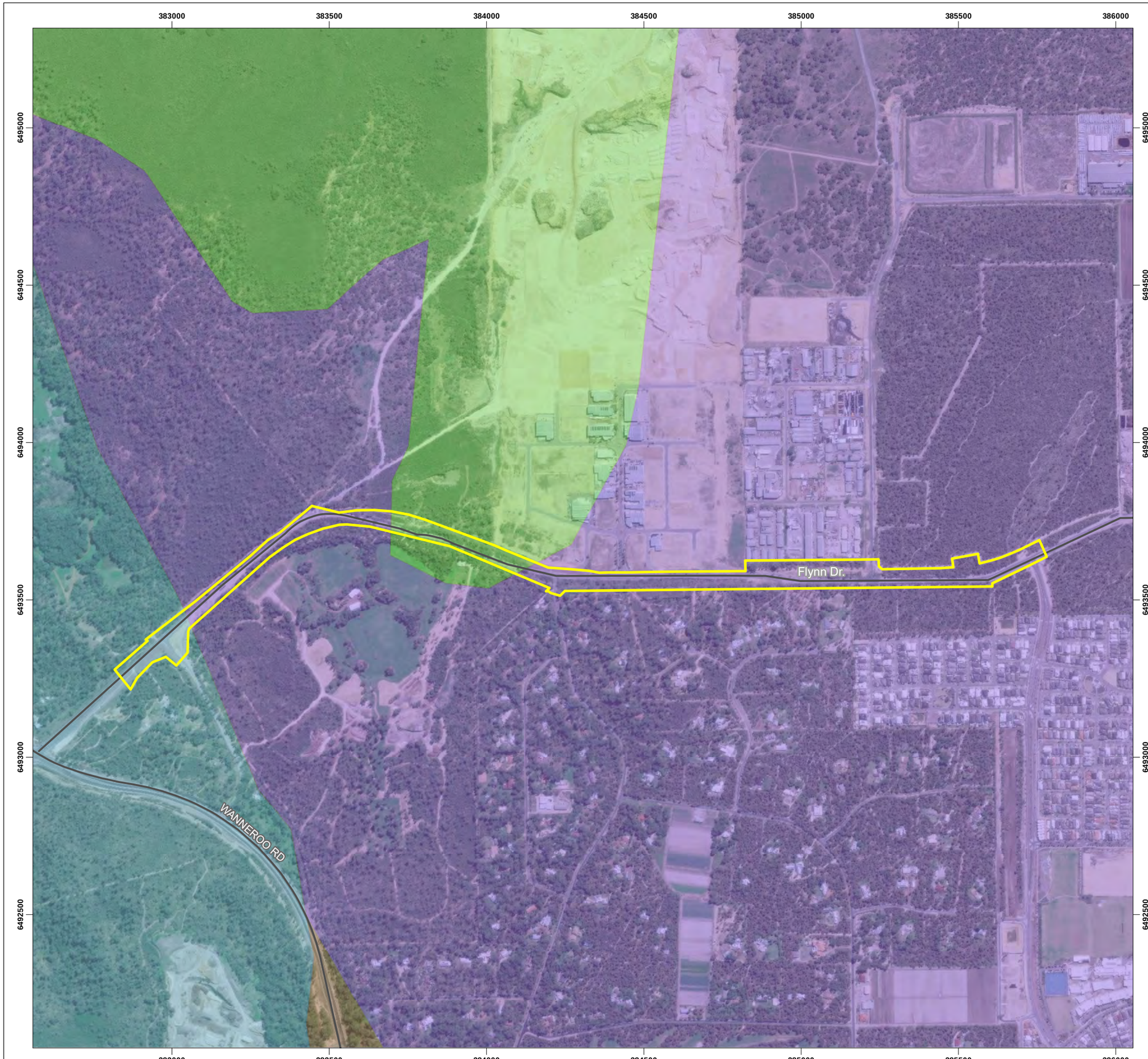
SCALE: 1:12,000 @ A3

0 0.1 0.2 0.3 0.4 0.5 km

PROJECT NO: 4544-20

REV	AUTHOR	APPROVED	DATE
00	KP	SB	27/11/2020

MAP 01



LEGEND

- Survey Area
- Roads

System Association

- Spearwood 6: Woodland southwest
- Spearwood 37: Thicket
- Spearwood 949: Low woodland or open low woodland
- Spearwood 998: Woodland southwest

DATASOURCES:
SOURCE DATA: PRE-EUROPEAN VEGETATION (DPIRD-006)
AERIAL: ESRI BASEMAP (2019)
BASEMAP: GEOSCIENCE AUSTRALIA
SERVICE LAYERS: SOURCE: ESRI, MAXAR, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRID, IGN, AND THE GIS USER COMMUNITY

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PRE-EUROPEAN VEGETATION ASSOCIATIONS

FLYNN DRIVE SPRING BIOLOGICAL SURVEY 2020

City of Wanneroo

COORDINATE SYSTEM: GDA 1994 MGA ZONE 50
PROJECTION: TRANSVERSE MERCATOR
DATUM: GDA 1994
UNITS: METER

N

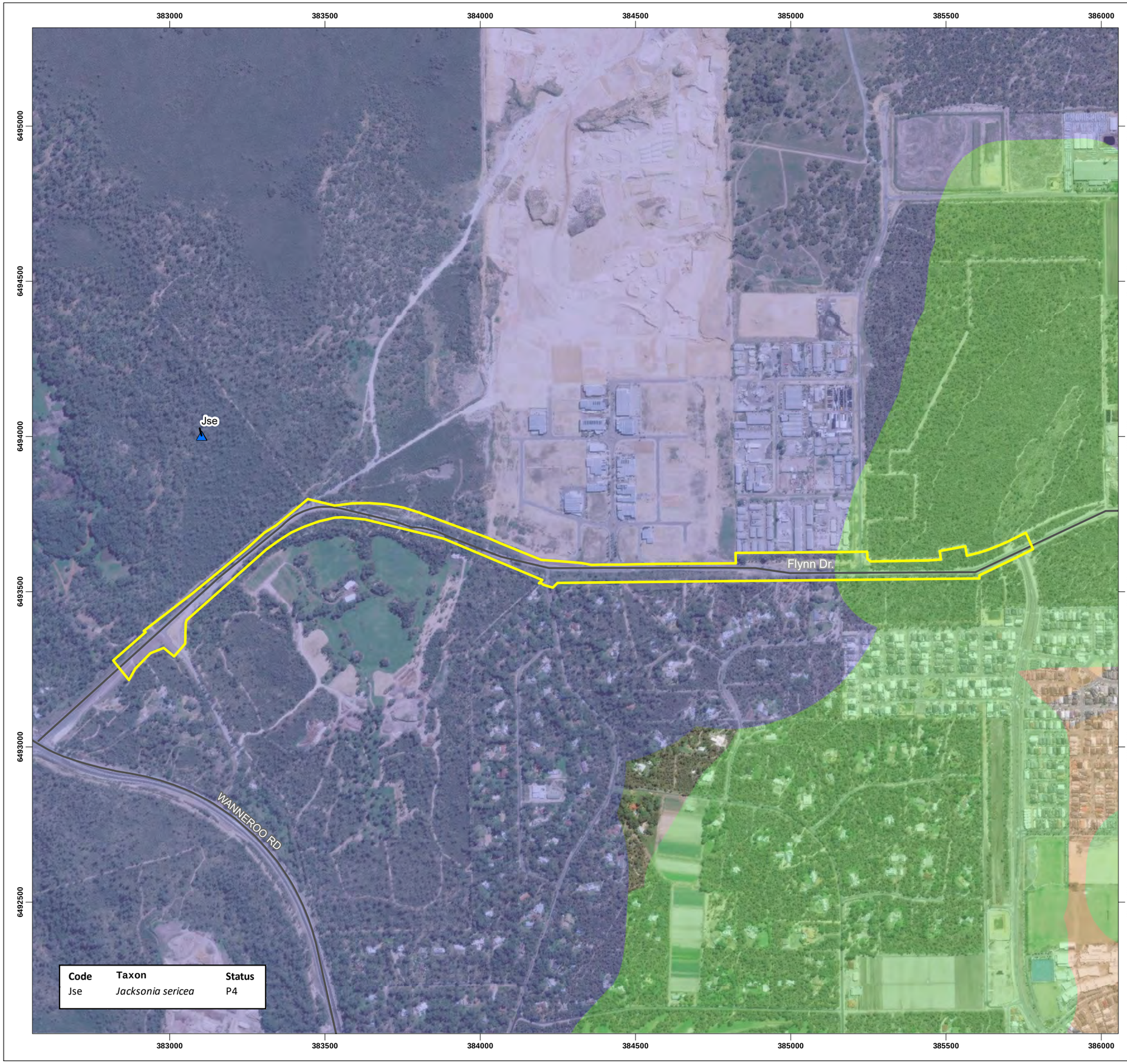
SCALE: 1:12,000 @ A3

0 0.1 0.2 0.3 0.4 0.5 km

PROJECT NO: 4544-20

REV	AUTHOR	APPROVED	DATE
00	KP	SB	27/11/2020

MAP 02



LEGEND

- Survey Area
- Roads

Conservation Significant Flora (DBCA 2020)

- Priority 1
- Priority 2
- Priority 3
- Priority 4
- Threatened

TEC/PEC

- *Banksia* Dominated Woodlands of the Swan Coastal Plain IBRA Region
- *Banksia attenuata* woodlands over species rich dense shrublands (floristic community type 20a as originally described in Gibson et al. (1994))
- Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain

DATA SOURCES:
SOURCE DATA: TEC/PEC, CS FLORA AND FAUNA (DBCA 2020)
AERIAL: ESRI BASEMAP (2019)
BASEMAP: GEOSCIENCE AUSTRALIA
SERVICE LAYERS: SOURCE: ESRI, MAXAR, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRID, IGN, AND THE GIS USER COMMUNITY

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FLORA & COMMUNITIES DATABASE SEARCH RESULTS

FLYNN DRIVE SPRING BIOLOGICAL SURVEY 2020

City of Wanneroo

COORDINATE SYSTEM: GDA 1994 MGA ZONE 50
PROJECTION: TRANSVERSE MERCATOR
DATUM: GDA 1994
UNITS: METER

N

SCALE: 1:12,000 @ A3

0 0.1 0.2 0.3 0.4 0.5 km

PROJECT NO: 4544-20

REV	AUTHOR	APPROVED	DATE
00	KP	SB	27/11/2020

MAP 03

382800 382900 383000 383100 383200 383300 383400 383500 383600

6493900 6493800 6493700 6493600 6493500 6493400 6493300 6493200

Cpa
QFD04
Go
Flynn Dr

Code	Taxon	Status
Cpa	*Conostylis ?pauciflora* subsp. *pauciflora*	P4
Cbr	*Conostylis bracteata*	P3
Jse	*Jacksonia sericea*	P4
Go	*Grevillea olivacea*	P4
Gth	*Grevillea thelemanniana*	T

LEGEND

- Survey Area
- Roads
- Quadrats

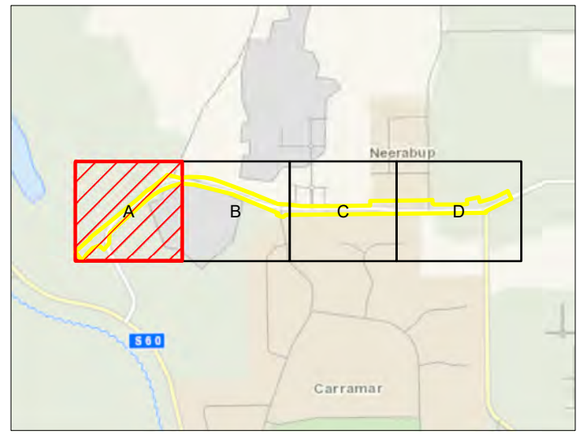
Conservation Significant Flora

- Priority 3
- Priority 4
- Threatened

Vegetation Unit

- *Eucalyptus gomphocephala* mid open woodland over *Banksia sessilis*, *Jacksonia sternbergiana* and *Xanthorrhoea preissii* tall open shrubland over exotic grassland
- *Eucalyptus marginata*, *Banksia attenuata* and *Allocasuarina fraseriana* mid woodland over *Xanthorrhoea preissii* mid open shrubland over *Hibbertia hypericoides* and *Mesomelaena pseudostygia* low sparse shrubland and sedges
- Revegation/Landscape planting
- Cleared/Not vegetated
- Vegetation Consistent with *Banksia Woodland* TECs

DATASOURCES:
SOURCE DATA: TRANSPORT ROAD CENTRELINES (MRWA 2012)
AERIAL: ESRI BASEMAP (2019)
BASEMAP: GEOSCIENCE AUSTRALIA
SERVICE LAYERS: SOURCE: ESRI, MAXAR, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRID, IGN, AND THE GIS USER COMMUNITY



ecoscape

VEGETATION UNITS, QUADRAT LOCATIONS & CS FLORA

FLYNN DRIVE SPRING BIOLOGICAL SURVEY 2020

City of Wanneroo

COORDINATE SYSTEM: GDA 1994 MGA ZONE 50
PROJECTION: TRANSVERSE MERCATOR
DATUM: GDA 1994
UNITS: METER

N

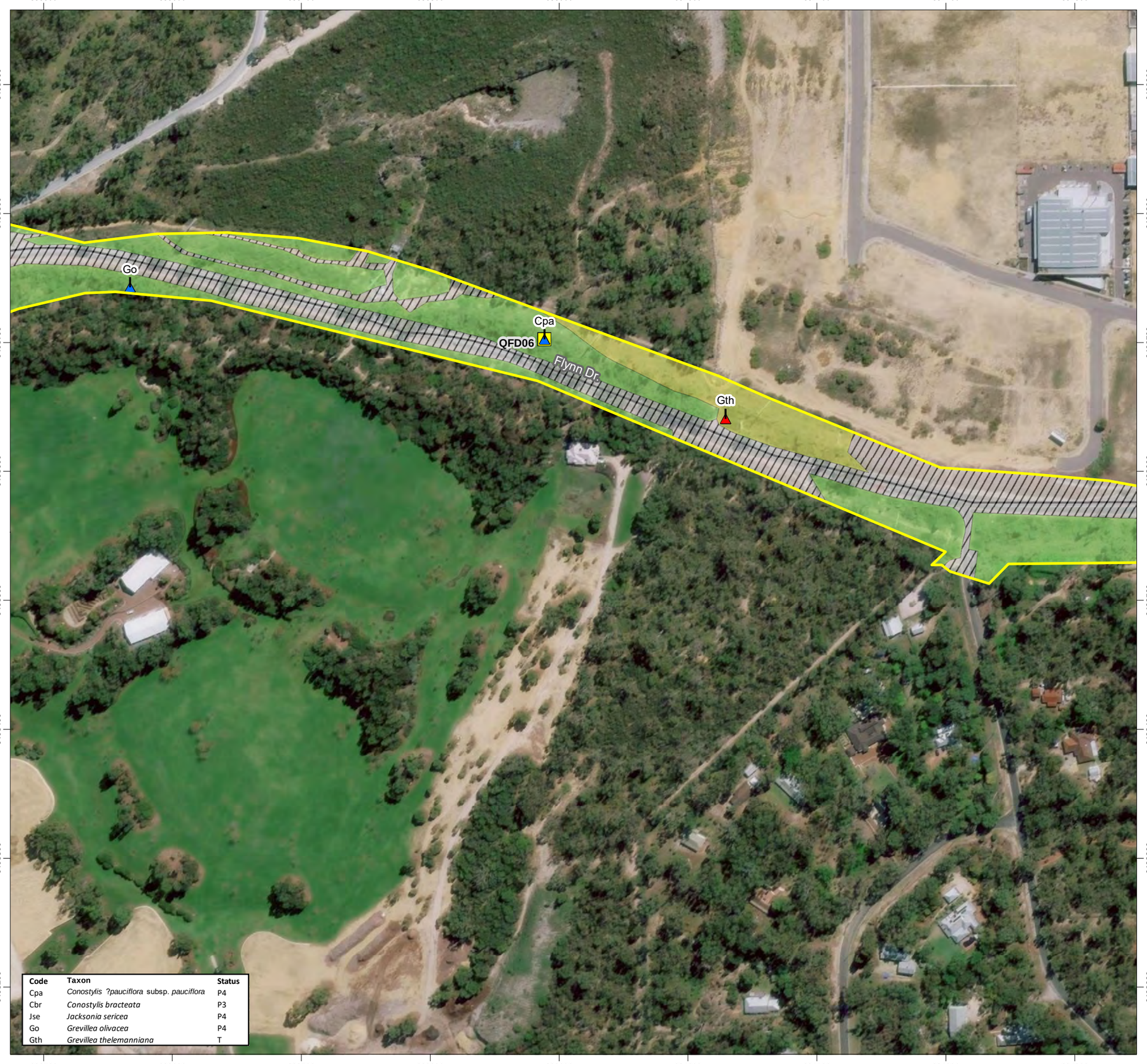
SCALE: 1:3,000 @ A3

0 25 50 75 100 m

PROJECT NO: 4544-20

REV	AUTHOR	APPROVED	DATE
00	KP	SB	27/11/2020

MAP 4A



Code	Taxon	Status
Cpa	*Conostylis ?pauciflora* subsp. *pauciflora*	P4
Cbr	*Conostylis bracteata*	P3
Jse	*Jacksonia sericea*	P4
Go	*Grevillea olivacea*	P4
Gth	*Grevillea thelemanniana*	T

LEGEND

- Survey Area
- Roads
- Quadrats

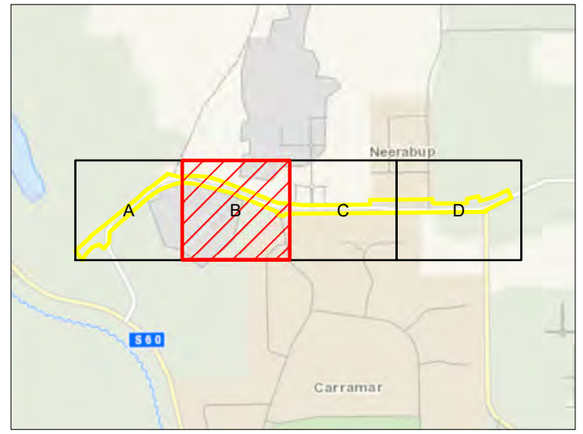
Conservation Significant Flora

- Priority 3
- Priority 4
- Threatened

Vegetation Unit

- *Eucalyptus gomphocephala* mid open woodland over *Banksia sessilis*, *Jacksonia sternbergiana* and *Xanthorrhoea preissii* tall open shrubland over exotic grassland
- *Eucalyptus marginata*, *Banksia attenuata* and *Allocasuarina fraseriana* mid woodland over *Xanthorrhoea preissii* mid open shrubland over *Hibbertia hypericoides* and *Mesomelaena pseudostygia* low sparse shrubland and sedges
- Revegation/Landscape planting
- Cleared/Not vegetated
- Vegetation Consistent with *Banksia Woodland* TECs

DATASOURCES:
SOURCE DATA: TRANSPORT ROAD CENTRELINES (MRWA 2012)
AERIAL: ESRI BASEMAP (2019)
BASEMAP: GEOSCIENCE AUSTRALIA
SERVICE LAYERS: SOURCE: ESRI, MAXAR, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRID, IGN, AND THE GIS USER COMMUNITY



ecoscape

VEGETATION UNITS, QUADRAT LOCATIONS & CS FLORA

FLYNN DRIVE SPRING BIOLOGICAL SURVEY 2020

City of Wanneroo

COORDINATE SYSTEM: GDA 1994 MGA ZONE 50
PROJECTION: TRANSVERSE MERCATOR
DATUM: GDA 1994
UNITS: METER

N

SCALE: 1:3,000 @ A3

0 25 50 75 100 m

PROJECT NO: 4544-20

REV	AUTHOR	APPROVED	DATE
00	KP	SB	27/11/2020

MAP 4B

Code	Taxon	Status
Cpa	*Conostylis ?pauciflora* subsp. *pauciflora*	P4
Cbr	*Conostylis bracteata*	P3
Jse	*Jacksonia sericea*	P4
Go	*Grevillea olivacea*	P4
Gth	*Grevillea thelemanniana*	T

LEGEND

- Survey Area
- Roads
- Quadrats

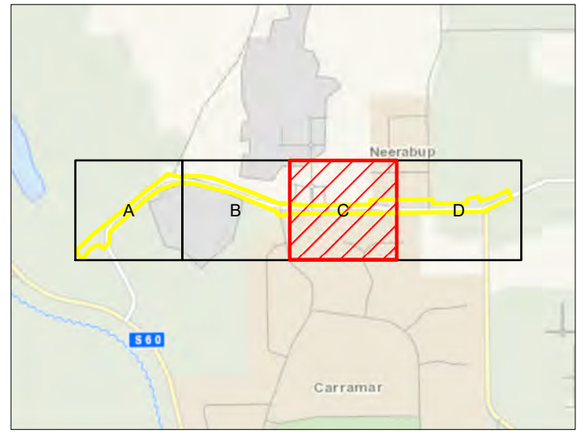
Conservation Significant Flora

- Priority 3
- Priority 4
- Threatened

Vegetation Unit

- *Eucalyptus gomphocephala* mid open woodland over *Banksia sessilis*, *Jacksonia sternbergiana* and *Xanthorrhoea preissii* tall open shrubland over exotic grassland
- *Eucalyptus marginata*, *Banksia attenuata* and *Allocasuarina fraseriana* mid woodland over *Xanthorrhoea preissii* mid open shrubland over *Hibbertia hypericoides* and *Mesomelaena pseudostygia* low sparse shrubland and sedges
- Revegation/Landscape planting
- Cleared/Not vegetated
- Vegetation Consistent with *Banksia Woodland* TECs

DATASOURCES:
SOURCE DATA: TRANSPORT ROAD CENTRELINES (MRWA 2012)
AERIAL: ESRI BASEMAP (2019)
BASEMAP: GEOSCIENCE AUSTRALIA
SERVICE LAYERS: SOURCE: ESRI, MAXAR, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRID, IGN, AND THE GIS USER COMMUNITY



ecoscape

VEGETATION UNITS, QUADRAT LOCATIONS & CS FLORA

FLYNN DRIVE SPRING BIOLOGICAL SURVEY 2020

City of Wanneroo

COORDINATE SYSTEM: GDA 1994 MGA ZONE 50
PROJECTION: TRANSVERSE MERCATOR
DATUM: GDA 1994
UNITS: METER

N

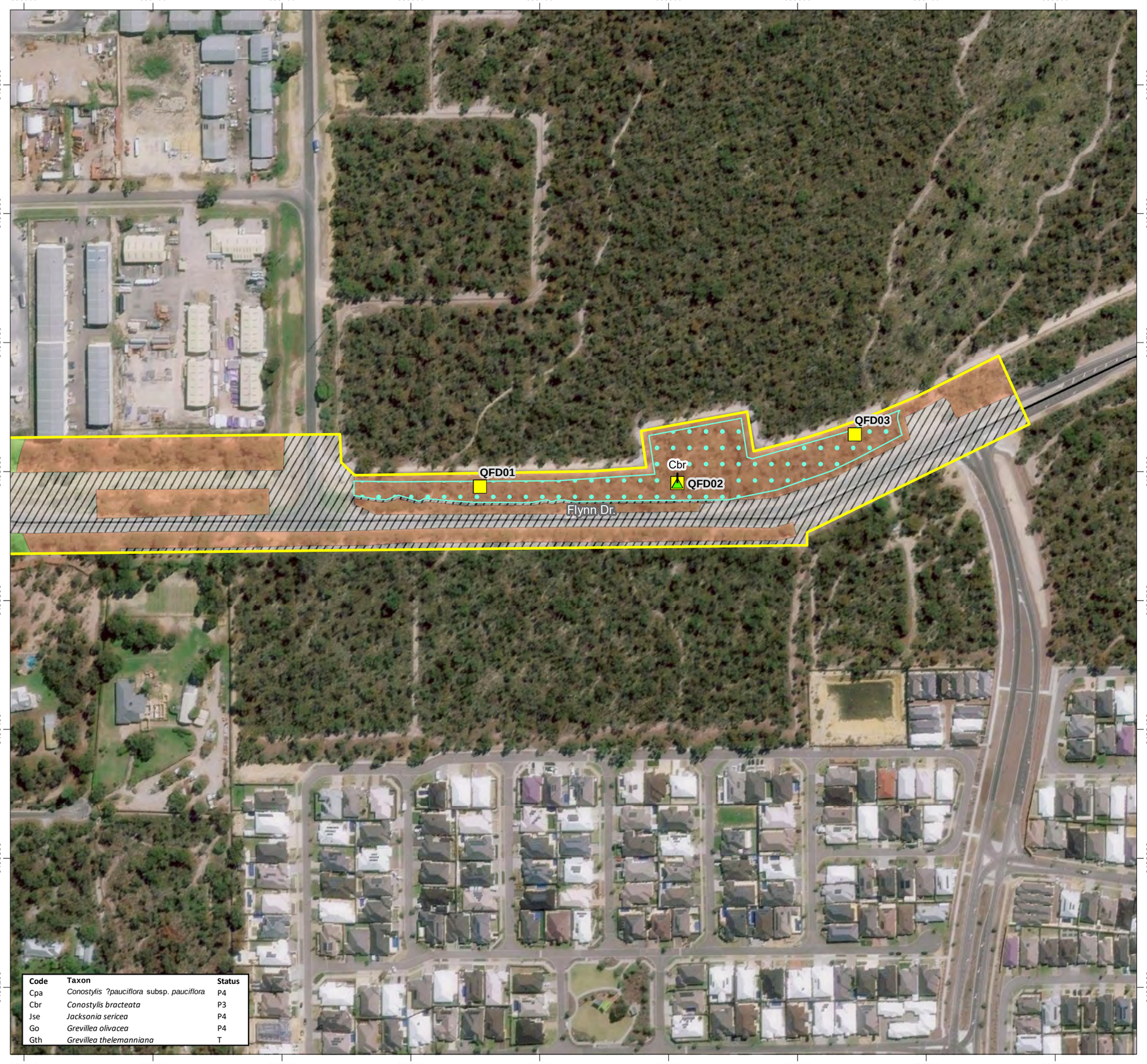
SCALE: 1:3,000 @ A3

0 25 50 75 100 m

PROJECT NO: 4544-20

REV	AUTHOR	APPROVED	DATE
00	KP	SB	27/11/2020

MAP 4C



Code	Taxon	Status
Cpa	*Conostylis ?pauciflora* subsp. *pauciflora*	P4
Cbr	*Conostylis bracteata*	P3
Jse	*Jacksonia sericea*	P4
Go	*Grevillea olivacea*	P4
Gth	*Grevillea thelemanniana*	T

LEGEND

- Survey Area
- Roads
- Quadrats

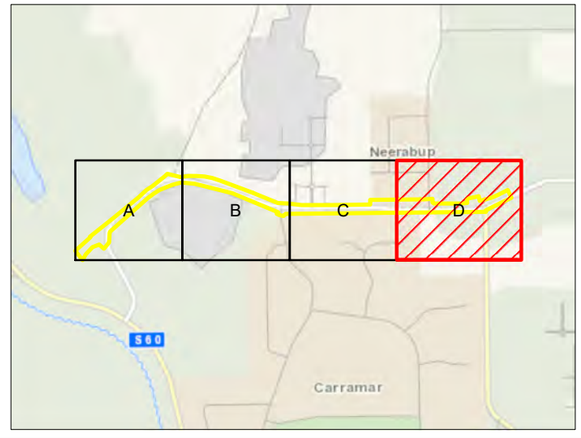
Conservation Significant Flora

- Priority 3
- Priority 4
- Threatened

Vegetation Unit

- *Eucalyptus gomphocephala* mid open woodland over *Banksia sessilis*, *Jacksonia sternbergiana* and *Xanthorrhoea preissii* tall open shrubland over exotic grassland
- *Eucalyptus marginata*, *Banksia attenuata* and *Allocasuarina fraseriana* mid woodland over *Xanthorrhoea preissii* mid open shrubland over *Hibbertia hypericoides* and *Mesomelaena pseudostygia* low sparse shrubland and sedges
- Revegation/Landscape planting
- Cleared/Not vegetated
- Vegetation Consistent with *Banksia Woodland* TECs

DATASOURCES:
SOURCE DATA: TRANSPORT ROAD CENTRELINES (MRWA 2012)
AERIAL: ESRI BASEMAP (2019)
BASEMAP: GEOSCIENCE AUSTRALIA
SERVICE LAYERS: SOURCE: ESRI, MAXAR, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRID, IGN, AND THE GIS USER COMMUNITY



ecoscape

VEGETATION UNITS, QUADRAT LOCATIONS & CS FLORA

FLYNN DRIVE SPRING BIOLOGICAL SURVEY 2020

City of Wanneroo

COORDINATE SYSTEM: GDA 1994 MGA ZONE 50
PROJECTION: TRANSVERSE MERCATOR
DATUM: GDA 1994
UNITS: METER

N

SCALE: 1:3,000 @ A3

0 25 50 75 100 m

PROJECT NO: 4544-20

REV	AUTHOR	APPROVED	DATE
00	KP	SB	27/11/2020

MAP
4D

382800 382900 383000 383100 383200 383300 383400 383500 383600

6493900 6493800 6493700 6493600 6493500 6493400 6493300 6493200

Flynn Dr

LEGEND

- Survey Area
- Roads

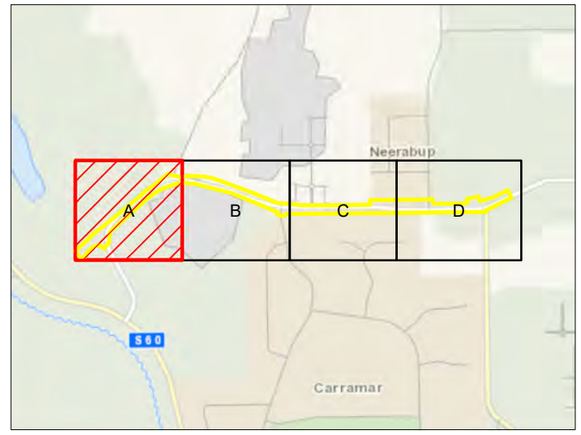
Significant Weeds

- *Asparagus asparagoides*

Vegetation Condition

- Excellent
- Very Good
- Good
- Degraded-Good
- Degraded
- Cleared/Not vegetated

DATA SOURCES :
AERIAL: ESRI BASEMAP (2019)
BASEMAP: GEOSCIENCE AUSTRALIA
SERVICE LAYERS: SOURCE: ESRI, MAXAR, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRID, IGN, AND THE GIS USER COMMUNITY



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VEGETATION CONDITION AND SIGNIFICANT WEED LOCATIONS

FLYNN DRIVE SPRING BIOLOGICAL SURVEY 2020

City of Wanneroo

COORDINATE SYSTEM: GDA 1994 MGA ZONE 50
PROJECTION: TRANSVERSE MERCATOR
DATUM: GDA 1994
UNITS: METER

N

SCALE: 1:3,000 @ A3

0 25 50 75 100 m

PROJECT NO: 4544-20

REV	AUTHOR	APPROVED	DATE
00	KP	SB	27/11/2020

MAP 5A

LEGEND

- Survey Area
- Roads

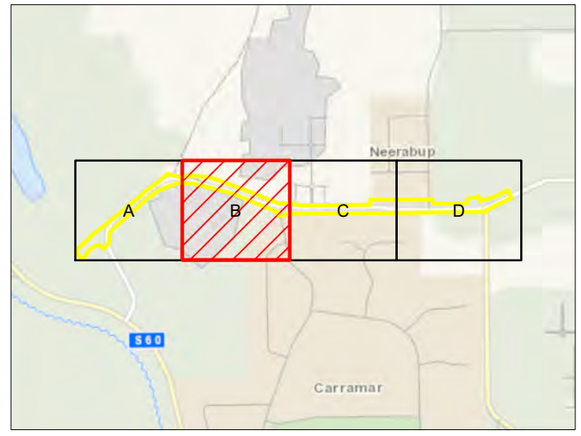
Significant Weeds

- *Asparagus asparagoides*

Vegetation Condition

- Excellent
- Very Good
- Good
- Degraded-Good
- Degraded
- Cleared/Not vegetated

DATA SOURCES :
AERIAL: ESRI BASEMAP (2019)
BASEMAP: GEOSCIENCE AUSTRALIA
SERVICE LAYERS: SOURCE: ESRI, MAXAR, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRID, IGN, AND THE GIS USER COMMUNITY



ecoscape

VEGETATION CONDITION AND SIGNIFICANT WEED LOCATIONS

FLYNN DRIVE SPRING BIOLOGICAL SURVEY 2020

City of Wanneroo

COORDINATE SYSTEM: GDA 1994 MGA ZONE 50
PROJECTION: TRANSVERSE MERCATOR
DATUM: GDA 1994
UNITS: METER

N

SCALE: 1:3,000 @ A3

0 25 50 75 100 m

PROJECT NO: 4544-20

REV	AUTHOR	APPROVED	DATE
00	KP	SB	27/11/2020

MAP 5B

LEGEND

- Survey Area
- Roads

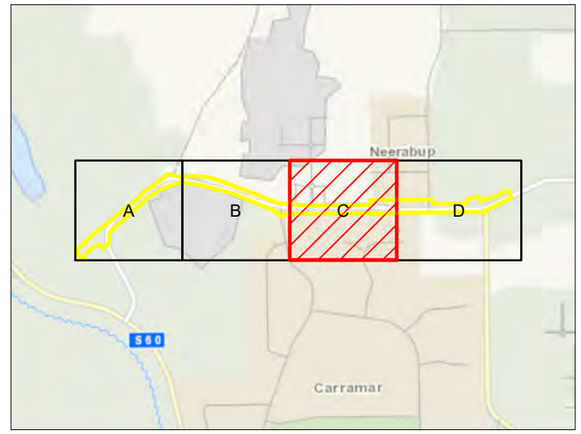
Significant Weeds

- *Asparagus asparagoides*

Vegetation Condition

- Excellent
- Very Good
- Good
- Degraded-Good
- Degraded
- Cleared/Not vegetated

DATA SOURCES :
AERIAL: ESRI BASEMAP (2019)
BASEMAP: GEOSCIENCE AUSTRALIA
SERVICE LAYERS: SOURCE: ESRI, MAXAR, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRID, IGN, AND THE GIS USER COMMUNITY



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VEGETATION CONDITION AND SIGNIFICANT WEED LOCATIONS

FLYNN DRIVE SPRING BIOLOGICAL SURVEY 2020

City of Wanneroo

COORDINATE SYSTEM: GDA 1994 MGA ZONE 50
PROJECTION: TRANSVERSE MERCATOR
DATUM: GDA 1994
UNITS: METER

N

SCALE: 1:3,000 @ A3

0 25 50 75 100 m

PROJECT NO: 4544-20

REV	AUTHOR	APPROVED	DATE
00	KP	SB	27/11/2020

MAP
5C

LEGEND

- Survey Area
- Roads

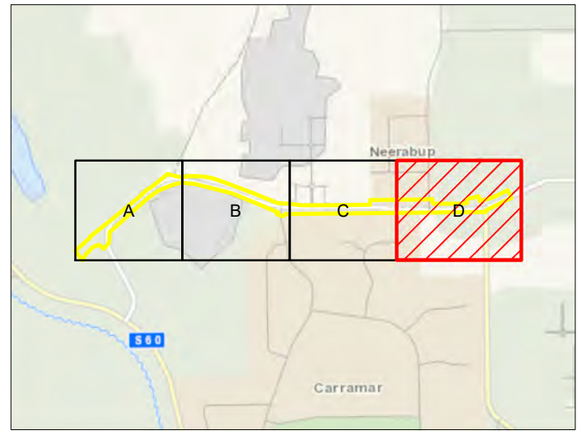
Significant Weeds

- *Asparagus asparagoides*

Vegetation Condition

- Excellent
- Very Good
- Good
- Degraded-Good
- Degraded
- Cleared/Not vegetated

DATA SOURCES :
AERIAL: ESRI BASEMAP (2019)
BASEMAP: GEOSCIENCE AUSTRALIA
SERVICE LAYERS: SOURCE: ESRI, MAXAR, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRID, IGN, AND THE GIS USER COMMUNITY



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VEGETATION CONDITION AND SIGNIFICANT WEED LOCATIONS

FLYNN DRIVE SPRING BIOLOGICAL SURVEY 2020

City of Wanneroo

COORDINATE SYSTEM: GDA 1994 MGA ZONE 50
PROJECTION: TRANSVERSE MERCATOR
DATUM: GDA 1994
UNITS: METER

N

SCALE: 1:3,000 @ A3

0 25 50 75 100 m

PROJECT NO: 4544-20

REV	AUTHOR	APPROVED	DATE
00	KP	SB	27/11/2020

MAP
5D

APPENDIX ONE DEFINITIONS AND CRITERIA

Table 14: EPBC Act categories for flora, fauna and ecological communities

Category	Threatened species	Threatened Ecological Communities
Extinct	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.	n/a
Extinct in the wild	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.	n/a
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.	An ecological community 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.	An ecological community 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.	An ecological community 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	A native species is eligible to be included in the conservation dependent category at a particular time if, at that time: (a) 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; or (b) the following subparagraphs are satisfied: (i) the species is a species of fish; (ii) the species is the focus of a plan of management that provides for management actions necessary to stop the decline of, and support the recovery of, the species so that its chances of long-term survival in nature are maximised; (iii) the plan of management is in force under a law of the Commonwealth or of a State or Territory; (iv) cessation of the plan of management would adversely affect the conservation status of the species.	n/a

Table 15: Conservation codes for Western Australian flora and fauna (DBCA 2019b)

Conservation Codes for Western Australian Flora and Fauna	
Threatened, Extinct and Specially Protected fauna or flora[1] are species[2] which have been adequately searched for and are deemed to be, in the wild, threatened, extinct or in need of special protection, and have been gazetted as such. **The *Wildlife Conservation (Specially Protected Fauna) Notice 2018* and the *Wildlife Conservation (Rare Flora) Notice 2018* have been transitioned under regulations 170, 171 and 172 of the *Biodiversity Conservation Regulations 2018* to be the lists of Threatened, Extinct and Specially Protected species under Part 2 of the *Biodiversity Conservation Act 2016*.** **Categories of Threatened, Extinct and Specially Protected fauna and flora are:**	
T	**Threatened species** Listed by order of the Minister as Threatened in the category of critically endangered, endangered or vulnerable under section 19(1), or is a rediscovered species to be regarded as threatened species under section 26(2) of the *Biodiversity Conservation Act 2016* (BC Act). Threatened fauna is that subset of 'Specially Protected Fauna' listed under schedules 1 to 3of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for Threatened Fauna. Threatened flora is that subset of 'Rare Flora' listed under schedules 1 to 3of the *Wildlife Conservation (Rare Flora) Notice 2018* for Threatened Flora. The assessment of the conservation status of these species is based on their national extent and ranked according to their level of threat using IUCN Red List categories and criteria as detailed below.
CR	**Critically endangered species** 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*". Listed as critically endangered undersection 19(1)(a) of the BC Act in accordance with the criteria set out in section 20 and the ministerial guidelines. Published under schedule 1 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for critically endangered fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for critically endangered flora.
EN	**Endangered species** 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*". Listed as endangered under section 19(1)(b) of the BC Act in accordance with the criteria set out in section 21 and the ministerial guidelines. Published under schedule 2 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for endangered fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for endangered flora.
VU	**Vulnerable species** 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*". Listed as vulnerable undersection 19(1)(c) of the BC Act in accordance with the criteria set out in section 22 and the ministerial guidelines. Published under schedule 3of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for vulnerable fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for vulnerable flora.
Extinct species **Listed by order of the Minister as extinct under section 23(1) of the BC Act as extinct or extinct in the wild.**	
EX	**Extinct species** Species where "*there is no reasonable doubt that the last member of the species has died*", and listing is otherwise in accordance with the ministerial guidelines (section 24 of the BC Act). Published as presumed extinct under schedule 4of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for extinct fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for extinct flora.
EW	Extinct in the wild species Species that "*is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; and it has not been recorded in its known habitat or expected habitat, at appropriate seasons, anywhere in its past range, despite surveys over a time frame appropriate to its life cycle and form*", and listing is otherwise in accordance with the ministerial guidelines (section 25of the BC Act). Currently there are no threatened fauna or threatened flora species listed as extinct in the wild. If listing of a species as extinct in the wild occurs, then a schedule will be added to the applicable notice.
Specially protected species **Listed by order of the Minister as specially protected under section 13(1) of the BC Act. Meeting one or more of the following categories: species of special conservation interest; migratory species; cetaceans; species subject to international agreement; or species otherwise in need of special protection.** **Species that are listed as threatened species (critically endangered, endangered or vulnerable) or extinct species under the BC Act cannot also be listed as Specially Protected species.**	

Conservation Codes for Western Australian Flora and Fauna	
MI	**Migratory species** Fauna that periodically or occasionally visit Australia or an external Territory or the exclusive economic zone; or the species is subject of an international agreement that relates to the protection of migratory species and that binds the Commonwealth; and listing is otherwise in accordance with the ministerial guidelines (section 15of the BC Act). Includes birds that are subject to an agreement between the government of Australia and the governments of Japan (JAMBA), China (CAMBA) and The Republic of Korea (ROKAMBA), and fauna subject to the *Convention on the Conservation of Migratory Species of Wild Animals* (Bonn Convention), an environmental treaty under the United Nations Environment Program. Migratory species listed under the BC Act are a subset of the migratory animals that are known to visit Western Australia, protected under the international agreements or treaties, excluding species that are listed as Threatened species. Published as migratory birds protected under an international agreement under schedule 5 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018.
CD	**Species of special conservation interest (conservation dependent fauna)** Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened, and listing is otherwise in accordance with the ministerial guidelines (section 14of the BC Act). Published as conservation dependent fauna under schedule 6 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018*.
OS	**Other specially protected species** Fauna otherwise in need of special protection to ensure their conservation, and listing is otherwise in accordance with the ministerial guidelines (section 18of the BC Act). Published as other specially protected fauna under schedule 7of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018*.
P	**Priority species** Possibly threatened species that do not meet survey criteria, or are otherwise data deficient, are added to the Priority Fauna or Priority Flora Lists under Priorities 1, 2 or 3. These three categories are ranked in order of priority for survey and evaluation of conservation status so that consideration can be given to their declaration as threatened fauna or flora. Species that are adequately known, are rare but not threatened, or meet criteria for near threatened, or that have been recently removed from the threatened species or other specially protected fauna lists for other than taxonomic reasons, are placed in Priority 4. These species require regular monitoring. Assessment of Priority codes is based on the Western Australian distribution of the species, unless the distribution in WA is part of a contiguous population extending into adjacent States, as defined by the known spread of locations.
1	**Priority 1: Poorly-known species** 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.
2	**Priority 2: Poorly-known species** 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.
3	**Priority 3: Poorly-known species** 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.

Conservation Codes for Western Australian Flora and Fauna	
4	**Priority 4: Rare, Near Threatened and other species in need of 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.
[1] The definition of flora includes algae, fungi and lichens. **[2] Species includes all taxa (plural of taxon - a classificatory group of any taxonomic rank, e.g. a family, genus, species or any infraspecific category i.e. subspecies or variety, or a distinct population).**	

Table 16: DBCA definitions and criteria for TECs and PECs (DEC 2013)

Criteria	Definition
Threatened Ecological Communities	
Presumed Totally Destroyed (PD)	An ecological community that has been adequately searched for but for which no representative occurrences have been located. The community has been found to be totally destroyed or so extensively modified throughout its range that no occurrence of it is likely to recover its species composition and/or structure in the foreseeable future. An ecological community will be listed as presumed totally destroyed if there are no recent records of the community being extant and either of the following applies (A or B): A. Records within the last 50 years have not been confirmed despite thorough searches of known or likely habitats or B. All occurrences recorded within the last 50 years have since been destroyed
Critically Endangered (CR)	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. An ecological community will be listed as Critically Endangered when it has been adequately surveyed and is found to be facing an extremely high risk of total destruction in the immediate future. This will be determined on the basis of the best available information, by it meeting any one or more of the following criteria (A, B or C): A. The estimated geographic range, and/or total area occupied, and/or number of discrete occurrences since European settlement have been reduced by at least 90% and either or both of the following apply (i or ii): i. geographic range, and/or total area occupied and/or number of discrete occurrences are continuing to decline such that total destruction of the community is imminent (within approximately 10 years); ii. modification throughout its range is continuing such that in the immediate future (within approximately 10 years) the community is unlikely to be capable of being substantially rehabilitated. B. Current distribution is limited, and one or more of the following apply (i, ii or iii): i. geographic range and/or number of discrete occurrences, and/or area occupied is highly restricted and the community is currently subject to known threatening processes which are likely to result in total destruction throughout its range in the immediate future (within approximately 10 years); ii. there are very few occurrences, each of which is small and/or isolated and extremely vulnerable to known threatening processes; iii. there may be many occurrences but total area is very small and each occurrence is small and/or isolated and extremely vulnerable to known threatening processes. C. The ecological community exists only as highly modified occurrences that may be capable of being rehabilitated if such work begins in the immediate future (within approximately 10 years).

Criteria	Definition
Endangered (EN)	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. An ecological community will be listed as Endangered when it has been adequately surveyed and is not Critically Endangered but is facing a very high risk of total destruction in the near future. This will be determined on the basis of the best available information by it meeting any one or more of the following criteria (A, B, or C): A. The geographic range, and/or total area occupied, and/or number of discrete occurrences have been reduced by at least 70% since European settlement and either or both of the following apply (i or ii): i. the estimated geographic range, and/or total area occupied and/or number of discrete occurrences are continuing to decline such that total destruction of the community is likely in the short term future (within approximately 20 years); ii. modification throughout its range is continuing such that in the short term future (within approximately 20 years) the community is unlikely to be capable of being substantially restored or rehabilitated. B. Current distribution is limited, and one or more of the following apply (i, ii or iii): i. geographic range and/or number of discrete occurrences, and/or area occupied is highly restricted and the community is currently subject to known threatening processes which are likely to result in total destruction throughout its range in the short term future (within approximately 20 years); ii. there are few occurrences, each of which is small and/or isolated and all or most occurrences are very vulnerable to known threatening processes; iii. there may be many occurrences but total area is small and all or most occurrences are small and/or isolated and very vulnerable to known threatening processes. The ecological community exists only as very modified occurrences that may be capable of being substantially restored or rehabilitated if such work begins in the short-term future (within approximately 20 years).
Vulnerable (VU)	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. An ecological community will be listed as Vulnerable when it 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. This will be determined on the basis of the best available information by it meeting any one or more of the following criteria (A, B or C): A. The ecological community exists largely as modified occurrences that are likely to be capable of being substantially restored or rehabilitated. B. The ecological community may already be modified and would be vulnerable to threatening processes, is restricted in area and/or range and/or is only found at a few locations. C. The ecological community may be still widespread but is believed likely to move into a category of higher threat in the medium to long term future because of existing or impending threatening processes.
Priority ecological communities	
Priority One	*Poorly known ecological communities* Ecological communities with apparently few, small occurrences, all or most not actively managed for conservation (e.g. within agricultural or pastoral lands, urban areas, active mineral leases) and for which current threats exist. 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.
Priority Two	*Poorly known ecological communities* Communities that are known from few small occurrences, all or most of which are actively managed for conservation (e.g. within national parks, conservation parks, nature reserves, state forest, unallocated Crown land, water reserves, etc.) and not under imminent threat 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.

Criteria	Definition
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 within significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat, 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, and inappropriate fire regimes. 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.
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 Vulnerable. iii. Ecological communities that have been removed from the list of threatened communities during the past five years.
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.

Table 17: NVIS structural formation terminology, terrestrial vegetation (NVIS Technical Working Group; DotEE 2017)

	Cover characteristics							
	Foliage cover *	70-100	30-70	10-30	<10	» 0 (scattered)	0-5 (clumped)	unknown
	Cover code	d	c	i	r	bi	bc	unknown
Growth Form	**Height Ranges (m)**	**Structural Formation Classes**						
tree, palm	<10,10-30, >30	closed forest	open forest	woodland	open woodland	isolated trees	isolated clumps of trees	tree, palm
tree mallee	<3, <10, 10-30	closed mallee forest	open mallee forest	mallee woodland	open mallee woodland	isolated mallee trees	isolated clumps of mallee trees	tree mallee
shrub, cycad, grass-tree, tree-fern	<1,1-2,>2	closed shrubland	shrubland	open shrubland	sparse shrubland	isolated shrubs	isolated clumps of shrubs	shrub, cycad, grass-tree, tree-fern
mallee shrub	<3, <10, 10-30	closed mallee shrubland	mallee shrubland	open mallee shrubland	sparse mallee shrubland	isolated mallee shrubs	isolated clumps of mallee shrubs	mallee shrub
heath shrub	<1,1-2,>2	closed heathland	heathland	open heathland	sparse heathland	isolated heath shrubs	isolated clumps of heath shrubs	heath shrub
chenopod shrub	<1,1-2,>2	closed chenopod shrubland	chenopod shrubland	open chenopod shrubland	sparse chenopod shrubland	isolated chenopod shrubs	isolated clumps of chenopod shrubs	chenopod shrub
samphire shrub	<0.5,>0.5	closed samphire shrubland	samphire shrubland	open samphire shrubland	sparse samphire shrubland	isolated samphire shrubs	isolated clumps of samphire shrubs	samphire shrub
hummock grass	<2,>2	closed hummock grassland	hummock grassland	open hummock grassland	sparse hummock grassland	isolated hummock grasses	isolated clumps of hummock grasses	hummock grass
tussock grass	<0.5,>0.5	closed tussock grassland	tussock grassland	open tussock grassland	sparse tussock grassland	isolated tussock grasses	isolated clumps of tussock grasses	tussock grass
other grass	<0.5,>0.5	closed grassland	grassland	open grassland	sparse grassland	isolated grasses	isolated clumps of grasses	other grass
sedge	<0.5,>0.5	closed sedgeland	sedgeland	open sedgeland	sparse sedgeland	isolated sedges	isolated clumps of sedges	sedge
rush	<0.5,>0.5	closed rushland	rushland	open rushland	sparse rushland	isolated rushes	isolated clumps of rushes	rush
herb	<0.5,>0.5	closed herbland	herbland	open herbland	sparse herbland	isolated herbs	isolated clumps of herbs	herb
fern	<1,1-2,>2	closed fernland	fernland	open fernland	sparse fernland	isolated ferns	isolated clumps of ferns	fern
bryophyte	<0.5	closed bryophyte-land	bryophyte-land	open bryophyteland	sparse bryophyteland	isolated bryophytes	isolated clumps of bryophytes	bryophyte
lichen	<0.5	closed lichenland	lichenland	open lichenland	sparse lichenland	isolated lichens	isolated clumps of lichens	lichen
vine	<10,10-30, >30	closed vineland	vineland	open vineland	sparse vineland	isolated vines	isolated clumps of vines	vine

Table 18: NVIS height classes (NVIS Technical Working Group; DotEE 2017)

Height		Growth form				
Height Class	**Height Range (m)**	**Tree, vine (M & U), palm (single-stemmed)**	**Shrub, heath shrub, chenopod shrub, ferns, samphire shrub, cycad, tree-fern, grass-tree, palm (multi-stemmed)**	**Tree mallee, mallee shrub**	**Tussock grass, hummock grass, other grass, sedge, rush, forbs, vine (G)**	**Bryophyte, lichen, seagrass, aquatic**
8	>30	tall	NA	NA	NA	NA
7	10-30	mid	NA	tall	NA	NA
6	<10	low	NA	mid	NA	NA
5	<3	NA	NA	low	NA	NA
4	>2	NA	tall	NA	tall	NA
3	1-2	NA	mid	NA	tall	NA
2	0.5-1	NA	low	NA	mid	tall
1	<0.5	NA	low	NA	low	low

Source: (based on Walker & Hopkins 1990)

Table 19: Vegetation condition scale for the South West and Interzone Botanical Provinces (EPA 2016)

Condition rating	Description
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 TWO TEC ASSESSMENT CRITERIA

BANKSIA WOODLANDS TEC

The criteria outlined in the Approved Conservation Advice for the *Banksia Woodlands of the Swan Coastal Plain* TEC (TSSC 2016) was used to determine if the TEC occurs, as below.

The key characteristics for vegetation to be included in this TEC are that:

- it occurs on the Swan Coastal Plain IBRA region, including the Dandaragan Plateau and adjacent to the Jarrah Forest IBRA region on the lower parts of the Darling and Whicher escarpments
- it generally occurs on low-nutrient sandy substrates, including sandy colluvium and aeolean sands although may occur occasionally on other substrates (usually on the Bassendean and Spearwood sands)
- the structure is typically low woodland or forest with a distinct upper stratum of low trees dominated or co-dominated by one or more of four characteristic Banksia species (Banksia attenuata, B. menziesii, B. prionotes, B. ilicifolia) although emergent trees are sometimes present but cannot be the dominant stratum
- the understorey is typically a highly diverse shrub and herb layer
- it meets the thresholds in the table that follows (with vegetation type mapping extrapolated outside the survey area to be included in the extent calculations).

Table 20: Condition categories and thresholds for inclusion in the Banksia Woodlands TEC (TSSC 2016)

Condition Threshold	Indicative Condition Measures (Typical)		Minimum Patch Size
	Native Vegetation Composition[1]	Weed Cover	
Pristine	Native plant species diversity	Native plant species diversity	No minimum
Excellent	High native plant species	High native plant species	0.5 ha / 5,000 m^2
Very Good	Moderate native plant species	Moderate native plant species	1 ha / 10,000 m^2
Good	Low native plant species	Low native plant species	2 ha / 20,000 m^2
Degraded	Very low native plant species	Very low native plant species	Not representative
Completely Degraded	Very low to no native species	Very low to no native species	Not representative

[1] Relative to expected natural range of diversity for that vegetation (e.g. Floristic Community Type; FCT), where comparative data exists.

Whilst FCTs, as defined in Gibson *et al.* (1994) can be used as a guide they do not necessarily define all vegetation that may be included in the TEC. Vegetation defined by Gibson *et al.* FCTs may be listed as TECs in Western Australia or as Priority Ecological Communities (PECs) by DBCA (combined into the EPBC-listed *Banksia Woodlands of the Swan Coastal Plain* TEC). Some Banksia woodlands on the eastern side of the Swan Coastal Plain (FCT 20 group) are not included in this TEC and have different conservation listings; these Banksia woodland types are not subject to the same thresholds as above to be considered representative of the relevant TEC or PEC.

TUART WOODLANDS TEC

The EPBC-listed critically endangered *Tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain ecological community* ('Tuart Woodlands') TEC was declared in 2019.

The criteria for inclusion in the TEC, as outlined in the Approved Conservation Advice (DotEE 2019), includes:

- confirming that the vegetation meets the diagnostic criteria (primarily being located within the Swan Coastal Plain and having at least two mature, living Tuart trees in the upper stratum with a gap of less than 60 m between outer edges of the canopies)
- the mapped extent of Tuart-dominated vegetation (woodlands, forests or mallee) meets various mapping criteria, and takes into consideration the entire extent of Tuart woodland regardless of changes in condition, structure or complexity, and extends to 30 m beyond the outer canopy of mature and dead Tuart trees (DBH greater than 15 cm). The Approved Conservation Advice includes additional information regarding mapping and condition assessment, noting that the condition assessment scale is not the equivalent of other scales generally used in Western Australia.
- patches occupying less than 0.5 ha are not included in the TEC; patches of 0.5-5 ha may be representative depending on vegetation condition; patches of 5 ha or greater that meet the diagnostic criteria are included in the TEC
- Tuart woodlands over 5 ha in extent do not require additional surveys to demonstrate inclusion in the TEC; smaller extents (0.5-5 ha) require ground surveys to determine inclusion, as per the following table.

Table 21: Condition categories and thresholds for inclusion in the Tuart Woodlands TEC (DotEE 2019)

Patch size	≥2 ha <5 ha	≥0.5 ha <2 ha
Biotic thresholds		
Very high condition ≥80% of all understorey vegetation cover is native Or At least 12 native understorey species per 0.01 ha (10 m x 10 m plot or equivalent sample unit)	Medium sized patches with very high condition understorey. PART OF THE PROTECTED ECOLOGICAL COMMUNITY	Smaller patches with very high condition understorey. PART OF THE PROTECTED ECOLOGICAL COMMUNITY
High condition ≥60% of all understorey vegetation cover is native Or At least 8 native understorey species per 0.01 ha (10 m x 10 m plot or equivalent sample unit)	Medium sized patches with high condition understorey. PART OF THE PROTECTED ECOLOGICAL COMMUNITY	Smaller patches with high condition understorey. AND That either: have an important landscape role (≤100 m to native vegetation)* OR have a habitat role (≥2 very large trees per 0.5 ha)* OR show regeneration (≥15 seedlings and/or saplings per 0.5 ha)* PART OF THE PROTECTED ECOLOGICAL COMMUNITY

Patch size Biotic thresholds	≥2 ha <5 ha	≥0.5 ha <2 ha
Moderate condition ≥50% of all understorey vegetation cover is native Or At least 4 native understorey species per 0.01 ha (10 m x 10 m plot or equivalent sample unit)	Medium sized patches with moderate condition understorey. AND That either: have an important landscape role (≤100 m to native vegetation)* OR have a habitat role (≥2 very large trees per 0.5 ha)* OR show regeneration (≥15 seedlings and/or saplings per 0.5 ha)* PART OF THE PROTECTED ECOLOGICAL COMMUNITY	NOT PART OF THE PROTECTED ECOLOGICAL COMMUNITY (but may be a focus for local protection or restoration)
Poor Has minimal or no native cover and species richness. That is: <50% of all understorey vegetation cover is native And Less than 4 native understorey species per 0.01 ha (10 m x 10 m plot or equivalent sample unit)	NOT PART OF THE PROTECTED ECOLOGICAL COMMUNITY (but may be a focus for local protection or restoration)	NOT PART OF THE PROTECTED ECOLOGICAL COMMUNITY (but may be a focus for local protection or restoration)

Note:

- understorey is considered as being <3 m in height (i.e. ground or mid stratum)
- *'important landscape role' or 'habitat role' takes into consideration:
  - proximity to other native vegetation that has ≥50% of vegetation cover being native
  - the patch contains ≥2 very large trees (≥50 cm DBH) of any native species per 0.5 ha
  - the patch shows evidence of natural regeneration of any native Eucalypt species (<15 cm DBH) of at least 15 individuals per 0.5 ha.

APPENDIX THREE DESKTOP ASSESSMENT RESULTS AND LIKELIHOOD ASSESSMENTS

Table 22: PMST flora search results

Species	EPBC Status	Species or habitat presence in survey area
Andersonia gracilis	Endangered	May occur
Anigozanthos viridis subsp. *terraspectans*	Vulnerable	Likely to occur
Caladenia huegelii	Endangered	Likely to occur
Diuris micrantha	Vulnerable	Likely to occur
Drakaea elastica	Endangered	Likely to occur
Drakaea micrantha	Vulnerable	May occur
Eleocharis keigheryi	Vulnerable	May occur
Eucalyptus argutifolia	Vulnerable	Known to occur
Grevillea curviloba subsp. *Incurva*	Endangered	May occur
Marianthus paralius	Endangered	Known to occur
Melaleuca sp. Wanneroo (G. J. Keighery 16705)	Endangered	Known to occur
Thelymitra dedmaniarum	Endangered	May occur

Table 23: Flora database search results, habitat and likelihood assessment

(Blue shading indicates high likelihood; dark blue indicates species is known (recorded) from the survey area)

DBCA*	PMST**	Species name	Habitat from *FloraBase* (WAH 1998-2020)	Flowers	Likelihood of occurrence	
					Desktop	Post-survey
		Threatened Flora				
x	x	*Eucalyptus argutifolia*	Shallow soils over limestone. On slopes or in gullies of limestone ridges, outcrops.	Mar-Apr	Unlikely	Highly Unlikely
x	x	*Marianthus paralius*	Coastal cliffs. White sand over limestone.	Sep-Nov	Unlikely	Highly Unlikely
x	x	*Melaleuca* sp. Wanneroo (G.J. Keighery 16705)	Limestone hills, slopes and flats. Shallow soils over limestone, with outcropping limestone.	Oct-Jan	Unlikely	Highly Unlikely
		Priority 1				
x	-	*Baeckea* sp. Limestone (N. Gibson & M.N. Lyons 1425)	Slopes, hills and flats. Yellow-grey sandy soils over limestone, with outcropping limestone.	Sep-Dec	Unlikely	Unlikely
x	-	*Drosera patens*	Sandy soils. Margins of winter-wet depressions, swamps and lakes.	Dec or Feb	Highly unlikely	Highly unlikely

DBCA*	PMST**	Species name	Habitat from *FloraBase* (WAH 1998-2020)	Flowers	Likelihood of occurrence	
					Desktop	Post-survey
x	-	*Drosera x sidjamesii*	Peaty sand. Along lake margins, close to winter high-water line.	Nov-Mar	Highly unlikely	Highly unlikely
x	-	*Grevillea* sp. Ocean Reef (D. Pike Joon 4)	Sand dunes.	Nov	Highly unlikely	Highly unlikely
		Priority 2				
x	-	*Acacia benthamii*	On limestone breakaways.	Aug-Sep	Unlikely	Unlikely
x	-	*Calectasia elegans*	Flats and gentle slopes. Sandy soil.	Sep-Nov	Unlikely	Possible
x	-	*Lecania turicensis* var. *turicensis*	Coastal rocks, limestone.		Highly unlikely	Highly unlikely
x	-	*Poranthera moorokatta*	Gently undulating plains, slopes and crests of dunes. Sandy soil.	Oct-Nov	Likely	Unlikely
x	-	*Stenanthemum sublineare*	Coastal plains. Sandy soil.	Oct-Dec	Highly unlikely	Highly unlikely
x	-	*Tetraria* sp. Chandala (G.J. Keighery 17055)	Swamps, edges of wetlands. Peaty soil.	Sep-Feb	Highly unlikely	Highly unlikely
x	x	*Thelymitra variegata*	Flats or limestone hills. Sandy soil.	Aug-Sep	Unlikely	Unlikely
		Priority 3				
x	-	*Austrostipa mundula*	Coastal dunes, slopes, ridges and plains. Sandy soil over limestone, with outcropping limestone.	Sep-Oct	Highly unlikely	Highly unlikely
x	-	*Conostylis bracteata*	Sand dunes. Sandy soil over limestone.	Aug-Sep	Highly unlikely	Known
x	-	*Cyathochaeta teretifolia*	Wetlands, creek edges. Sandy loam or peaty soil.	Jan	Highly unlikely	Highly unlikely
x	-	*Hibbertia leptotheca*	Dunes, limestone outcrops or slopes. Sandy soils.	Aug-Oct	Unlikely	Unlikely
x	-	*Jacksonia gracillima*	Sand dunes, slopes with outcropping limestone, flats and wetlands. Peaty sand or sandy soil.	Oct-Nov	Unlikely	Unlikely
x	-	*Leucopogon* sp. Yanchep (M. Hislop 1986)	Coastal plains, breakaways, valley slopes and low hills. Sandy or loamy soil over limestone, laterite or granite.	Apr-Sep	Unlikely	Unlikely
x	-	*Pimelea calcicola*	Coastal limestone ridges. Sandy soil.	Sep-Nov	Highly unlikely	Highly unlikely
x	-	*Pithocarpa corymbulosa*	Amongst granite outcrops. Gravelly or sandy loam.	Jan-Apr	Highly unlikely	Highly unlikely
x	-	*Sarcozona bicarinata*	Sandy soil with limestone outcrops.	Aug	Unlikely	Unlikely
x	-	*Stylidium maritimum*	Dune slopes and flats. Sandy soil over limestone.	Sep-Nov	Unlikely	Unlikely
x	-	*Stylidium paludicola*	Winter-wet areas. Peaty sand over clay.	Oct-Dec	Highly unlikely	Highly unlikely
x	-	*Styphelia filifolia*	Flats, slopes. Yellow-brown sandy soil.	Feb-Apr	Unlikely	Unlikely
		Priority 4				
x	-	*Jacksonia sericea*	Plains, gentle slopes. Sandy soil, with outcropping limestone.	Dec-Feb	Likely	Known
x	-	*Stylidium longitubum*	Seasonal wetlands. Sandy clay or clay soil.	Oct-Dec	Highly unlikely	Highly unlikely
x	-	*Tripterococcus* sp. Brachylobus (A.S. George 14234)	Plains, wetlands and on gentle slopes. Sandy soil.	Jan-Mar and Oct-Dec	Unlikely	Unlikely

* WAH = herbarium record (vouchered specimen)
TP = Threatened and Priority Flora Report Form record; may be unconfirmed i.e. without vouchered specimen

** PMST likelihood of occurrence or likelihood of habitat occurring

*** Commonwealth EPBC Act and Western Australian BC Act conservation status

APPENDIX FOUR FIELD SURVEY RESULTS

Table 24: Flora inventory (site x species)

Family	Species	Naturalised	Cons. code	[1]Opps	QFD01	QFD02	QFD03	QFD04	QFD05	QFD06
Amaranthaceae	*Ptilotus manglesii*				X					
	Ptilotus polystachyus			X					X	
Apiaceae	*Foeniculum vulgare*	*		X						
	Xanthosia huegelii						X			
Araliaceae	*Trachymene pilosa*				X	X	X			
Asparagaceae	*Acanthocarpus preissii*								X	X
	Agave attenuata	*		X						
	Asparagus asparagoides	*		X				X		
	Lomandra hermaphrodita					X	X	X		
	Lomandra preissii				X	X	X			
	Sowerbaea laxiflora				X	X			X	
	Thysanotus sp. Coastal plain (N.H. Brittan 66/63)				X	X	X			
Asteraceae	*Conyza* sp.	*		X						
	Hyalosperma cotula				X	X	X			
	Hypochaeris glabra	*			X	X	X	X		
	Lactuca serriola	*						X	X	
	Lagenophora huegelii				X					
	Leontodon rhagadioloides	*							X	
	Podotheca gnaphalioides				X	X				
	Sonchus oleraceus	*						X	X	X
	Ursinia anthemoides subsp. *anthemoides*	*			X	X			X	
	Waitzia suaveolens			X						
Brassicaceae	*Brassica tournefortii*	*							X	
Casuarinaceae	*Allocasuarina fraseriana*				X	X	X			
Colchicaceae	*Burchardia congesta*					X	X			
Crassulaceae	*Crassula colorata* var. *colorata*			X						
	Crassula glomerata	*			X					
Cyperaceae	*Lepidosperma leptostachyum*								X	
	Lepidosperma pubisquameum							X		
	Mesomelaena pseudostygia				X	X	X		X	
	Schoenus curvifolius					X				
	Schoenus grandiflorus			X						
Dasypogonaceae	*Calectasia narragara*			X						
Dilleniaceae	*Hibbertia crassifolia*			X						
	Hibbertia huegelii				X					
	Hibbertia hypericoides				X	X	X		X	
	Hibbertia racemosa			X						
Droseraceae	*Drosera erythrorhiza*				X	X	X			

Family	Species	Naturalised	Cons. code	[1]Opps	QFD01	QFD02	QFD03	QFD04	QFD05	QFD06
	Drosera macrantha				X	X	X			
Ericaceae	*Brachyloma preissii*			X						
	Conostephium pendulum				X	X	X			
	Styphelia propinqua							X		
Euphorbiaceae	*Euphorbia peplus*	*						X		X
	Euphorbia terracina	*						X	X	X
	Monotaxis grandiflora			X						
	Ricinus communis	*		X						
Fabaceae	*Acacia applanata*			X						
	Acacia iteaphylla	*		X			X			
	Acacia longifolia subsp. *longifolia*	*		X						
	Acacia rostellifera			X						
	Acacia saligna							X	X	X
	Bossiaea eriocarpa			X	X					
	Daviesia nudiflora subsp. *nudiflora*					X				
	Daviesia triflora				X	X	X			
	Gastrolobium capitatum						X			
	Gastrolobium linearifolium				X					
	Gompholobium tomentosum					X				
	Hardenbergia comptoniana					X	X	X		X
	Hovea trisperma				X					
	Jacksonia sericea		P4	X					X	
	Jacksonia sternbergiana				X				X	X
	Kennedia prostrata				X		X			
	Lupinus cosentinii	*		X						
	Ornithopus sp.	*							X	
	Trifolium angustifolium	*		X						
	Trifolium arvense	*		X					X	
	Trifolium campestre	*							X	
	Trifolium hirtum	*							X	
Geraniaceae	*Erodium cicutarium*	*		X						
	Pelargonium capitatum	*		X						
Goodeniaceae	*Dampiera linearis*			X						
	Lechenaultia linarioides									X
	Scaevola canescens								X	
	Scaevola repens var. *repens*			X					X	
Haemodoraceae	*Anigozanthos humilis* subsp. *humilis*			X						
	Anigozanthos manglesii			X		X				
	Conostylis ?pauciflora subsp. *pauciflora*		P4					X	X	X
	Conostylis aculeata									X
	Conostylis bracteata		P3			X				
	Conostylis juncea			X						

Family	Species	Naturalised	Cons. code	[1]Opps	QFD01	QFD02	QFD03	QFD04	QFD05	QFD06
	Conostylis setigera					X				
	Conostylis setigera subsp. *setigera*			X						
	Haemodorum laxum			X		X				
	Haemodorum sp.				X					
	Phlebocarya ciliata			X						
Hemerocallidaceae	*Corynotheca micrantha*								X	
	Dianella revoluta							X		
	Tricoryne elatior				X				X	X
Iridaceae	*Gladiolus caryophyllaceus*	*			X	X	X		X	
	Patersonia occidentalis				X	X				
	Romulea rosea	*							X	
Lamiaceae	*Hemiandra pungens*			X						
	Lavandula dentata	*		X						
	Lavandula stoechas	*		X						
Loganiaceae	*Phyllangium divergens*				X	X				
Loranthaceae	*Nuytsia floribunda*			X						
Myrtaceae	*Agonis flexuosa*			X						
	Calothamnus quadrifidus			X						
	Calothamnus sanguineus			X						
	Chamelaucium uncinatum			X						
	Eremaea pauciflora var. *pauciflora*						X			
	Eucalyptus gomphocephala							X	X	X
	Eucalyptus marginata					X	X			
	Eucalyptus utilis			X						
	Hypocalymma robustum			X						
	Kunzea glabrescens				X					
	Leptospermum erubescens				X					
	Leptospermum laevigatum	*		X						
	Melaleuca huegelii subsp. *huegelii*			X						
	Melaleuca preissiana			X						
	Melaleuca systena			X						
	Melaleuca trichophylla			X						
	Verticordia densiflora			X						
Orchidaceae	*Caladenia arenicola*			X	X					
	Caladenia flava subsp. *flava*				X	X	X			
	Caladenia latifolia							X		
	Diuris longifolia				X				X	
	Eriochilus dilatatus subsp. *multiflorus*					X				
	Eriochilus sp.				X					
	Pterostylis recurva				X	X				
	Pterostylis sp.			X						
Oxalidaceae	*Oxalis pes-caprae*	*						X		

Family	Species	Naturalised	Cons. code	[1]Opps	QFD01	QFD02	QFD03	QFD04	QFD05	QFD06
Papaveraceae	*Fumaria capreolata*	*		X						
Phyllanthaceae	*Phyllanthus calycinus*							X		X
	Poranthera microphylla				X					
Pittosporaceae	*Pittosporum undulatum*	*		X						
Poaceae	*Aira cupaniana*	*				X				
	Austrostipa compressa				X	X				
	Avellinia michelii	*			X					
	Avena barbata	*						X		X
	Briza maxima	*			X	X	X		X	
	Cenchrus setaceus	*		X						
	Cynodon dactylon	*							X	
	Ehrharta calycina	*						X	X	X
	Ehrharta longiflora	*						X		
	Eragrostis curvula	*		X					X	
	Lolium rigidum	*		X						
	Rytidosperma occidentale					X	X			
Primulaceae	*Lysimachia arvensis*	*						X	X	X
Proteaceae	*Adenanthos cygnorum*						X			
	Adenanthos sericeus			X						
	Banksia attenuata				X	X	X			
	Banksia dallanneyi			X						
	Banksia grandis			X						
	Banksia menziesii			X						
	Banksia prionotes			X						
	Banksia sessilis			X				X	X	X
	Grevillea olivacea		P4	X						
	Grevillea sp.			X						
	Grevillea thelemanniana		T	X						
	Grevillea thelemanniana x *olivacea*			X						
	Grevillea vestita subsp. *vestita*			X						
	Hakea petiolaris			X						
	Hakea prostrata			X						
	Hakea trifurcata									X
	Petrophile linearis					X	X			
	Petrophile macrostachya			X						
	Stirlingia latifolia				X	X	X			
Restionaceae	*Alexgeorgea nitens*				X	X	X			
	Desmocladus flexuosus				X	X	X		X	
	Lepidobolus preissianus					X	X			
Rhamnaceae	*Spyridium globulosum*			X						
Rubiaceae	*Galium murale*	*						X		
	Opercularia vaginata				X					

Family	Species	Naturalised	Cons. code	[1]Opps	QFD01	QFD02	QFD03	QFD04	QFD05	QFD06
Rutaceae	*Philotheca spicata*				X	X				
Solanaceae	*Solanum nigrum*	*		X						
Stylidiaceae	*Stylidium androsaceum*			X	X	X	X			
	Stylidium neurophyllum			X						
	Stylidium piliferum					X	X			
	Stylidium tenue subsp. *majusculum*					X				
Thymelaeaceae	*Pimelea sulphurea*				X	X	X			
Tropaeolaceae	*Tropaeolum majus*	*		X						
Violaceae	*Hybanthus calycinus*				X	X				
Xanthorrhoeaceae	*Xanthorrhoea preissii*				X	X	X		X	X
Zamiaceae	*Macrozamia fraseri*			X						

[1]Opps = Opportunistic records

Table 25: Introduced flora (weed) species recorded

Scientific Name	Common Name	Family	WONS	Declared Pest
Acacia iteaphylla	Flinders Range Wattle	Fabaceae	-	-
Acacia longifolia subsp. *longifolia*		Fabaceae	-	-
Agave attenuata		Asparagaceae	-	-
Aira cupaniana	Silvery Hair Grass	Poaceae	-	-
Asparagus asparagoides	Bridal Creeper	Asparagaceae	X	-
Avellinia michelii	Avellinia	Poaceae	-	-
Avena barbata	Bearded Oat	Poaceae	-	-
Brassica tournefortii	Wild Turnip	Brassicaceae	-	-
Briza maxima	Blowfly Grass	Poaceae	-	-
Cenchrus setaceus	Fountain Grass	Poaceae	-	-
Conyza sp.		Asteraceae	-	-
Crassula glomerata		Crassulaceae	-	-
Cynodon dactylon	Couch	Poaceae	-	-
Ehrharta calycina	Perennial Veldt Grass	Poaceae	-	-
Ehrharta longiflora	Annual Veldgrass	Poaceae	-	-
Eragrostis curvula	African Love Grass	Poaceae	-	-
Erodium cicutarium	Common Storkbill	Geraniaceae	-	-
Euphorbia peplus	Petty Spurge	Euphorbiaceae	-	-
Euphorbia terracina	Geraldton Carnation Weed	Euphorbiaceae	-	-
Foeniculum vulgare	Fennel	Apiaceae	-	-
Fumaria capreolata	Whiteflower Fumitory	Papaveraceae	-	-
Galium murale	Small Goosegrass	Rubiaceae	-	-
Gladiolus caryophyllaceus	Wild Gladiolus	Iridaceae	-	-
Hypochaeris glabra	Flat Weed	Asteraceae	-	-
Lactuca serriola	Prickly Lettuce	Asteraceae	-	-

Scientific Name	Common Name	Family	WONS	Declared Pest
Lavandula dentata		Lamiaceae	-	-
Lavandula stoechas	French Lavender, Lavender	Lamiaceae	-	-
Leontodon rhagadioloides		Asteraceae	-	-
Leptospermum laevigatum	Victorian Tea Tree, Coast Teatree	Lamiaceae	-	-
Lolium rigidum	Annual Rye Grass	Poaceae	-	-
Lupinus cosentinii	Western Blue Lupin, Sandplain Lupin	Fabaceae	-	-
Lysimachia arvensis	Pimpernel	Primulaceae	-	-
Ornithopus sp.		Fabaceae	-	-
Oxalis pes-caprae	Soursob	Oxalidaceae	-	-
Pelargonium capitatum	Rose Pelargonium	Geraniaceae	-	-
Pittosporum undulatum	Sweet Pittosporum	Pittosporaceae	-	-
Ricinus communis	Castor Oil Plant	Euphorbiaceae	-	-
Romulea rosea	Guildford Grass	Iridaceae	-	-
Solanum nigrum	Black Nightshade, Blackberry Nightshade	Solanaceae	-	-
Sonchus oleraceus	Common Sowthistle	Asteraceae	-	-
Trifolium angustifolium	Narrow Leaf Clover	Fabaceae	-	-
Trifolium arvense	Hare's Foot Clover	Fabaceae	-	-
Trifolium campestre	Hop Clover	Fabaceae	-	-
Trifolium hirtum		Fabaceae	-	-
Tropaeolum majus	Nasturtium	Tropaeolaceae	-	-
Ursinia anthemoides subsp. *anthemoides*		Asteraceae	-	-

WONS = Weed of National Significance

APPENDIX FIVE FLORISTIC QUADRAT DATA

QFD01

Staff	TCJ	**Date**	1/09/2020	**Season**	A		
Revisit	TCJ		6/10/2020		A		
Type	Q 10 m x 10 m						
Location	Flynn Drive						
MGA Zone	50	385354 **mE**	6493588 **mN**	**Lat.**	-31.6873	**Long.**	115.7904
Habitat	Flat						
Aspect	N/A	**Slope**	N/A				
Soil Type	Pale yellow sand						
Rock Type	Nil						
Loose Rock	0 % cover			**Litter**	90 % cover ; 4 cm in depth		
Bare ground	6 % cover	**Weeds**	<1 % cover				

Vegetation U+ ^*Allocasuarina fraseriana*,^*Banksia attenuata*\^tree\6\c;M ^*Xanthorrhoea preissii*\^grass tree\3\i;G ^*Hibbertia hypericoides*,^*Mesomelaena pseudostygia*\^shrub,sedge\1\i

Veg. Condition Excellent

Disturbance Some rubbish and animal diggings

Fire Age <5 years

Notes Fire evidence looks like cool burn only, just some charring of logs and trunks at low height. Photo taken of spider orchid 01-33 Hairy Spider.

Species	WA Cons.	Height (m)	Cover (%)	Count
Alexgeorgea nitens		0.1	<1	
Allocasuarina fraseriana		5	22	
Austrostipa compressa		0.2	<1	
**Avellinia michelii*		0.1	<1	

Banksia attenuata	3	10	
Bossiaea eriocarpa	0.2	<1	
**Briza maxima*	0.2	<1	
Caladenia arenicola	0.3	<1	2
Caladenia flava subsp. *flava*	0.2	<1	
Conostephium pendulum	0.3	<1	
**Crassula glomerata*	0.1	<1	
Daviesia triflora	0.4	<1	
Desmocladus flexuosus	0.2	<1	
Diuris longifolia	0.2	<1	
Drosera erythrorhiza	0.1	<1	
Drosera macrantha	0.3	<1	
Eriochilus sp.	0.1	<1	
Gastrolobium linearifolium	0.2	<1	
**Gladiolus caryophyllaceus*	0.6	<1	
Haemodorum sp.	0.4	<1	
Hibbertia huegelii	0.3	<1	
Hibbertia hypericoides	0.3	12	
Hovea trisperma	0.3	<1	
Hyalosperma cotula	0.1	<1	
Hybanthus calycinus	0.2	<1	
**Hypochaeris glabra*	0.1	<1	
Jacksonia sternbergiana	2.5	<1	
Kennedia prostrata		<1	
Kunzea glabrescens	1.5	<1	
Lagenophora huegelii	0.4	<1	
Leptospermum erubescens	1.8	<1	
Lomandra preissii	0.3	<1	
Mesomelaena pseudostygia	0.3	7	
Opercularia vaginata	0.2	<1	
Patersonia occidentalis	0.3	<1	
Philotheca spicata	0.3	<1	
Phyllangium divergens	0.1	<1	
Pimelea sulphurea	0.35	<1	
Podotheca gnaphalioides	0.2	<1	
Poranthera microphylla	0.1	<1	
Pterostylis recurva	0.1	<1	
Ptilotus manglesii	0.1	<1	

Sowerbaea laxiflora	0.3	<1
Stirlingia latifolia	0.2	<1
Stylidium androsaceum	0.1	<1
Thysanotus sp. Coastal plain (N.H. Brittan 66/63)	0.6	<1
Trachymene pilosa	0.1	<1
Tricoryne elatior		<1
**Ursinia anthemoides* subsp. *anthemoides*	0.1	<1
Xanthorrhoea preissii	1.6	32

QFD02

Staff TCJ **Date** 1/09/2020 **Season** A

Revisit TCJ 6/10/2020 A

Type Q 10 m x 10 m

Location

MGA Zone 50 385507 **mE** 6493591 **mN** **Lat.** -31.6873 **Long.** 115.7920

Habitat Flat

Aspect SW **Slope** Very Gentle

Soil Type Sand white yellow

Rock Type

Loose Rock 0 % cover **Litter** 2 % cover ; 2 cm in depth

Bare ground 25 % cover **Weeds** <1 % cover

Vegetation U+ ^^*Eucalyptus marginata*,*Banksia attenuata*,*Allocasuarina fraseriana*\^tree\7\i;M ^*Xanthorrhoea preissii*\^grass tree\3\r;G ^*Hibbertia hypericoides*,^*Mesomelaena pseudostygia*\^shrub,sedge\1\r

Veg. Condition Excellent

Disturbance

Fire Age >5 years

Notes

Species	WA Cons.	Height (m)	Cover (%)	Count
**Aira cupaniana*		0.1	<1	
Alexgeorgea nitens		0.2	<1	
Allocasuarina fraseriana		2	2	
Anigozanthos manglesii		0.4	<1	
Anigozanthos manglesii		0.5	<1	

Austrostipa compressa		0.3	<1
Banksia attenuata		6	2
Bossiaea eriocarpa		0.3	<1
**Briza maxima*		0.1	<1
Burchardia congesta		0.3	<1
Caladenia flava subsp. *flava*		0.15	<1
Conostephium pendulum		0.2	<1
Conostylis bracteata	P 3	0.2	<1
Conostylis juncea		0.2	<1
Conostylis setigera		0.1	<1
Daviesia nudiflora subsp. *nudiflora*		0.6	<1
Daviesia triflora		0.4	<1
Desmocladus flexuosus		0.2	<1
Drosera erythrorhiza		0.01	<1
Drosera macrantha		0.5	<1
Eriochilus dilatatus subsp. *multiflorus*		0.2	<1
Eucalyptus marginata		18	12
**Gladiolus caryophyllaceus*		1	<1
Gompholobium tomentosum		0.4	<1
Haemodorum laxum		0.5	<1
Hardenbergia comptoniana		2	<1
Hibbertia hypericoides		0.4	5
Hyalosperma cotula		0.1	<1
Hybanthus calycinus		0.2	<1
**Hypochaeris glabra*		0.01	<1
**Hypochaeris glabra*		0.1	<1
Lepidobolus preissianus		0.3	<1
Lomandra hermaphrodita		0.2	<1
Lomandra preissii		0.3	<1
Mesomelaena pseudostygia		0.4	3
Patersonia occidentalis		0.2	<1
Petrophile linearis		0.3	<1
Philotheca spicata		0.2	<1
Phyllangium divergens		0.1	<1
Pimelea sulphurea		0.3	<1
Podotheca gnaphalioides		0.3	<1
Pterostylis recurva		0.2	<1
Rytidosperma occidentale		0.3	<1

Scaevola repens var. *repens*	0.1	<1
Schoenus curvifolius	0.3	<1
Sowerbaea laxiflora	0.3	<1
Stirlingia latifolia	0.2	<1
Stylidium androsaceum	0.1	<1
Stylidium neurophyllum	0.2	<1
Stylidium piliferum	0.02	<1
?Stylidium sp.	0.05	<1
Stylidium tenue subsp. *majusculum*	0.2	<1
Thysanotus sp. Coastal plain (N.H. Brittan 66/63)	0.5	<1
Trachymene pilosa	0.1	<1
**Ursinia anthemoides* subsp. *anthemoides*	0.1	<1
Xanthorrhoea preissii	1.1	4

QFD03

Staff TCJ **Date** 1/09/2020 **Season** A

Revisit TCJ 6/10/2020 A

Type Q 10 m x 10 m

Location Flynn Drive

MGA Zone 50 385644 **mE** 6493629 **mN** **Lat.** -31.6870 **Long.** 115.7934

Habitat Flat

Aspect N/A **Slope** N/A

Soil Type Pale yellow sand

Rock Type Nil

Loose Rock 0 % cover **Litter** 95 % cover ; 2 cm in depth

Bare ground 1 % cover **Weeds** <1 % cover

Vegetation U+ ^^*Eucalyptus marginata*,*Allocasuarina fraseriana*,*Banksia attenuata*\^tree\7\i;M ^*Xanthorrhoea preissii*\^grass tree\3\i;G ^*Hibbertia hypericoides*\^shrub\1\r

Veg. Condition Excellent

Disturbance Some animal diggings (rabbits?) and small rubbish.

Fire Age >10 years

Notes Near a lay down area opposite Pindar Rd.

Species	WA Cons.	Height (m)	Cover (%)	Count
**Acacia iteaphylla*		0.9	<1	
Adenanthos cygnorum		4	2	
Alexgeorgea nitens		0.2	<1	
Allocasuarina fraseriana		7	8	
Banksia attenuata		4	2	

Bossiaea eriocarpa	0.3	<1
**Briza maxima*	0.2	<1
Burchardia congesta	0.5	<1
Caladenia flava subsp. *flava*	0.2	<1
Conostephium pendulum	0.4	<1
Conostylis juncea	0.2	<1
Daviesia triflora	0.3	<1
Desmocladus flexuosus	0.3	<1
Drosera erythrorhiza	0.1	<1
Drosera macrantha	0.3	<1
Eremaea pauciflora var. *pauciflora*	0.5	<1
Eucalyptus marginata	7	18
Gastrolobium capitatum	0.2	<1
Gastrolobium capitatum	0.2	<1
**Gladiolus caryophyllaceus*	0.7	<1
**Gladiolus caryophyllaceus*	0.4	<1
Hardenbergia comptoniana	0.1	<1
Hibbertia hypericoides	0.4	5
Hyalosperma cotula	0.1	<1
Hypocalymma robustum	0.4	<1
**Hypochaeris glabra*	0.1	<1
Kennedia prostrata	0.1	<1
Lepidobolus preissianus	0.3	<1
**Leptospermum laevigatum*	0.3	<1
Lomandra hermaphrodita	0.2	<1
Lomandra preissii	0.7	<1
Mesomelaena pseudostygia	0.6	<1
Petrophile linearis	0.4	<1
Petrophile macrostachya	0.4	<1
Pimelea sulphurea	0.3	<1
Pterostylis sp.	0.1	<1
Rytidosperma occidentale	0.2	<1
Scaevola repens var. *repens*	0.1	<1
Stirlingia latifolia	0.7	<1
Stylidium androsaceum	0.1	<1
Stylidium piliferum	0.2	<1
Thysanotus sp. Coastal plain (N.H. Brittan 66/63)	0.6	<1
Trachymene pilosa	0.1	<1

Trachymene pilosa	0.1	<1
Waitzia suaveolens	0.1	<1
Xanthorrhoea preissii	1.3	15
Xanthosia huegelii	0.1	<1

QFD04

Staff TCJ **Date** 1/09/2020 **Season** A

Revisit TCJ 6/10/2020 A

Type Q 10 m x 10 m

Location Flynn Drive

MGA Zone 50 383369 **mE** 6493695 **mN** **Lat.** -31.6861 **Long.** 115.7694

Habitat Gentle slope

Aspect W **Slope** Gentle

Soil Type Brown sandy loam

Rock Type Nil

Loose Rock 0 % cover **Litter** 99 % cover ; 6 cm in depth

Bare ground 0 % cover **Weeds** 95 % cover

Vegetation U+ ^*Eucalyptus gomphocephala*\^tree\7\c;M ^*Banksia sessilis*,^*Acacia saligna*\^shrub\4\i;G ^*Oxalis pes-caprae*,^*Avena barbata*\^forb\1\d

Veg. Condition Good

Disturbance Rubbish throughout

Fire Age >10 years

Notes Between main road and embankment.

Species	WA Cons.	Height (m)	Cover (%)	Count
Acacia saligna		1.8	2	
**Asparagus asparagoides*		0	<1	
**Avena barbata*		0.5	20	
Banksia sessilis		2.2	8	
Caladenia latifolia		0.3	<1	

Conostylis ?pauciflora subsp. *pauciflora*	P4	0.35	<1
Dianella revoluta		0.7	<1
**Ehrharta calycina*		0.5	<1
**Ehrharta longiflora*		0.5	<1
Eucalyptus gomphocephala		12	35
**Euphorbia peplus*		0.5	<1
**Euphorbia terracina*		0.4	<1
**Galium murale*		0.1	<1
Hardenbergia comptoniana		0.5	<1
**Hypochaeris glabra*			<1
**Lactuca serriola*		0.2	<1
Lepidosperma pubisquameum		0.7	<1
Lomandra hermaphrodita		0.3	<1
**Lysimachia arvensis*		0.1	<1
**Oxalis pes-caprae*		0.2	65
Phyllanthus calycinus		0.15	<1
**Sonchus oleraceus*		0.6	1
Styphelia propinqua		0.3	<1

QFD05

Staff	TCJ	**Date**	2/09/2020	**Season**	A		
Revisit	TCJ		6/10/2020		A		
Type	Q 10 m x 10 m						
Location	Flynn Drive						
MGA Zone	50	384722 **mE**	6493553 **mN**	**Lat.**	-31.6876	**Long.**	115.7837
Habitat	Upper-Slope						
Aspect	N	**Slope**	Gentle				
Soil Type	Brown sandy loam						
Rock Type	Nil						
Loose Rock	0 % cover			**Litter**	90 % cover ; 3 cm in depth		
Bare ground	5 % cover	**Weeds**	25 % cover				

Vegetation U+ ^*Eucalyptus gomphocephala*\^tree\7\r;M ^^*Banksia sessilis*,*Jacksonia sternbergiana*, *Xanthorrhoea preissii*\^shrub,grass tree\4\i;G ^*Ehrharta calycina*,^*Hibbertia hypericoides*\^tussock grass,shrub\1\c

Veg. Condition Good

Disturbance Access tracks either side, large amounts of small sized rubbish.

Fire Age >5 years

Notes Reveg/landscaped areas to north between remnant and road verge, with grevillea, olearia and hibbertia cultivars and Geraldton wax and banksia prionotes.

Species	WA Cons.	Height (m)	Cover (%)	Count
Acacia saligna		2	1.5	
Acanthocarpus preissii		0.4	<1	
Banksia sessilis		2	6	

*Brassica tournefortii		0.3	<1	
*Briza maxima		0.3	<1	
Conostylis ?pauciflora subsp. *pauciflora*	P4	0.3	<1	
Corynotheca micrantha		0.3	<1	
Cynodon dactylon		0.1	<1	
Desmocladus flexuosus		0.2	<1	
Diuris longifolia		0.3	<1	
Ehrharta calycina		0.4	12	
Eragrostis curvula		1.2	6	
Eucalyptus gomphocephala		13	3	
Euphorbia terracina		0.4	<1	
Gladiolus caryophyllaceus		0.4	<1	
Hibbertia hypericoides		0.4	10	
Jacksonia sericea	P 4	0.2	1	5
Jacksonia sternbergiana		2.2	3	
Lactuca serriola		0.2	3	
Leontodon rhagadioloides		0.2	<1	
Lepidosperma leptostachyum		0.4	<1	
Lysimachia arvensis		0.1	<1	
Mesomelaena pseudostygia		0.4	<1	
Ornithopus sp.		0.1	<1	
Pelargonium capitatum		0.3	1	
Ptilotus polystachyus		0.3	<1	
Romulea rosea		0.3	<1	
Scaevola canescens		0.2	<1	
Scaevola repens var. *repens*		0.2	<1	
Sonchus oleraceus		0.1	<1	
Sowerbaea laxiflora		0.4	<1	
Tricoryne elatior		0.3	<1	
Trifolium arvense		0.1	<1	
Trifolium campestre		0.1	<1	
Trifolium hirtum		0.1	<1	
Ursinia anthemoides subsp. *anthemoides*		0.1	<1	
Xanthorrhoea preissii		2	2	

QFD06

Staff TCJ **Date** 2/09/2020 **Season** A

Revisit TCJ 7/10/2020 A

Type Q 10 m x 10 m

Location Flynn Drive

MGA Zone 50 383889 **mE** 6493702 **mN** **Lat.** -31.6861 **Long.** 115.7749

Habitat Flat

Aspect N/A **Slope** N/A

Soil Type Brown sandy loam

Rock Type Nil

Loose Rock 0 % cover **Litter** 98 % cover ; 5 cm in depth

Bare ground 0 % cover **Weeds** 85 % cover

Vegetation U+ ^*Eucalyptus gomphocephala*\^tree\7\r;M ^^*Jacksonia sternbergiana*,*Banksia sessilis*, *Xanthorrhoea preissii*\^shrub,grass tree\4\c;G ^*Ehrharta calycina*\^tussock grass\2\d

Veg. Condition Good

Disturbance Some small and large rubbish, near access track and road, dumping of building materials and

Fire Age >10 years

Notes

Species	WA Cons.	Height (m)	Cover (%)	Count
Acacia saligna		0.5	<1	
Acanthocarpus preissii		0.3	<1	
**Avena barbata*		0.5	<1	
Banksia sessilis		2.2	5	
Conostylis ?pauciflora subsp. *pauciflora*	P4	0.4	<1	

Conostylis aculeata	0.3	<1
**Ehrharta calycina*	0.7	80
Eucalyptus gomphocephala	19	3
**Euphorbia peplus*	0.1	2
**Euphorbia terracina*	0.5	4
Hakea trifurcata	2.3	2
Hardenbergia comptoniana	0.2	<1
Jacksonia sternbergiana	2.8	35
Lechenaultia linarioides	0.4	<1
**Lysimachia arvensis*	0.2	<1
Phyllanthus calycinus	0.5	<1
**Sonchus oleraceus*	0.3	<1
Tricoryne elatior	0.8	<1
Xanthorrhoea preissii	1.3	3

APPENDIX SIX DBCA REPORT FORMS

Department of Biodiversity, Conservation and Attractions
GOVERNMENT OF WESTERN AUSTRALIA

Threatened and Priority Flora Report Form

Version 1.3a July 2020

Please complete as much of the form as possible, with emphasis on those sections bordered in black. For information on how to complete the form please refer to the Threatened & Priority Flora Report Form (TPRF) manual on the DBCA website at http://dpaw.wa.gov.au/ under *Standard Report Forms*

TAXON: Grevillea thelemanniana **TPFL Pop. No:**

OBSERVATION DATE: 01/09/20 **CONSERVATION STATUS:** T New population ☐

OBSERVER/S: Terri Jones **PHONE:** 0894308955

ROLE: Senior Ecologist **ORGANISATION:** Ecoscape Australia Pty Ltd

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

On northern side of Flynn Drive, west of Greenwich Parade, Neerabup, WA.

Reserve No:

DBCA DISTRICT: Swan Coastal District **LGA:** Wanneroo Land manager present: ☐

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

COORDINATES: (If UTM coords provided, **Zone** is also required)
DecDegrees ☐ DegMinSec ☐ UTMs ☒
Lat / Northing: 6493640
Long / Easting: 384029
ZONE: 50J

METHOD USED:
GPS ☒ Differential GPS ☐ Map ☐
No. satellites: ___ Map used: ___
Boundary polygon captured: ☐ Map scale: ___

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: ___

AREA ASSESSMENT: Edge survey ☐ Partial survey ☒ Full survey ☐ Area observed (m²): 50

EFFORT: Time spent surveying (minutes): 2 No. of minutes spent / 100 m²: ___

POP'N COUNT ACCURACY: Actual ☐ Extrapolation ☐ Estimate ☒ Count method: ___
(Refer to field manual for list)

WHAT COUNTED: Plants ☐ Clumps ☐ Clonal stems ☐

TOTAL POP'N STRUCTURE:

	Mature:	Juveniles:	Seedlings:	Totals:
Alive	~5			
Dead				

Area of pop (m²): 25

Note: Pls record count as numbers (not percentages) for database.

QUADRATS PRESENT: No. ___ Size ___ Data attached ☐ Total area of quadrats (m²): ___

Summary Quad. Totals: Alive				

REPRODUCTIVE STATE: Clonal ☐ Vegetative ☐ Flowerbud ☐ Flower ☐
Immature fruit ☐ Fruit ☐ Dehisced fruit ☐ Percentage in flower: ___%

CONDITION OF PLANTS: Healthy ☒ Moderate ☐ Poor ☐ Senescent ☐

COMMENT: Part of landscape plantings. Not naturally occurring.

THREATS - type, agent and supporting information: Eg clearing, too frequent fire, weed, disease. Refer to field manual for list of threats & agents. **Specify agent** where relevant. 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+)	**Current impact (N-E)**	**Potential Impact (L-E)**	**Potential Threat Onset (S-L)**
• Road widening.	N	M	M
• Fire.	N	E	L
•			

Please return completed form to **Species And Communities Branch** DBCA,
Locked Bag 104, BENTLEY DELIVERY CENTRE WA 6983 **OR** email to: flora.data@dbca.wa.gov.au

RECORDS: Please forward to **Flora Administrative Officer,** Species and Communities Branch.

Record entered by:_____ **Sheet No.:**_____ **Record Entered in Database** ❑

Department of Biodiversity, Conservation and Attractions
GOVERNMENT OF WESTERN AUSTRALIA

Threatened and Priority Flora Report Form

Version 1.3a July 2020

HABITAT INFORMATION:

LANDFORM:
Crest ☐
Hill ☐
Ridge ☐
Outcrop ☐
Slope ☒
Flat ☐
Open depression ☐
Drainage line ☐
Closed depression ☐
Wetland ☐

ROCK TYPE:
Granite ☐
Dolerite ☐
Laterite ☐
Ironstone ☐
Limestone ☒
Quartz ☐
Specify other: _____

LOOSE ROCK:
(on soil surface; eg gravel, quartz fields)
0-10% ☒
10-30% ☐
30-50% ☐
50-100% ☐

SOIL TYPE:
Sand ☐
Sandy loam ☒
Loam ☐
Clay loam ☐
Light clay ☐
Peat ☐
Specify other: _____

SOIL COLOUR:
Red ☐
Brown ☒
Yellow ☐
White ☐
Grey ☐
Black ☐
Specify other: _____

DRAINAGE:
Well drained ☒
Seasonally inundated ☐
Permanently inundated ☐
Tidal ☐

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

CONDITION OF SOIL: Dry ☒ Moist ☐ Waterlogged ☐ Inundated ☐

VEGETATION CLASSIFICATION*:
Eg: **1**. Banksia woodland (B. attenuata, B. ilicifolia); **2**. Open shrubland (Hibbertia sp., Acacia spp.) ; **3**. Isolated clumps of sedges (Mesomelaena tetragona)

1. Eucalyptus gomphocephala mid open woodland over Banksia sessilis, Jacksonia sternbergiana and Xanthorrhoea preissii tall open shrubland over exotic grassland.
2.
3.
4.

ASSOCIATED SPECIES:
Other (non-dominant) spp

* Please record up to four of the most representative vegetation layers (with up to three dominant species in each layer). Structural Formations should follow 2009 *Australian Soil and Land Survey Field Handbook* guidelines – refer to field manual for further information and structural formation table.

CONDITION OF HABITAT: Pristine ☐ Excellent ☐ Very good ☐ Good ☐ Degraded ☒ Completely degraded ☐

COMMENT: Appears to part of beautification/landscaping plantings.

FIRE HISTORY: **Last Fire:** Season/Month: _____ Year: _____ **Fire Intensity:** High ☐ Medium ☐ Low ☐ No signs of fire ☐

FENCING: Not required ☐ Present ☐ Replace / repair ☐ Required ☐ Length req'd: _____

ROADSIDE MARKERS: Not required ☐ Present ☐ Replace / reposition ☐ Required ☐ Quantity req'd: _____

OTHER COMMENTS: (Please include recommended management actions and/or implemented actions - include date. Also include details of additional data available, and how to locate it.)

Appears to part of beautification/landscaping plantings.

DRF PERMIT/ LICENCE No: TFL 8-2021 Note if only observing plants (i.e. no specimens or plant matieral is taken) then no permit/licence is required. For further information on permit and licening requirements see the Threatened Flora and Wildlife Licensing pages on DBCA's website. Any actions carried out under licence/permit should be recorded above in the OTHER COMMENTS section.

SPECIMEN: Collectors No: _____ WA Herb. ☐ Regional Herb. ☐ District Herb. ☐ Other: _____

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

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

Submitter of Record: Terri Jones Role: Senior Ecologist Signed: _____ Date: 8/1/21

Please return completed form to **Species And Communities Branch** DBCA,
Locked Bag 104, BENTLEY DELIVERY CENTRE WA 6983 **OR** email to: flora.data@dbca.wa.gov.au

RECORDS: Please forward to **Flora Administrative Officer,** Species and Communities Branch.

Record entered by:_____ **Sheet No.:**_____ **Record Entered in Database** ❑

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GOVERNMENT OF WESTERN AUSTRALIA

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Version 1.3a July 2020

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TAXON: Conostylis bracteata **TPFL Pop. No:**

OBSERVATION DATE: 02/09/20 **CONSERVATION STATUS:** P3 New population ☐

OBSERVER/S: Terri Jones **PHONE:** 0894308955

ROLE: Senior Ecologist **ORGANISATION:** Ecoscape Australia Pty Ltd

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

On northern side of Flynn Drive, between Mather Drive and Pinjar Rd, Neerabup, WA.

Reserve No:

DBCA DISTRICT: Swan Coastal District **LGA:** Wanneroo Land manager present: ☐

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

COORDINATES: (If UTM coords provided, **Zone** is also required)
DecDegrees ☐ DegMinSec ☐ UTMs ☒
Lat / Northing: 385506.847
Long / Easting: 6493591.154
ZONE: 50J

METHOD USED:
GPS ☒ Differential GPS ☐ Map ☐
No. satellites: ___ Map used: ___
Boundary polygon captured: ☐ Map scale: ___

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: ___

AREA ASSESSMENT: Edge survey ☐ Partial survey ☒ Full survey ☐ Area observed (m²): 100

EFFORT: Time spent surveying (minutes): 30 No. of minutes spent / 100 m²: ___

POP'N COUNT ACCURACY: Actual ☒ Extrapolation ☐ Estimate ☐ Count method: ___
(Refer to field manual for list)

WHAT COUNTED: Plants ☒ Clumps ☐ Clonal stems ☐

TOTAL POP'N STRUCTURE:

	Mature:	Juveniles:	Seedlings:	Totals:
Alive	1			1
Dead				

Area of pop (m²): ___
Note: Pls record count as numbers (not percentages) for database.

QUADRATS PRESENT: No. ___ Size ___ Data attached ☐ Total area of quadrats (m²): ___

Summary Quad. Totals: Alive				

REPRODUCTIVE STATE: Clonal ☐ Vegetative ☐ Flowerbud ☒ Flower ☐
Immature fruit ☐ Fruit ☐ Dehisced fruit ☐ Percentage in flower: ___%

CONDITION OF PLANTS: Healthy ☒ Moderate ☐ Poor ☐ Senescent ☐

COMMENT: Suspect further indivduals may occur in vicinity.

THREATS - type, agent and supporting information: Eg clearing, too frequent fire, weed, disease. Refer to field manual for list of threats & agents. **Specify agent** where relevant. 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+)	**Current impact (N-E)**	**Potential Impact (L-E)**	**Potential Threat Onset (S-L)**
• Road widening.	N	M	M
• Fire.	N	E	L
•			

Please return completed form to **Species And Communities Branch** DBCA,
Locked Bag 104, BENTLEY DELIVERY CENTRE WA 6983 **OR** email to: flora.data@dbca.wa.gov.au

RECORDS: Please forward to **Flora Administrative Officer,** Species and Communities Branch.
Record entered by:_____ **Sheet No.:**_____ **Record Entered in Database** ❑

Department of Biodiversity, Conservation and Attractions
GOVERNMENT OF WESTERN AUSTRALIA

Threatened and Priority Flora Report Form

Version 1.3a July 2020

HABITAT INFORMATION:

LANDFORM:
Crest ☒
Hill ☐
Ridge ☐
Outcrop ☐
Slope ☐
Flat ☐
Open depression ☐
Drainage line ☐
Closed depression ☐
Wetland ☐

ROCK TYPE:
Granite ☐
Dolerite ☐
Laterite ☐
Ironstone ☐
Limestone ☐
Quartz ☐
Specify other: _____

LOOSE ROCK:
(on soil surface; eg gravel, quartz fields)
0-10% ☒
10-30% ☐
30-50% ☐
50-100% ☐

SOIL TYPE:
Sand ☒
Sandy loam ☐
Loam ☐
Clay loam ☐
Light clay ☐
Peat ☐
Specify other: _____

SOIL COLOUR:
Red ☐
Brown ☐
Yellow ☒
White ☒
Grey ☐
Black ☐
Specify other: _____

DRAINAGE:
Well drained ☒
Seasonally inundated ☐
Permanently inundated ☐
Tidal ☐

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

CONDITION OF SOIL: Dry ☒ Moist ☐ Waterlogged ☐ Inundated ☐

VEGETATION CLASSIFICATION*:
Eg: **1**. Banksia woodland (B. attenuata, B. ilicifolia); **2**. Open shrubland (Hibbertia sp., Acacia spp.) ; **3**. Isolated clumps of sedges (Mesomelaena tetragona)

1. Eucalyptus marginata, Banksia attenuata and Allocasuarina fraseriana mid woodland over Xanthorrhoea preissii mid open shrubland over Hibbertia hypericoides and Mesomelaena pseudostygia low sparse shrubland and sedges.
2.
3.
4.

ASSOCIATED SPECIES:

Other (non-dominant) spp

* Please record up to four of the most representative vegetation layers (with up to three dominant species in each layer). Structural Formations should follow 2009 *Australian Soil and Land Survey Field Handbook* guidelines – refer to field manual for further information and structural formation table.

CONDITION OF HABITAT: Pristine ☐ Excellent ☒ Very good ☐ Good ☐ Degraded ☐ Completely degraded ☐

COMMENT: Suspect further indivduals may occur in vicinity.

FIRE HISTORY: **Last Fire:** Season/Month: _____ Year: _____ **Fire Intensity:** High ☐ Medium ☐ Low ☐ No signs of fire ☐

FENCING: Not required ☐ Present ☐ Replace / repair ☐ Required ☐ Length req'd: _____

ROADSIDE MARKERS: Not required ☐ Present ☐ Replace / reposition ☐ Required ☐ Quantity req'd: _____

OTHER COMMENTS: (Please include recommended management actions and/or implemented actions - include date. Also include details of additional data available, and how to locate it.)

Suspect further indivduals may occur in vicinity.

DRF PERMIT/ LICENCE No: TFL 8-2021 Note if only observing plants (i.e. no specimens or plant matieral is taken) then no permit/licence is required. For further information on permit and licening requirements see the Threatened Flora and Wildlife Licensing pages on DBCA's website. Any actions carried out under licence/permit should be recorded above in the OTHER COMMENTS section.

SPECIMEN: Collectors No: _____ WA Herb. ☐ Regional Herb. ☐ District Herb. ☐ Other: _____

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

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

Submitter of Record: Terri Jones Role: Senior Ecologist Signed: _____ Date: 8/1/21

Please return completed form to **Species And Communities Branch** DBCA,
Locked Bag 104, BENTLEY DELIVERY CENTRE WA 6983 **OR** email to: flora.data@dbca.wa.gov.au

RECORDS: Please forward to **Flora Administrative Officer,** Species and Communities Branch.

Record entered by:_____ **Sheet No.:**_____ **Record Entered in Database** ❑

Department of Biodiversity, Conservation and Attractions
GOVERNMENT OF WESTERN AUSTRALIA

Threatened and Priority Flora Report Form

Version 1.3a July 2020

Please complete as much of the form as possible, with emphasis on those sections bordered in black. For information on how to complete the form please refer to the Threatened & Priority Flora Report Form (TPRF) manual on the DBCA website at http://dpaw.wa.gov.au/ under *Standard Report Forms*

TAXON: Grevillea olivacea **TPFL Pop. No:**

OBSERVATION DATE: 01/09/20 **CONSERVATION STATUS:** P4 New population ☐

OBSERVER/S: Terri Jones **PHONE:** 0894308955

ROLE: Senior Ecologist **ORGANISATION:** Ecoscape Australia Pty Ltd

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

On southern side of Flynn Drive, east of Travertine Vista, Neerabup, WA.

Reserve No:

DBCA DISTRICT: Swan Coastal District **LGA:** Wanneroo Land manager present: ☐

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

COORDINATES: (If UTM coords provided, **Zone** is also required)
DecDegrees ☐ DegMinSec ☐ UTMs ☒

Lat / Northing: 6493742

Long / Easting: 383567

ZONE: 50J

METHOD USED:
GPS ☒ Differential GPS ☐ Map ☐

No. satellites: ___ Map used: _____

Boundary polygon captured: ☐ Map scale: _____

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: _____

AREA ASSESSMENT: Edge survey ☐ Partial survey ☒ Full survey ☐ Area observed (m²): 50

EFFORT: Time spent surveying (minutes): 10 No. of minutes spent / 100 m²: _____

POP'N COUNT ACCURACY: Actual ☒ Extrapolation ☐ Estimate ☐ Count method: _____
(Refer to field manual for list)

WHAT COUNTED: Plants ☐ Clumps ☐ Clonal stems ☐

TOTAL POP'N STRUCTURE:

	Mature:	Juveniles:	Seedlings:	Totals:
Alive	1			1
Dead				

Area of pop (m²): 25

Note: Pls record count as numbers (not percentages) for database.

QUADRATS PRESENT: No. ___ Size _____ Data attached ☐ Total area of quadrats (m²): _____

Summary Quad. Totals: Alive				

REPRODUCTIVE STATE: Clonal ☐ Vegetative ☒ Flowerbud ☐ Flower ☐
Immature fruit ☐ Fruit ☐ Dehisced fruit ☐ Percentage in flower: _____%

CONDITION OF PLANTS: Healthy ☒ Moderate ☐ Poor ☐ Senescent ☐

COMMENT: Suspected planted/escapee from adjacent golf course plantings. Not thought to be naturally occurring.

THREATS - type, agent and supporting information: Eg clearing, too frequent fire, weed, disease. Refer to field manual for list of threats & agents. **Specify agent** where relevant. 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+)	**Current impact (N-E)**	**Potential Impact (L-E)**	**Potential Threat Onset (S-L)**
• Road widening.	N	M	M
• Fire.	N	E	L
•			

Please return completed form to **Species And Communities Branch** DBCA,
Locked Bag 104, BENTLEY DELIVERY CENTRE WA 6983 **OR** email to: flora.data@dbca.wa.gov.au

RECORDS: Please forward to **Flora Administrative Officer,** Species and Communities Branch.

Record entered by:_____ **Sheet No.:**_____ **Record Entered in Database** ❑

Department of **Biodiversity, Conservation and Attractions**

GOVERNMENT OF WESTERN AUSTRALIA

Threatened and Priority Flora Report Form

Version 1.3a July 2020

HABITAT INFORMATION:

LANDFORM:
Crest ☐
Hill ☐
Ridge ☐
Outcrop ☐
Slope ☒
Flat ☐
Open depression ☐
Drainage line ☐
Closed depression ☐
Wetland ☐

ROCK TYPE:
Granite ☐
Dolerite ☐
Laterite ☐
Ironstone ☐
Limestone ☒
Quartz ☐
Specify other: _____

LOOSE ROCK:
(on soil surface; eg gravel, quartz fields)
0-10% ☒
10-30% ☐
30-50% ☐
50-100% ☐

SOIL TYPE:
Sand ☐
Sandy loam ☒
Loam ☐
Clay loam ☐
Light clay ☐
Peat ☐
Specify other: _____

SOIL COLOUR:
Red ☐
Brown ☒
Yellow ☐
White ☐
Grey ☐
Black ☐
Specify other: _____

DRAINAGE:
Well drained ☒
Seasonally inundated ☐
Permanently inundated ☐
Tidal ☐

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

CONDITION OF SOIL: Dry ☒ Moist ☐ Waterlogged ☐ Inundated ☐

VEGETATION CLASSIFICATION*:
Eg: **1**. Banksia woodland (B. attenuata, B. ilicifolia); **2**. Open shrubland (Hibbertia sp., Acacia spp.) ; **3**. Isolated clumps of sedges (Mesomelaena tetragona)

1. Eucalyptus gomphocephala mid open woodland over Banksia sessilis, Jacksonia sternbergiana and Xanthorrhoea preissii tall open shrubland over exotic grassland.
2.
3.
4.

ASSOCIATED SPECIES:
Other (non-dominant) spp

* Please record up to four of the most representative vegetation layers (with up to three dominant species in each layer). Structural Formations should follow 2009 *Australian Soil and Land Survey Field Handbook* guidelines – refer to field manual for further information and structural formation table.

CONDITION OF HABITAT: Pristine ☐ Excellent ☐ Very good ☐ Good ☒ Degraded ☐ Completely degraded ☐

COMMENT: Suspected planted/escapee from adjacent golf course plantings. Not thought to be naturally occurring.

FIRE HISTORY: **Last Fire:** Season/Month: _____ Year: _____ **Fire Intensity:** High ☐ Medium ☐ Low ☐ No signs of fire ☐

FENCING: Not required ☐ Present ☐ Replace / repair ☐ Required ☐ Length req'd: _____

ROADSIDE MARKERS: Not required ☐ Present ☐ Replace / reposition ☐ Required ☐ Quantity req'd: _____

OTHER COMMENTS: (Please include recommended management actions and/or implemented actions - include date. Also include details of additional data available, and how to locate it.)

Suspected planted/escapee from adjacent golf course plantings. Not thought to be naturally occurring.

DRF PERMIT/ LICENCE No: TFL 8-2021 Note if only observing plants (i.e. no specimens or plant matieral is taken) then no permit/licence is required. For further information on permit and licening requirements see the Threatened Flora and Wildlife Licensing pages on DBCA's website. Any actions carried out under licence/permit should be recorded above in the OTHER COMMENTS section.

SPECIMEN: Collectors No: _____ WA Herb. ☐ Regional Herb. ☐ District Herb. ☐ Other: _____

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

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

Submitter of Record: Terri Jones Role: Senior Ecologist Signed: _____ Date: 8/1/21

Please return completed form to **Species And Communities Branch** DBCA,
Locked Bag 104, BENTLEY DELIVERY CENTRE WA 6983 **OR** email to: flora.data@dbca.wa.gov.au

RECORDS: Please forward to **Flora Administrative Officer,** Species and Communities Branch.

Record entered by:_____ **Sheet No.:**_____ **Record Entered in Database** ❑

Department of Biodiversity, Conservation and Attractions
GOVERNMENT OF WESTERN AUSTRALIA

Threatened and Priority Flora Report Form

Version 1.3a July 2020

Please complete as much of the form as possible, with emphasis on those sections bordered in black. For information on how to complete the form please refer to the Threatened & Priority Flora Report Form (TPRF) manual on the DBCA website at http://dpaw.wa.gov.au/ under *Standard Report Forms*

TAXON: Jacksonia sericea **TPFL Pop. No:**

OBSERVATION DATE: 02/09/20 **CONSERVATION STATUS:** P4 New population ☐

OBSERVER/S: Terri Jones **PHONE:** 0894308955

ROLE: Senior Ecologist **ORGANISATION:** Ecoscape Australia Pty Ltd

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

On northern and southern sides of Flynn Drive, between Travertine Vista and Greenwich Parade, Neerabup, WA.

Reserve No:

DBCA DISTRICT: Swan Coastal District **LGA:** Wanneroo Land manager present: ☐

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

COORDINATES: (If UTM coords provided, **Zone** is also required)
DecDegrees ☐ DegMinSec ☐ UTMs ☒
Lat / Northing: 6493552.9
Long / Easting: 384721.8
ZONE: 50J

METHOD USED:
GPS ☒ Differential GPS ☐ Map ☐
No. satellites: ___ Map used: _____
Boundary polygon captured: ☐ Map scale: _____

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: _____

AREA ASSESSMENT: Edge survey ☐ Partial survey ☒ Full survey ☐ Area observed (m²): 1000

EFFORT: Time spent surveying (minutes): 30 No. of minutes spent / 100 m²: _____

POP'N COUNT ACCURACY: Actual ☐ Extrapolation ☐ Estimate ☒ Count method: _____
(Refer to field manual for list)

WHAT COUNTED: Plants ☒ Clumps ☐ Clonal stems ☐

TOTAL POP'N STRUCTURE:

	Mature:	Juveniles:	Seedlings:	Totals:
Alive	~135			~135
Dead				

Area of pop (m²): 800

Note: Pls record count as numbers (not percentages) for database.

QUADRATS PRESENT: No. ___ Size _____ Data attached ☐ Total area of quadrats (m²): _____

Summary Quad. Totals: Alive				

REPRODUCTIVE STATE: Clonal ☐ Vegetative ☒ Flowerbud ☐ Flower ☐
Immature fruit ☐ Fruit ☐ Dehisced fruit ☐ Percentage in flower: _____%

CONDITION OF PLANTS: Healthy ☒ Moderate ☐ Poor ☐ Senescent ☐

COMMENT: Healthy population along powerline track and in adjacent vegetation.

THREATS - type, agent and supporting information: Eg clearing, too frequent fire, weed, disease. Refer to field manual for list of threats & agents. **Specify agent** where relevant. 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+)	**Current impact (N-E)**	**Potential Impact (L-E)**	**Potential Threat Onset (S-L)**
• Road widening.	N	M	M
• Fire.	N	E	L
•			

Please return completed form to **Species And Communities Branch** DBCA,
Locked Bag 104, BENTLEY DELIVERY CENTRE WA 6983 **OR** email to: flora.data@dbca.wa.gov.au

RECORDS: Please forward to **Flora Administrative Officer,** Species and Communities Branch.

Record entered by:_____ **Sheet No.:**_____ **Record Entered in Database** ❑

Department of Biodiversity, Conservation and Attractions
GOVERNMENT OF WESTERN AUSTRALIA

Threatened and Priority Flora Report Form

Version 1.3a July 2020

HABITAT INFORMATION:

LANDFORM:
Crest ☐
Hill ☐
Ridge ☐
Outcrop ☐
Slope ☒
Flat ☐
Open depression ☐
Drainage line ☐
Closed depression ☐
Wetland ☐

ROCK TYPE:
Granite ☐
Dolerite ☐
Laterite ☐
Ironstone ☐
Limestone ☒
Quartz ☐
Specify other: _____

LOOSE ROCK:
(on soil surface; eg gravel, quartz fields)
0-10% ☒
10-30% ☐
30-50% ☐
50-100% ☐

SOIL TYPE:
Sand ☐
Sandy loam ☒
Loam ☐
Clay loam ☐
Light clay ☐
Peat ☐
Specify other: _____

SOIL COLOUR:
Red ☐
Brown ☒
Yellow ☐
White ☐
Grey ☐
Black ☐
Specify other: _____

DRAINAGE:
Well drained ☒
Seasonally inundated ☐
Permanently inundated ☐
Tidal ☐

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

CONDITION OF SOIL: Dry ☒ Moist ☐ Waterlogged ☐ Inundated ☐

VEGETATION CLASSIFICATION*:
Eg: **1**. Banksia woodland (B. attenuata, B. ilicifolia); **2**. Open shrubland (Hibbertia sp., Acacia spp.) ; **3**. Isolated clumps of sedges (Mesomelaena tetragona)

1. Eucalyptus gomphocephala mid open woodland over Banksia sessilis, Jacksonia sternbergiana and Xanthorrhoea preissii tall open shrubland over exotic grassland.
2.
3.
4.

ASSOCIATED SPECIES:
Other (non-dominant) spp

* Please record up to four of the most representative vegetation layers (with up to three dominant species in each layer). Structural Formations should follow 2009 *Australian Soil and Land Survey Field Handbook* guidelines – refer to field manual for further information and structural formation table.

CONDITION OF HABITAT: Pristine ☐ Excellent ☐ Very good ☐ Good ☒ Degraded ☐ Completely degraded ☐

COMMENT: Healthy population along powerline track and in adjacent vegetation.

FIRE HISTORY: **Last Fire:** Season/Month: _____ Year: _____ **Fire Intensity:** High ☐ Medium ☐ Low ☐ No signs of fire ☐

FENCING: Not required ☐ Present ☐ Replace / repair ☐ Required ☐ Length req'd: _____

ROADSIDE MARKERS: Not required ☐ Present ☐ Replace / reposition ☐ Required ☐ Quantity req'd: _____

OTHER COMMENTS: (Please include recommended management actions and/or implemented actions - include date. Also include details of additional data available, and how to locate it.)

Healthy population along powerline track, fenceline and in adjacent vegetation. Specific locations contributing to this record are:

384721.795	6493552.939
384894.287	6493598.763
384840.733	6493606.703
384688.777	6493538.491
384610.513	6493543.715
384543.225	6493542.188

DRF PERMIT/ LICENCE No: TFL 8-2021 Note if only observing plants (i.e. no specimens or plant matieral is taken) then no permit/licence is required. For further information on permit and licening requirements see the Threatened Flora and Wildlife Licensing pages on DBCA's website. Any actions carried out under licence/permit should be recorded above in the OTHER COMMENTS section.

SPECIMEN: Collectors No: _____ WA Herb. ☐ Regional Herb. ☐ District Herb. ☐ Other: _____

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

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

Submitter of Record: Terri Jones Role: Senior Ecologist Signed: _____ Date: 8/1/21

Please return completed form to **Species And Communities Branch** DBCA,
Locked Bag 104, BENTLEY DELIVERY CENTRE WA 6983 **OR** email to: flora.data@dbca.wa.gov.au

RECORDS: Please forward to **Flora Administrative Officer,** Species and Communities Branch.

Record entered by:_____ **Sheet No.:**_____ **Record Entered in Database** ❑

Department of Parks and Wildlife

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

Version 6.0 July 2013

COMMUNITY: Banksia Woodlands of the Swan Coastal Plain ecological community **OBSERVATION DATE:** 1/9/20

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

OBSERVER/S: Terri Jones **PHONE:** 0894308955

ROLE: Senior Ecologist **ORGANISATION:** Ecoscape Australia Pty Ltd

EMAIL: terrij@ecoscape.com.au

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

Northern road verge of Flynn Drive, between Mather Drive and Pijar Rd, Neerabup WA.

Adjacent to Mather Reserve.

Reserve No:

DISTRICT: Swan Coastal District **LGA:** Wanneroo Land manager present: ☐

DATUM:

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

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

DecDegrees ☐ DegMinSec ☐ UTMs ☒

Lat / Northing:

Long / Easting: 385524

Zone: 6493592

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: _____

AREA ASSESSMENT: Edge survey ☐ Partial survey ☒ Full survey ☐ Area observed (m²): _____

EFFORT: Time spent surveying (minutes): 120 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)
• Road maintenance/widening		%	N	H	M
• Fire		%	N	E	L
• Weeds		100%	L	H	L
•		%			
•		%			
•		%			
•		%			
•		%			
•		%			

*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 ☐ _____% Degraded ☐ _____%

Excellent ☒ _____% Good ☐ _____% Completely Degraded ☐ _____%

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.

Weed control. Removal of rubbish and debris.

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. Eucalyptus marginata, Banksia attenuata and Allocasuarina fraseriana mid woodland over Xanthorrhoea preissii mid open shrubland over Hibbertia hypericoides and Mesomelaena pseudostygia low sparse
	2.
	3.
	4.

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:*_____

Adjacent Landuse:	Road, conservation reserve.

Associated Flora Species:
Alexgeorgea nitens, Adenanthos cygnorum,Allocasuarina fraseriana, Banksia attenuata,Banksia menziesii, Burchardia congesta,Caladenia flava subsp. flava, Conostephium pendulum, Daviesia triflora, Desmocladus flexuosus, Drosera erythrorhiza, Drosera macrantha, Eucalyptus marginata, Hibbertia hypericoides, Lepidobolus preissianus, Lomandra preissii, Mesomelaena pseudostygia, Petrophile linearis, Pimelea sulphurea, Rytidosperma occidentale, Stirlingia latifolia, Stylidium androsaceum, Stylidium piliferum, Thysanotus sp. Coastal plain (N.H. Brittan 66/63), Xanthorrhoea preissii.

Associated Fauna Species:
Australian Ringneck
Brown Honeyeater
Galah
Golden Whistler
Grey-breasted White-eye
New Holland Honeyeater
Red Wattlebird
Singing Honeyeater
Willie Wagtail

OTHER COMMENTS:

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

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

Other:

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

Submitter of record:	**Terri Jones**	**Role:**	**Senior Ecologist**
Signature:	**T.Jones**	**Date submitted:**	**8/1/2021**

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:*_____