FLYNN DRIVE (STAGE 2) FLORA AND VEGETATION SURVEY 2021

City of Wanneroo

ecoscape

Revision	Author	QA Reviewer	Approved	Date
Draft	Terri Jones	Lyn Atkins	Lyn Atkins	21/01/2022
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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

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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 Pinjar Road and Old Yanchep 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 of 2021, by experienced Ecoscape ecologists Terri Jones and Louisa Carlsson.

The desktop assessment identified the following relevant aspects:

- the DBCA communities database search identified three Threatened Ecological Communities (TECs) as intersecting with the survey area
- the combined database searches identified 43 conservation-listed vascular flora taxa within a 10 km buffer area, none of which are previously recorded in the survey area. Of these, 15 were Threatened Flora (TF) species, four were Priority 1 (P1) species, seven were Priority 2 (P2), 12 were Priority 3 (P3) and five were Priority 4 (P4). A likelihood assessment identified that five of these species were considered likely to occur within the survey area.

The field survey, undertaken during 7-9 September and 18 October 2021, identified the following:

- 147 vascular flora species recorded from six quadrats and opportunistic observations
- no Threatened flora species were recorded during the survey
- no Priority flora species were recorded during the survey, however, three Priority Flora taxa are considered to still have potential to be present within the survey area:
  - *Poranthera moorokatta* (P2), which may have been overlooked due to its diminutive size
  - *Conostylis bracteata* (P3), which may co-occur with physically similar species
  - *Jacksonia sericea* (P4), which may be present in the seed bank and be stimulated to germinate during disturbance activities such as rehabilitation
- 43 introduced species (weeds) were recorded, none of which were Declared Pest plants or Weeds of National Significance
- one native vegetation type was assessed as occurring in the survey area:
  - **BAf** - *Banksia* spp. and *Allocasuarina fraseriana* low open woodland
- a portion of the **BAf** vegetation within the survey area 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)
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
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
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.

In 2021 the City engaged Ecoscape to undertake a biological survey of a portion of Flynn Drive in Neerabup (between Pinjar Road and Old Yanchep 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 Stage 2 of proposed road upgrade works on Flynn Drive, inform any permit amendments due to design changes and inform an environmental impact assessment of the proposed clearing between Pinjar Road and Old Yanchep 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 8.83 ha in size and forms a linear corridor of vegetation adjacent to a busy roadway. A portion of the survey area at its western extent 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 2021, 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 13** 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 14** 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 13** 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 14** 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 14**.

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] 2021) and are designated with an asterisk (*) in this document.

1.5.3.1 Weeds of National Significance

At a national level there are 32 weed species listed as Weeds of National Significance (WoNS) (Weeds Australia & Centre for Invasive Species Solutions 2021). 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 13** 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 15** 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 15 July 2021 (Species and Communities Program; DBCA 2021).

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°C 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 typical, recording approximately 102% of the long-term mean for the March to August 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.

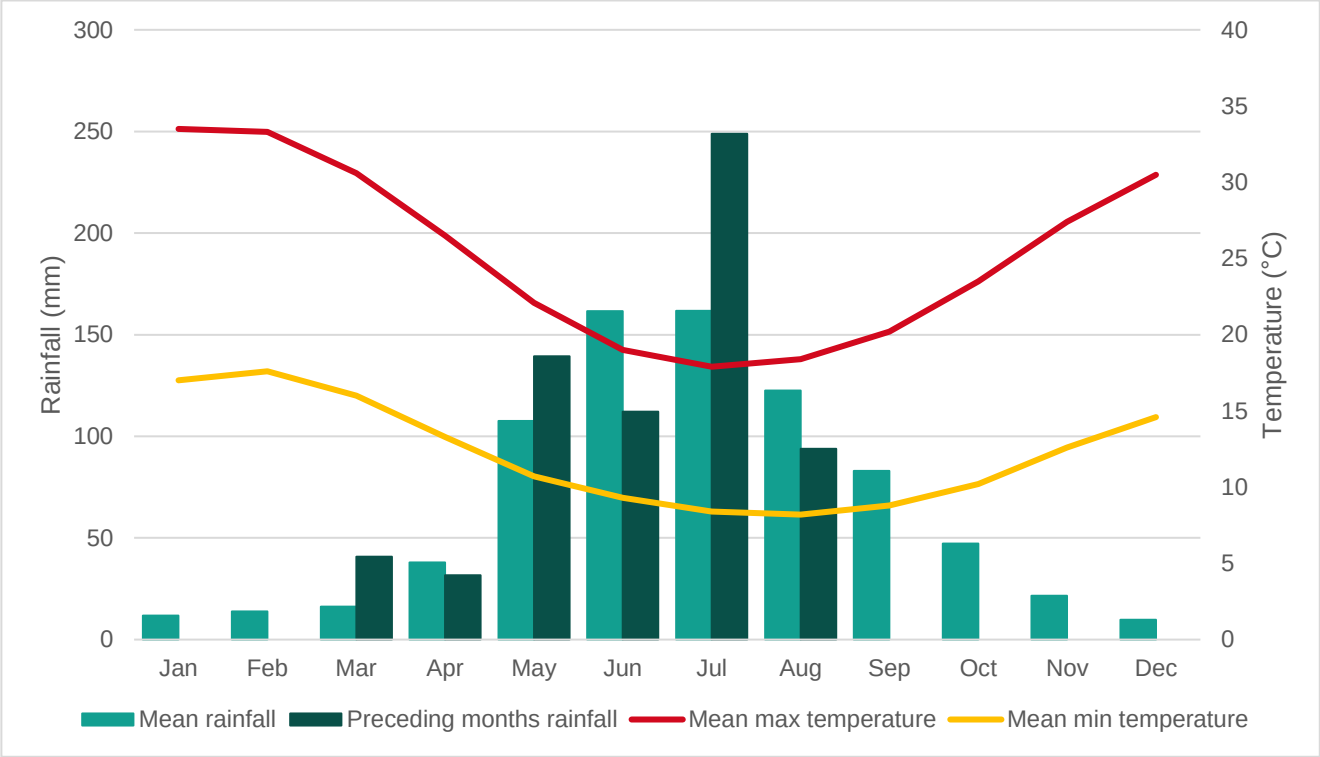

Figure 2: Rainfall and temperature data for the survey area

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)	%
212Bs_Ja	Bassendean, Jandakot Phase	Jandakot low dunes. Slopes <10% and generally more than 5m relief. Grey sand over pale yellow sands generally underlain by humic and iron podsols; *Banksia* spp. low open woodland with a dense shrub layer	0.35	3.91
211Sp_Ky	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.	8.49	96.09

2.1.3 GEOLOGY

Geological mapping covering the survey area is associated with the Muchea (2034 I) map sheet of the 1:50,000 Geological Series of Western Australia (DMIRS 2020). According to this mapping, one geological unit intersects the survey area, as shown in **Table 3**.

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

Code	Description	Extent (ha)	%
S7	SAND – pale and olive yellow. medium to coarse-grained sub-angular quartz, moderately sorted, of residual origin, modified by marine inundation	8.83	100

2.1.4 WETLANDS AND DRAINAGE

The survey area intersects the Wanneroo Coastal Lakes catchment at its western extent, with the majority of the survey area falling within the Swan Avon (Lower Swan) catchment, in the Swan Coastal basin (DWER 2018a). The survey area does not intersect with any wetlands or drainage lines. The nearest wetlands to the survey area include a number of small damplands and sumplands associated with Little Coogee Flat approximately 600 m to the east, Lake Pinjar at 1.2 km to the north, and Lake Adams at 1.2 km to the south-southeast (DBCA 2019a). Hydrology of the area includes the minor river of Ellen Brook approximately 18 km to the east, and the Swan River located approximately 21 km southeast of the survey area (DWER 2018b).

2.1.5 ENVIRONMENTALLY SENSITIVE AREAS

The survey area partially intersects a Bush Forever site (Site 295) in the west, as well as an area of vegetation mapped as being representative of the State-listed TEC *Banksia attenuata woodland over species rich dense shrublands (SCP 20a)*.

2.1.6 CONSERVATION LANDS

The survey area does not directly intersect any conservation lands (i.e. National Parks, Nature Reserves and other areas vested for conservation). The Gnangara-Moore River State Forest, vested with the Conservation Commission of Western Australia, is the nearest conservation estate located immediately to the east of the survey area on the eastern side of Old Yanchep Road.

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 (2019b). This mapping indicates that the survey area intersects two pre-European vegetation units, as shown in **Table 4**.

Table 4: Pre-European vegetation corresponding with the survey area (DBCA 2019b)

Association	Code	Description	% of survey area
Spearwood System	6	Woodland southwest	98.33
Bassendean System	949	Low woodland or open low woodland	1.67

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 2019b) and shown on **Map 2**.

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

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	56.42
IBRA biographic region (Swan Coastal Plan)	6	56,343.01	13,362.25	23.72
	949	209,983.26	120,287.93	57.28
IBRA biographic subregion (Perth)	6	56,343.01	13,362.25	23.72
	949	184,475.82	104,128.96	56.45
LGA (City of Wanneroo)	6	12,662.10	2,777.67	21.94
	949	37,138.40	17,196.34	46.30

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 (DBCA 2018b)

Vegetation Complex	System 6 Code	Landform	Description	% of Survey Area
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.	8.71
Pinjar Complex	54	Swan Coastal Plain – Aeolian deposits	Vegetation ranges from woodland of *Eucalyptus marginata* (Jarrah) - *Banksia* species to a fringing woodland of *Eucalyptus rudis* (Flooded Gum) - *Melaleuca preissiana* (Moonah) and sedgelands.	0.13

Table 7: Vegetation complex extents in the Swan Coastal Plain (Government of Western Australia 2019)

Vegetation Complex	Pre-European extent (ha)	Current extent (ha)	% Remaining	Proportion within the LGA[1]
Karrakatta Complex – Central and South	53,080.99	12,467.20	23.49	19.85
Pinjar Complex	4,892.64	1,735.34	35.47	100.00

2.2.4 THREATENED AND PRIORITY ECOLOGICAL COMMUNITIES

The Protected Matters Search Tool (PMST) search (Department of Agriculture Water and the Environment [DAWE] 2021; search reference FRPPY3) identified two EPBC-listed TECs likely to occur within a 10 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 47_0821EC) identified a total of nine TECs and PECs within a 5 km buffer of the search area, shown in **Table 8**. Of these, three ecological communities correspond with the survey area:

- *Banksia attenuata woodland over species rich dense shrublands* (FCT 20a)
- *Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region*
- *Banksia ilicifolia woodlands.*

Table 8: Summary of DBCA TEC/PEC results

Name	TEC	PEC	Code (WA)	Code (EPBC Act)
Banksia attenuata woodland over species rich dense shrublands (FCT 20a) (a component of the Endangered *Banksia Woodlands of the Swan Coastal Plain* EPBC-listed TEC)	x	-	EN	EN
Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region[1] (can form a component of the Endangered *Banksia Woodlands of the Swan Coastal Plain* EPBC-listed TEC)	-	x	P3	EN
Banksia ilicifolia woodlands (can form a component of the Endangered *Banksia Woodlands of the Swan Coastal Plain* EPBC-listed TEC)	x	x	P3	EN
Banksia Woodlands of the Swan Coastal Plain ecological community[1]	x	-	-	EN
Low lying Banksia attenuata woodlands or shrublands (FCT 21c)	-	x	P3	EN
Melaleuca huegelii – Melaleuca systena shrublands on limestone ridges (FCT 26a)	x	-	EN	-
Northern Spearwood shrublands and woodlands (FCT 24) (can form a component of the Endangered Banksia Woodlands of the Swan Coastal Plain EPBC-listed TEC)	x	x	P3	EN
Swan Coastal Plain Banksia attenuata - Banksia menziesii woodlands (FCT 23b) (a component of the Endangered *Banksia Woodlands 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

FCT = Floristic community type (as originally described in Gibson *et al.* 1994)

[1]Note that TECs of similar description and inclusion criteria may be attributed under similar but distinct official names, hence the *Banksia Woodlands of the Swan Coastal Plain ecological community* is likely to be inclusive of, if not equivalent to, the *Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region* TEC.

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, including the Banksia Woodlands TEC.

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 19** and text in **Appendix Two**.

2.2.5 THREATENED AND PRIORITY FLORA

A search of the PMST applying a 10km buffer (search reference PMST_FRPPY3) identified 15 EPBC-listed TF within the search area buffer: three for which species or species habitat is "known to occur", five classed as "likely to occur" and eight as "may occur". These are listed in **Table 20** 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 19-0921FL). The DBCA database searches identified the following State-listed flora taxa:

- TF:
  - *Caladenia huegelii*
  - *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*
  - *Fabronia hampeana*
  - *Lecania turicensis* var. *turicensis*
  - *Poranthera moorokatta*
  - *Stenanthemum sublineare*
  - *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:
  - *Anigozanthos humilis* subsp. *chrysanthus*
  - *Jacksonia sericea*
  - *Schoenus griffinianus*
  - *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 results of the DBCA and PMST database searches are presented in **Table 21** in **Appendix Three**.

2.2.5.1 Threatened and Priority Flora Likelihood Assessment

Ecoscape conducted a likelihood assessment to identify TF and PF species that have high potential to occur within the survey area. The likelihood of a species occurring is based on the following attributes, as listed on *FloraBase* (WAH 1998-2021, 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 21** in **Appendix Three**. No species were identified as having been recorded previously within the survey area. Three P2, one P3 and one P4 species were identified as being 'Likely' to occur 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 21** 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 (2021) *Flynn Drive Flora and Vegetation Survey 2020,* adjoins the current survey area to the west
- 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 western 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, Ecoscape 2021). *Banksia* woodland vegetation in in this location was assessed by Ecoscape in 2020 as being in Very Good to Excellent condition, and was found to be consistent with the State-listed *Banksia attenuata woodlands over species rich dense shrublands* TEC and Commonwealth-listed *Banksia Woodlands of the Swan Coastal Plain* TEC.

The conservation-listed flora species *Conostylis bracteata* (P3) was previously recorded from the adjoining *Banksia* woodland to the west of the survey area by Ecoscape in 2020, with nearby occurrences of *Jacksonia sericea* (P4), a species identified during desktop assessment as having potential to occur in the current survey area, also recorded during the same study (Ecoscape 2021).

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 13**, **Table 14** and **Table 15** 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 16** and **Table 17** 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 18** 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 during 7-9 September and secondary survey conducted on 18 October 2021. 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 within 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 Louisa Carlsson (Environmental Scientist, Flora Collecting Permit FB2000295) during 7-9 September and 18 October 2021.

4.1 FLORA

Eight assessment sites, comprised of four floristic quadrats and four floristic relevés, were recorded from within the survey area. Relevés were used in degraded areas of linear form where a bounded 10 m x 10 m quadrat was not practicable and vegetation was such that data could more effectively be captured via relevé assessment.

A total of 147 vascular flora taxa were recorded from 110 genera and 43 families from the quadrats, relevés, opportunistic observations and during searches for conservation-listed flora. Of these, 43 taxa were introduced (29.25%) and eight taxa (5.44%) could not be confidently identified to species level due to insufficient diagnostic reproductive material.

The most commonly represented families were Fabaceae (19), Asteraceae (15 taxa) and Poaceae (13). The genera recorded most frequently were *Conostylis* with seven taxa, *Banksia* (five), *Acacia* (four) and *Stylidium* (four).

The number of species per assessment site ranged from 18 in relevés R02 and R03, to 49 in quadrat Q02, with an average species diversity per site of 31.5 taxa. The most commonly recorded native species within sites were *Adenanthos cygnorum*, *Desmocladus fasciculatus*, *Stirlingia latifolia* and *Xanthorrhoea preissii* (each recorded from five quadrats or relevés), with *Allocasuarina fraseriana, Conostylis aculeata* subsp. *cygnorum, Daviesia nudiflora, Hibbertia hypericoides, Kennedia prostrata* and *Mesomelaena pseudostygia* each recorded from four quadrats. A number of introduced flora taxa (weed species) were observed across multiple locations, the most commonly observed of these being **Gladiolus caryophyllaceus* at seven assessment sites, **Hypochaeris glabra* recorded from four sites, and **Arctotheca calendula, *Ehrharta longiflora, *Euphorbia terracina, *Pelargonium capitatum, *Sonchus oleraceus, *Trifolium campestre* and **Ursinia anthemoides* subsp. *anthemoides* each recorded from four sites.

The combined flora inventory is presented in **Table 22** in **Appendix Four**. Quadrat data is presented in **Appendix Five**.

4.1.1 CONSERVATION-LISTED FLORA

Threatened Flora

No TF species listed under the Commonwealth EPBC Act or Western Australian BC Act were recorded during the field survey.

Priority Flora

No PF species listed under the Western Australian BC Act were recorded during the field survey.

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 43 introduced flora species (weeds) were recorded during the field survey (**Table 23**, **Appendix Four**), representing 29.25% of the overall flora inventory. Weed burden and diversity within the survey area was highest along road verges and where previous clearing or disturbance had occurred, with covers ranging from 15% to 85% recorded from relevés R01, R02, R03 and R04, and 20% weed cover observed at Q04 which had been revegetated following clearing activities. Weed diversity at these sites ranged from 10 to 17 taxa, with families Asteraceae, Euphorbiaceae, Fabaceae and Poaceae predominant.

Within *Banksia* woodland at sites Q01, Q02 and Q03, weed cover was observed to be low (<3%). Diversity at these quadrats ranged from three to six taxa, with common and less aggressive weeds recorded, including **Briza maxima* (Blowfly Grass), **Gladiolus caryophyllaceus* (Wild Gladiolus), **Hypochaeris glabra* (Flat Weed) and **Ursinia anthemoides* subsp. *anthemoides*.

No Declared Pest species or Weeds of National Significance (WoNS) were observed during the survey.

4.2 VEGETATION

4.2.1 VEGETATION TYPES

One distinct native vegetation type was 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. This vegetation unit (**Table 10**, **Map 4** series) is broadly described as:

- **BAf** - *Banksia* spp. and *Allocasuarina fraseriana* low open woodland.

Other portions of the survey area constitute revegetation plantings or areas which have been cleared, and are not considered native vegetation.

Table 10: Vegetation types

Landform	Mapping unit	Floristic quadrats / relevés	Vegetation type	Characteristic species	Representative photograph	Area (ha) and extent (%)
Undulating Plain	**BAf**	Q01 Q02 Q03	*Banksia* spp. and *Allocasuarina fraseriana* low open woodland, over *Xanthorrhoea preissii* mid sparse shrubland, over *Hibbertia hypericoides* and *Mesomelaena pseudostygia* low open shrubland/sedgeland.	*Adenanthos cygnorum, Alexgeorgea nitens, Allocasuarina fraseriana, Anigozanthos manglesii, Banksia attenuata, Banksia menziesii, Bossiaea eriocarpa, Burchardia congesta, Caladenia flava, Conostylis aculeata* subsp. *cygnorum, Conostylis setigera* subsp. *setigera, Crassula colorata, Dampiera linearis, Daviesia nudiflora, Daviesia triflora, Desmocladus fasciculatus, Desmocladus flexuosus, Drosera erythrorhiza, Haemodorum laxum, Hibbertia hypericoides subsp. hypericoides, Hyalosperma cotula, Mesomelaena pseudostygia, Philotheca spicata, Stirlingia latifolia, Stylidium androsaceum, Stylidium neurophyllum, Trachymene pilosa, Xanthorrhoea preissii.*		2.54 ha 28.74%
Undulating Plain	n/a	Q04	Revegetation			0.26 ha 2.99%
Undulating Plain	n/a	R01 R02 R03 R04	Cleared / Not Vegetated			6.03 ha 68.27%
			TOTAL EXTENT			**8.83 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 **BAf** vegetation unit at the western end of the survey area and north of Flynn Drive were observed during the survey to be general consistent with criteria defined for these TEC/PECs (DPaW 2016; Threatened Species Scientific Committee 2016), 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 minimum patch size (when taking into consideration contiguous vegetation beyond the survey area boundary)
- containing a species-rich understorey including characteristic species (*Adenanthos cygnorum, Bossiaea eriocarpa, Burchardia congesta, Conostephium pendulum, Conostylis aurea, Conostylis setigera, Dampiera linearis, Daviesia* spp., *Desmocladus fasciculatus, Drosera erythrorhiza, Hibbertia hypericoides, Petrophile linearis, Petrophile macrostachya, Philotheca spicata, Scaevola repens, Stirlingia latifolia, and Xanthorrhoea preissii*).

Of note, the general dominance or co-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.

A total area of 0.86 ha was found to meet the Banksia Woodlands TEC criteria following analysis post survey, representing 9.7% of the survey area.

No further TECs were recorded during the survey. Although the provided DBCA communities mapping indicates that the Priority 3(iii) ecological community *Banksia ilicifolia woodlands, southern Swan Coastal Plain ('floristic community type 22')*, which also forms part of the *Banksia woodlands of the Swan Coastal Plain* EPBC-listed TEC, occurs in the central portion of the survey area, no vegetation consistent with this community was recorded during the survey.

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 floristic groupings based on the quadrats surveyed. The grouping of quadrats in analysis aligns with separation of distinct native remnant vegetation from cleared or revegetated areas observed in the field. The first grouping (Q01-03) corresponds with *Banksia* spp. and *Allocasuarina fraseriana* low open woodland, with the second grouping (Q04 and R01-04) corresponding with revegetation areas (Q04) and areas effectively cleared of vegetation.

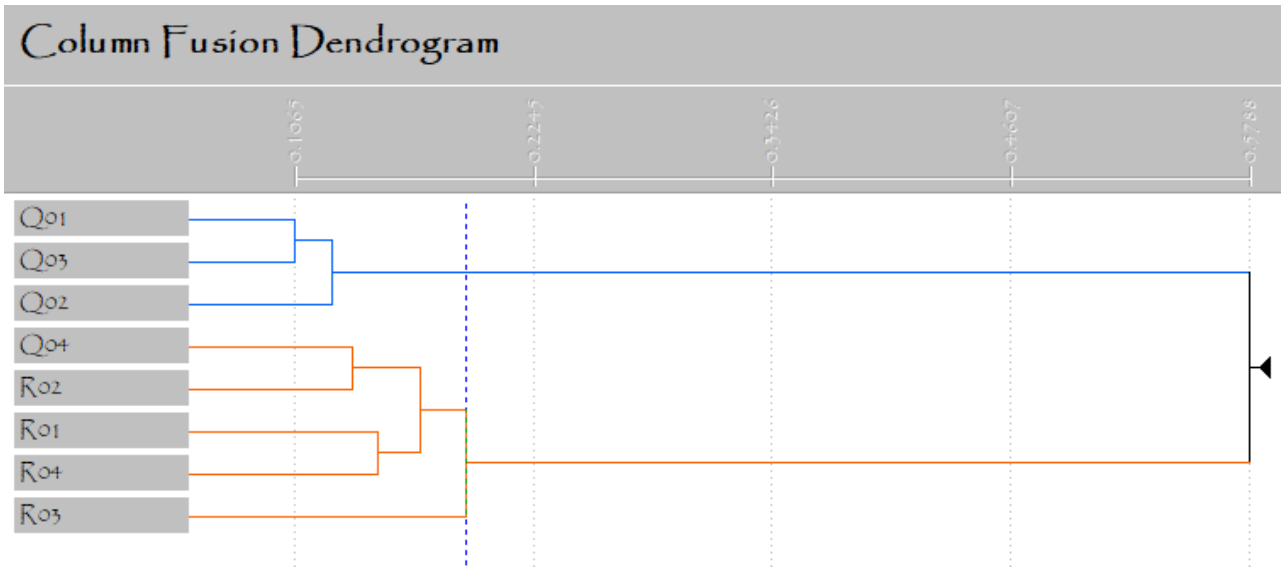

Figure 3: Floristic analysis dendrogram

4.2.4 VEGETATION CONDITION

The condition of extant native within the survey area ranged from Completely Degraded to Very Good-Excellent condition. Larger sections of **BAf** vegetation at the western end of the survey area were in Very Good-Excellent condition, whilst narrow linear vegetated areas adjacent to the road verge and towards the eastern extent of the survey area were predominantly in Degraded to Completely Degraded condition (**Table 11**). The main factors affecting vegetation condition were structural integrity, weed burden and type, and degradation through human disturbance with the presence of rubbish.

Table 11: Vegetation condition

Vegetation condition	Extent (ha)	Proportion (%)
Pristine	0.00	0.00
Excellent	0.00	0.00
Very Good - Excellent	0.69	7.85
Very Good	0.17	1.97
Good	0.78	8.86
Degraded	0.31	3.55
Degraded - Completely Degraded	0.15	1.65
Completely Degraded	0.43	4.86
Revegetation	0.26	2.99
Cleared / Not Vegetated	6.03	68.27

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 139.2 species when applied to the *Species Diversity and Richness IV* software (Pisces Conservation Ltd 2010). When opportunistic records are included, a total of 147 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.

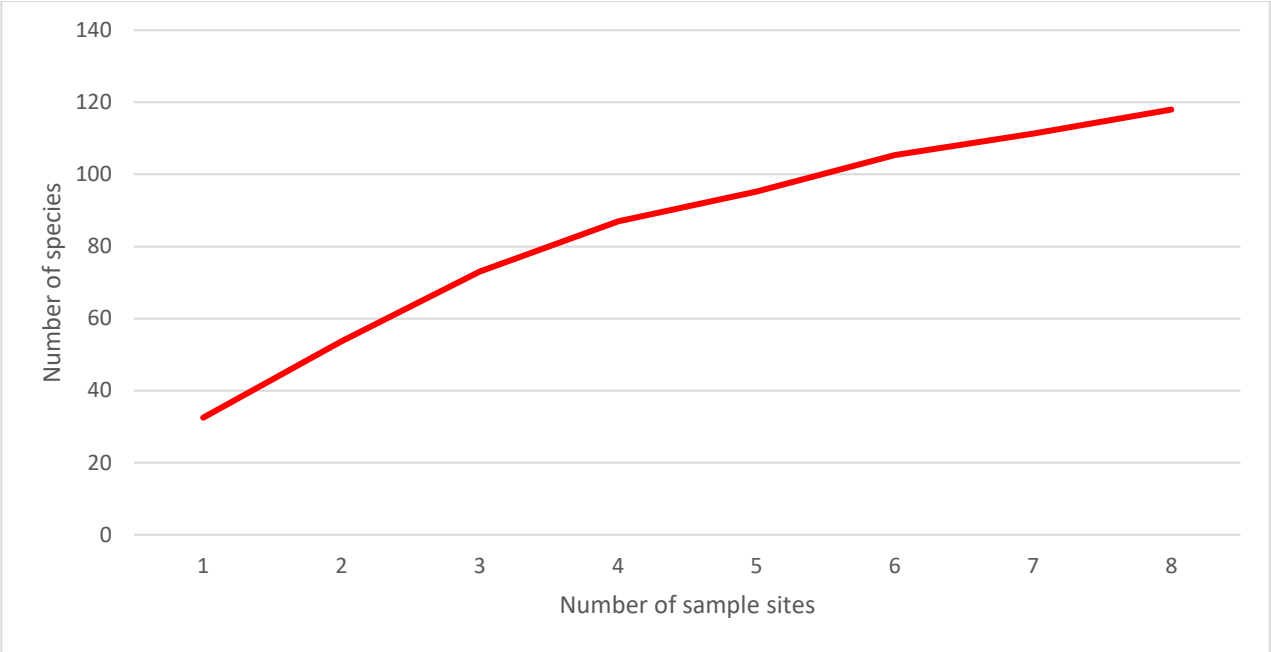

Figure 4: Species accumulation curve

Quadrat species richness may also indicate adequacy of survey. The average species richness from all the quadrats and relevés recorded during this survey was 31.5 taxa per quadrat. Quadrat species richness may be influenced by factors including vegetation type, condition, season, rainfall, and landform, therefore provides only a broad frame of reference. The quadrat species richness from this survey is comparable with that recorded from adjacent vegetation in 2020 where an average of 35.5 species was recorded (Ecoscape 2021), as well as that of 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 41 to 49 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 increased degradation from proximity to an active road. The revegetated and highly degraded sections of the survey area are not directly comparable with Gibson *et al.*, however, richness results (ranging from 18 to 28 taxa per quadrat) are not unexpected given 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 and seasonal conditions preceding the field survey were not considered to be a constraint.

A full summary of botanical limitations is presented in **Table 12**.

Table 12: 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	147 vascular flora taxa were recorded during the field survey of which 5.44% 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 at this location. None of the unidentified specimens were similar to any conservation-listed species.
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	No	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 typical for the period, at 102% of long-term average rainfall levels (**Figure 2, Figure 5**).
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.

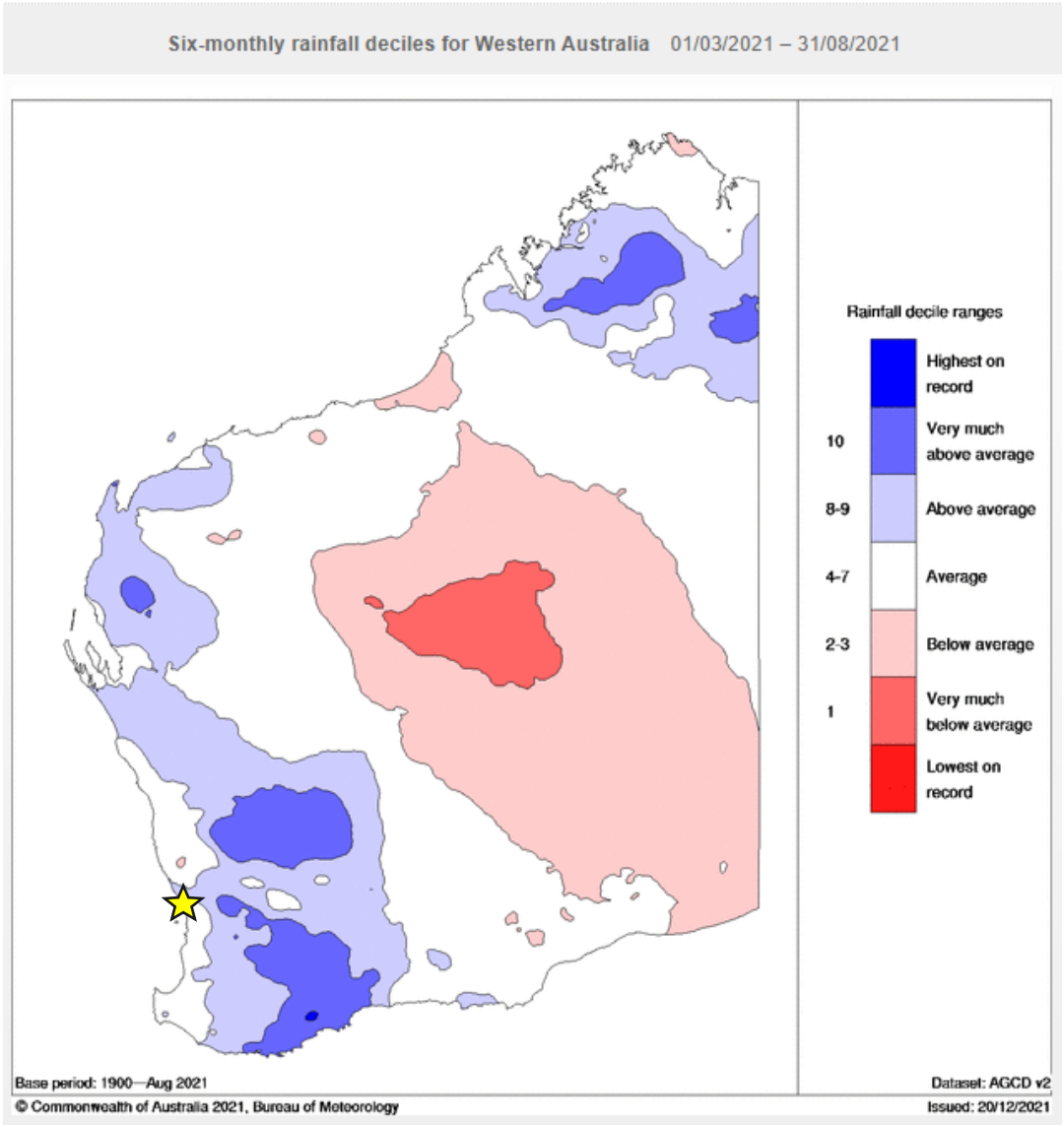

Figure 5: Rainfall deciles for the 6 months prior to the field survey (the star indicates the approximate survey area location)

5 DISCUSSION

5.1 FLORA SIGNIFICANCE

Overall, 147 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

No Threatened Flora species listed under the Commonwealth EPBC Act or Western Australian BC Act were recorded during the field survey. None of the unidentified species resembled any currently listed TF.

Priority Flora

No Priority Flora species under DBCA listings were recorded during the field survey. None of the unidentified species resembled any currently listed PF

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 21** in **Appendix Three**.

No TF species identified by the database searches are considered likely to occur in the survey area.

Three PF species identified by the database searches are considered to have remaining potential to occur in the survey area:

- ***Poranthera moorokatta*** **(P2)**
  This taxon occurs in open spaces of *Banksia attenuata – B. menziesii* woodland on white sand in a restricted number of locations from Perth to Bindoon and has previously been recorded approximately 1 km from the survey area. Suitable habitat is found in the survey area and the small size and inconspicuous habit of the taxon means there is potential for individuals to be missed during field survey. Despite not being recorded during field assessment, this species may occur in the survey area.
- ***Conostylis bracteata*** **(P3)**
  This species has been recorded recently in *Banksia* woodland vegetation immediately adjacent to the survey area, east of Mather Drive on the northern road verge of Flynn Drive (Ecoscape 2021). Additional individuals may occur within the survey area, co-mingling with other physically similar *Conostylis* species that occur in the vicinity and, based on availability of habitat and known distribution, likely form part of a single, naturally-occurring population. It is therefore possible for the taxon to be present in the survey area despite not having been recorded during the current field survey.
- ***Jacksonia sericea*** **(P4)**
  Often occurring in open areas on coastal, sandy soils from Mandurah to Two Rocks, this species may thrive following light disturbance of an area such as revegetation works. It was not observed during the current field survey, however, has been recorded recently from the vicinity in moderate numbers (Ecoscape 2021) and as such small individuals or seedlings may have potential to be present in the survey area particularly along firebreak or informal track edges.

5.1.1.2 Introduced Flora

A total of 43 weed taxa were recorded from field survey. No WONS or Declared Pest plant species were observed, and weed taxa recorded during the survey are commonly recorded from bushland remnant and road verge in the local area.

5.2 VEGETATION SIGNIFICANCE

Based on a combination of species composition and vegetation structure, one native vegetation type was identified as occurring in the survey area:

- **BAf** - *Banksia* spp. and *Allocasuarina fraseriana* low open woodland.

Floristic analysis confirmed the distinction of this vegetation type based on the sites sampled within the survey area.

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 **BAf** vegetation type at the western end of the survey area 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 when also taking contiguous vegetation into consideration. The **BAf** vegetation type is also considered representative of the *Banksia attenuata woodland over species rich dense shrublands* TEC/PEC.

The **BAf** vegetation type was mapped across 2.54 ha of the survey area, however only a 0.86 ha area (as shown on **Map 6**) is considered to fulfil the *Banksia woodlands of the Swan Coastal Plain* TEC criteria for condition and patch size, representing 9.7% of the total survey area.

5.2.2 VEGETATION CONDITION

The vegetation of the survey area ranged in condition from Completely Degraded, in areas of narrow linear vegetation adjacent to road verge and informal access tracks, to Very Good-Excellent with no obvious signs of disturbance in less fragmented portions of *Banksia* spp. and *Allocasuarina fraseriana* woodland (**Map 5**).

Much of the survey area had been subject to previous vegetation clearing, with little to no extant native plants, and was impacted by high weed burden. These areas are considered to be essentially devoid of vegetation and are mapped as such. Areas of disturbance and rubbish deposition were also observed. This is reflected in the condition ratings as mapped.

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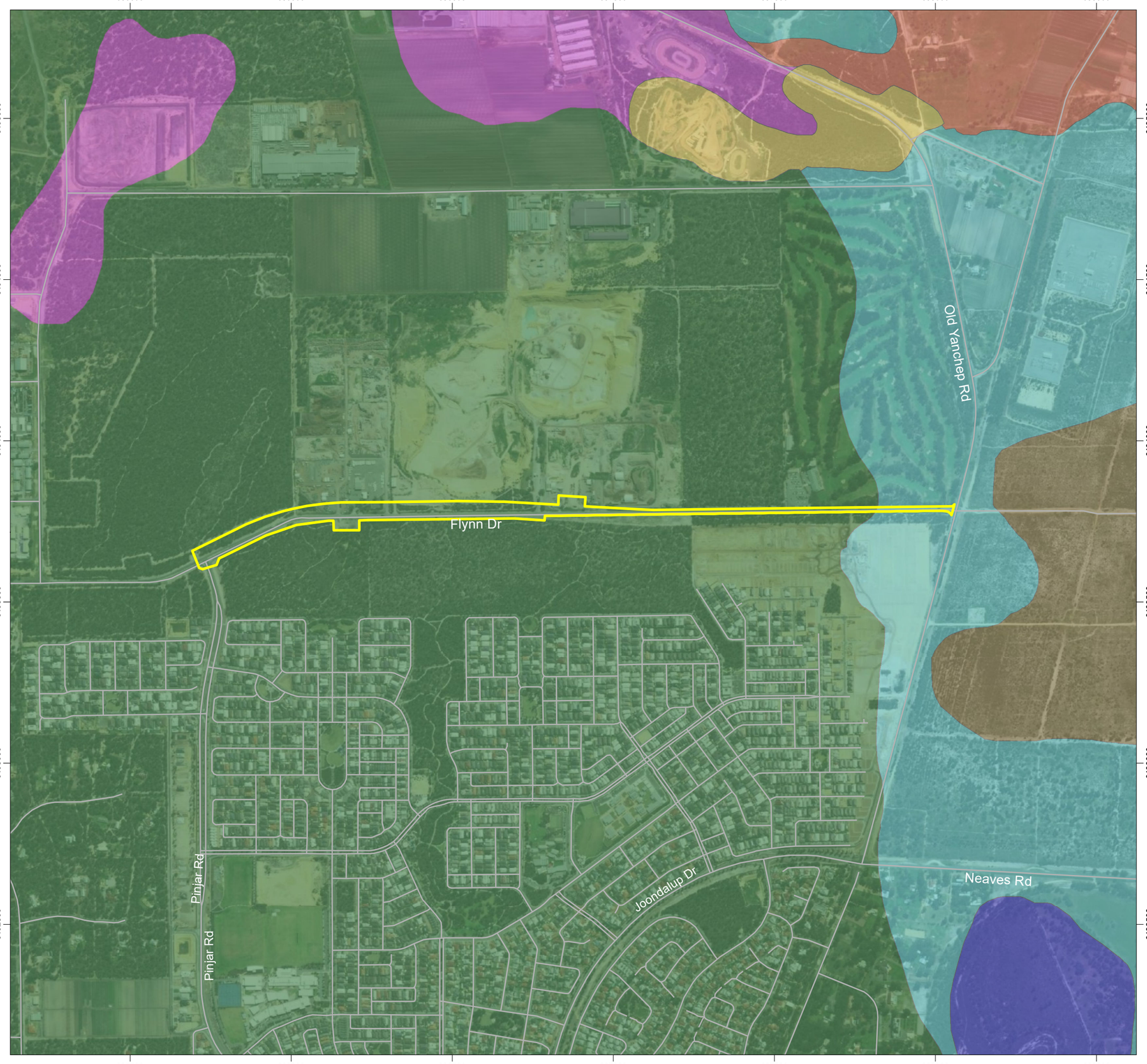
MAPS



LEGEND

- Survey Area
- Roads

Land System

- 211Sp__Kg: Karrakatta Sand Grey Phase: Low hilly to gently undulating terrain. Iron podzols. Banksia spp woodland with E. todtiana and depauperate E. marginata; dense shrub layer.
- 211Sp__Ky: 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.
- 212Bs__G: Bassendean, Gavin Phase: Flat or gently undulating landscape. Iron-humus podzols and some diatomite deposits. Banksia spp. Low open woodland with scattered emergent Eucalyptus calophylla and Melaleuca pressiana dense shrub layer.
- 212Bs__J: Bassendean, Joel Phase: Poorly drained depressions. Humus podzols. Scattered M. preissiana, E. rudis and Banksia ilicifolia with a dense shrub layer.
- 212Bs__Ja: Bassendean, Jandakot Phase: Jandakot low dunes. Slopes <10% and generally more than 5m relief. Grey sand over pale yellow sands generally underlain by humic and iron podsols; Banksia spp. low open woodland with a dense shrub layer.
- 212Bs__P: Bassendean, Pinjar Phase: Extensively flat swampy areas. Sandy surface sometimes with diatomite over organic hardpan below. E. rudis, B. littoralis and M. preissiana around the edges; sedges and reeds with scattered M. teretifolius in centre; Jacksonia furcellata.
- 212Bs__Ws: Bassendean seasonal swamps Phase: Depressions with free water in winter. Humus podzols and peat. Dense M. preissiana; M. rhaphiophylla and E. rudis around the edges with reeds and sedges in the centre.

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

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SOIL LANDSCAPE MAPPING

FLYNN DRIVE (STAGE 2)
SPRING BIOLOGICAL SURVEY 2021

City of Wanneroo

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

N

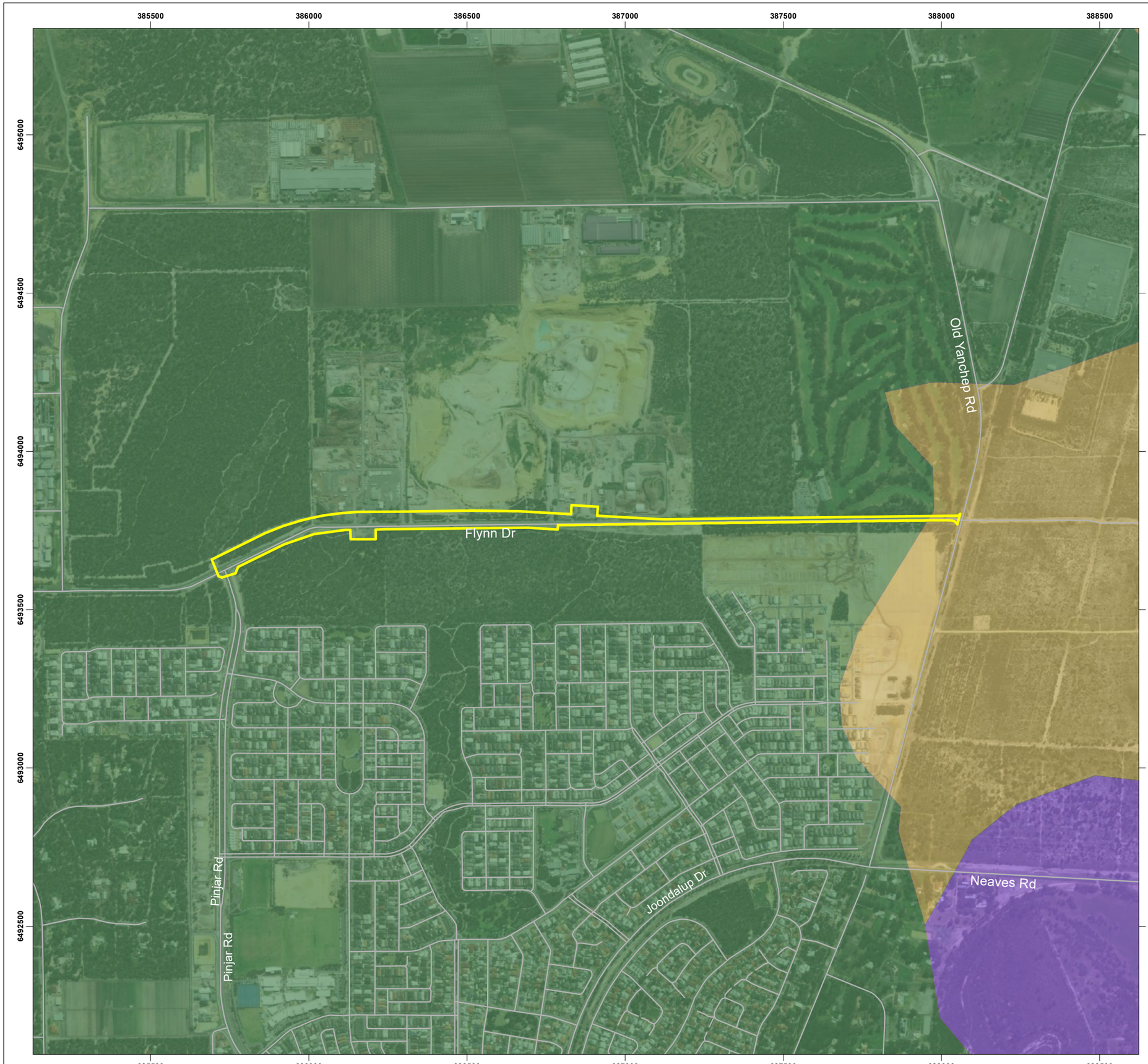
SCALE: 1:12,000 @ A3

0 0.1 0.2 0.3 0.4 0.5 km

PROJECT NO: 4665-21

REV	AUTHOR	APPROVED	DATE
00	TJ	SB	21/12/2021

MAP 1



LEGEND

- Survey Area
- Roads

System Association

- BASSENDEAN_126: Freshwater lake:
- BASSENDEAN_949: Low woodland or open low woodland: Other acacia, banksia, peppermint, cypress pine, casuarina, York gum *Acacia* spp., *Banksia* spp., *Agonis flexuosa, Callitris* spp., *Allocasuarina* spp., *Eucalyptus loxophleba.*
- SPEARWOOD_6: Woodland southwest: Jarrah, marri and wandoo *Eucalyptus marginata, Corymbia calophylla, E. wandoo.*

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

FLYNN DRIVE (STAGE 2)
SPRING BIOLOGICAL SURVEY 2021

City of Wanneroo

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

N

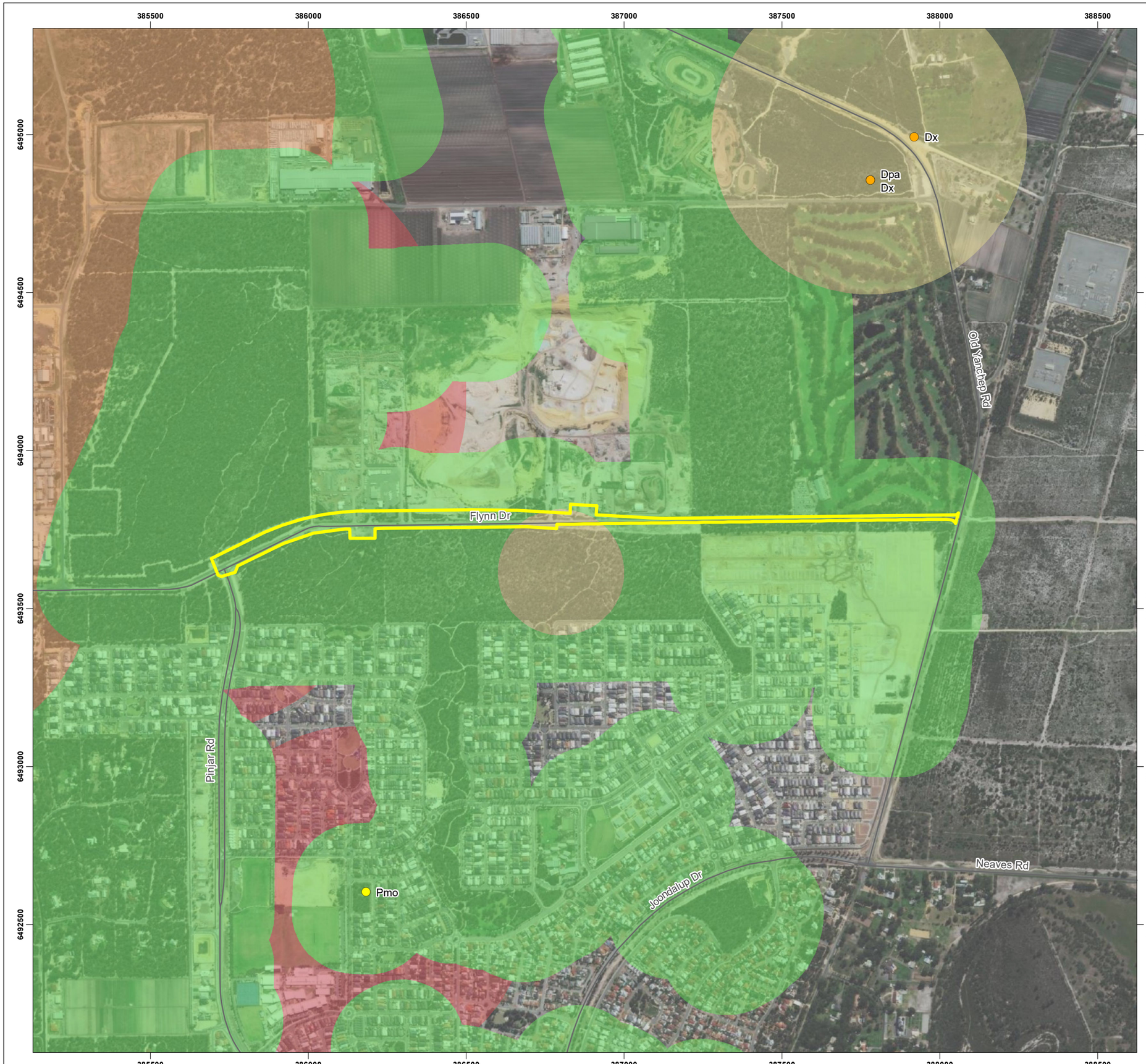
SCALE: 1:12,000 @ A3

0 0.1 0.2 0.3 0.4 0.5 km

PROJECT NO: 4665-21

REV	AUTHOR	APPROVED	DATE
00	TJ	SB	21/12/2021

MAP 2



LEGEND

- Survey Area
- Roads

Conservation-Listed Flora (DBCA 2021)

- Priority 1
- Priority 2

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))
- *Banksia ilicifolia* woodlands
- Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain

Code	Taxon	Status
Dpa	*Drosera patens*	P3
Dx	*Drosera x sidjamesii*	P3
Pmo	*Poranthera moorokatta*	P2

DATA SOURCES :
SOURCE DATA: CONSERVATION-LISTED FLORA (DBCA 2021), TEC/PEC (DBCA 2021)
AERIAL: ESRI BASEMAP (2020)
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 (STAGE 2)
SPRING BIOLOGICAL SURVEY 2021

City of Wanneroo

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

N

SCALE: 1:12,000 @ A3

0 100 200 300 400 500 m

PROJECT NO: 4665-21

REV	AUTHOR	APPROVED	DATE
00	TJ	SB	21/12/2021

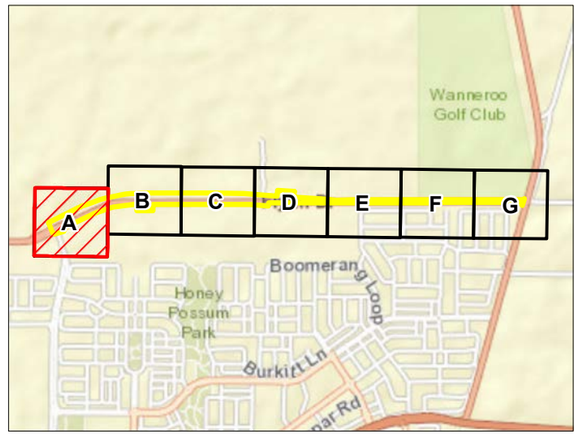
MAP 3

LEGEND

- Survey Area
- Roads
- Quadrats

Vegetation Unit

- **BAf** - *Banksia* spp. and *Allocasuarina fraseriana* low open woodland over *Xanthorrhoea preissii* mid sparse shrubland over *Hibbertia hypericoides* and *Mesomelaena pseudostygia* low open shrubland/sedgeland.
- Cleared/Not vegetated
- Revegetation



DATA SOURCES :
AERIAL: NEARMAP (2021)
SERVICE LAYERS: SOURCES: ESRI, HERE, GARMIN, USGS, INTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY

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VEGETATION UNITS AND QUADRAT LOCATIONS

FLYNN DRIVE (STAGE 2)
SPRING BIOLOGICAL SURVEY 2021

City of Wanneroo

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

N

SCALE: 1:1,370 @ A3

0 10 20 30 40 50 m

PROJECT NO: 4665-21

REV	AUTHOR	APPROVED	DATE
00	TJ	SB	21/12/2021

MAP 4A

386000 386100 386200 386300

6493900 6493800 6493700 6493600

Flynn Dr

Q4

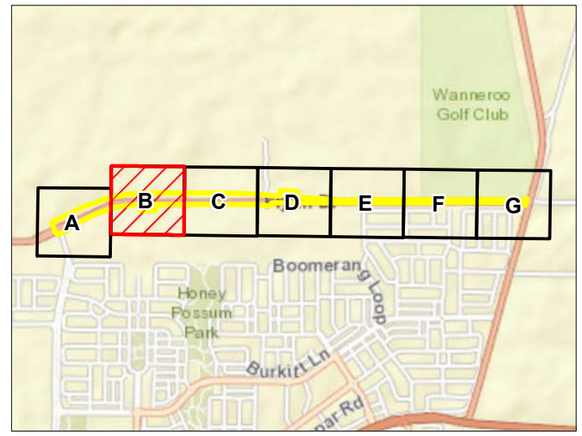
386000 386100 386200 386300

LEGEND

- Survey Area
- Roads
- Quadrats

Vegetation Unit

- **BAf** - *Banksia* spp. and *Allocasuarina fraseriana* low open woodland over *Xanthorrhoea preissii* mid sparse shrubland over *Hibbertia hypericoides* and *Mesomelaena pseudostygia* low open shrubland/sedgeland.
- Cleared/Not vegetated
- Revegetation



DATA SOURCES :
AERIAL: NEARMAP (2021)
SERVICE LAYERS: SOURCES: ESRI, HERE, GARMIN, USGS, INTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY

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VEGETATION UNITS AND QUADRAT LOCATIONS

FLYNN DRIVE (STAGE 2)
SPRING BIOLOGICAL SURVEY 2021

City of Wanneroo

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

N

SCALE: 1:1,370 @ A3

0 10 20 30 40 50 m

PROJECT NO: 4665-21

REV	AUTHOR	APPROVED	DATE
00	TJ	SB	21/12/2021

MAP 4B

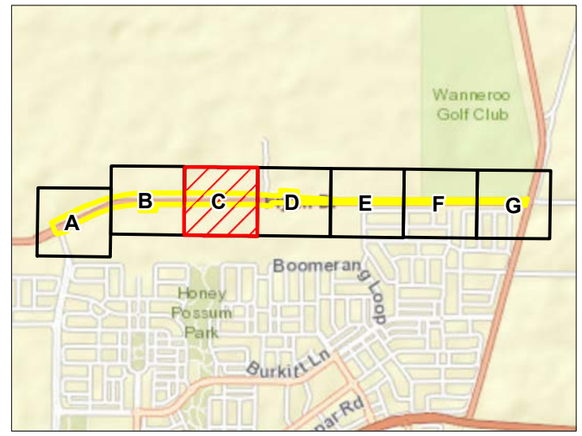
LEGEND

- Survey Area
- Roads
- Quadrats

Vegetation Unit

BAf - *Banksia* spp. and *Allocasuarina fraseriana* low open woodland over *Xanthorrhoea preissii* mid sparse shrubland over *Hibbertia hypericoides* and *Mesomelaena pseudostygia* low open shrubland/sedgeland.

- Cleared/Not vegetated



DATA SOURCES :
AERIAL: NEARMAP (2021)
SERVICE LAYERS: SOURCES: ESRI, HERE, GARMIN, USGS, INTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY

ecoscape

VEGETATION UNITS AND QUADRAT LOCATIONS

FLYNN DRIVE (STAGE 2)
SPRING BIOLOGICAL SURVEY 2021

City of Wanneroo

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

N

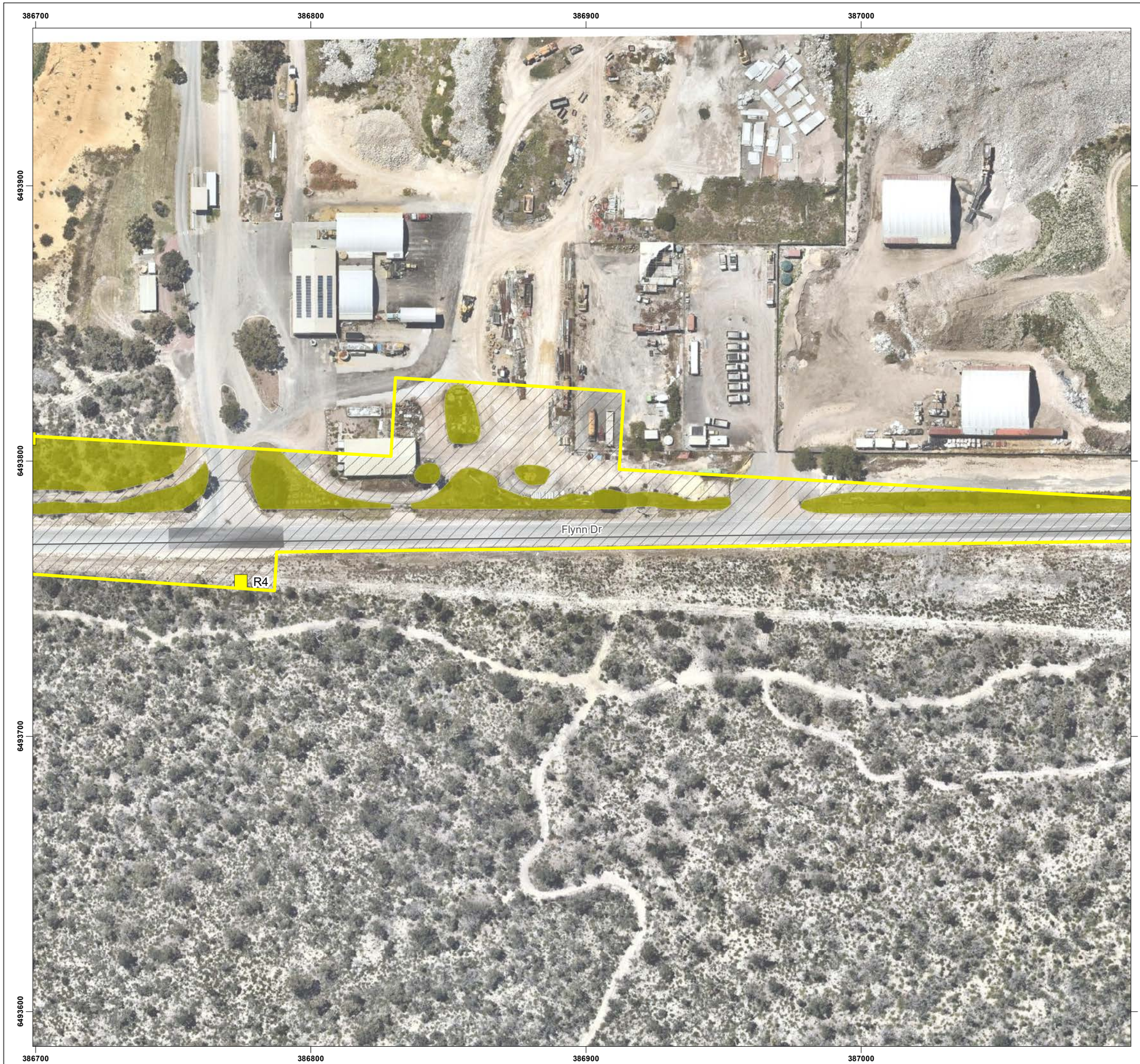
SCALE: 1:1,370 @ A3

0 10 20 30 40 50 m

PROJECT NO: 4665-21

REV	AUTHOR	APPROVED	DATE
00	TJ	SB	21/12/2021

MAP
4C



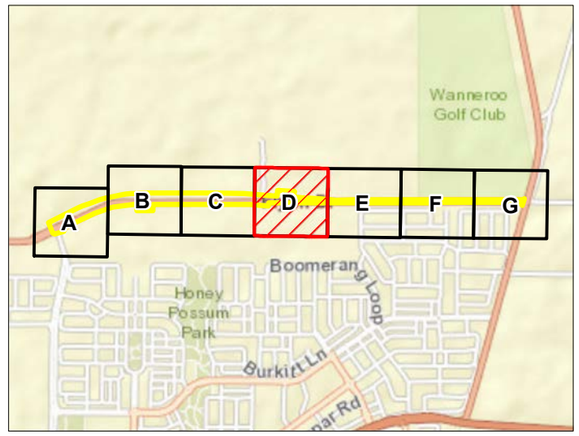
LEGEND

- Survey Area
- Roads
- Quadrats

Vegetation Unit

BAf - *Banksia* spp. and *Allocasuarina fraseriana* low open woodland over *Xanthorrhoea preissii* mid sparse shrubland over *Hibbertia hypericoides* and *Mesomelaena pseudostygia* low open shrubland/sedgeland.

- Cleared/Not vegetated



DATA SOURCES :
AERIAL: NEARMAP (2021)
SERVICE LAYERS: SOURCES: ESRI, HERE, GARMIN, USGS, INTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY

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VEGETATION UNITS AND QUADRAT LOCATIONS

FLYNN DRIVE (STAGE 2)
SPRING BIOLOGICAL SURVEY 2021

City of Wanneroo

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

N

SCALE: 1:1,370 @ A3

0 10 20 30 40 50 m

PROJECT NO: 4665-21

REV	AUTHOR	APPROVED	DATE
00	TJ	SB	21/12/2021

MAP
4D

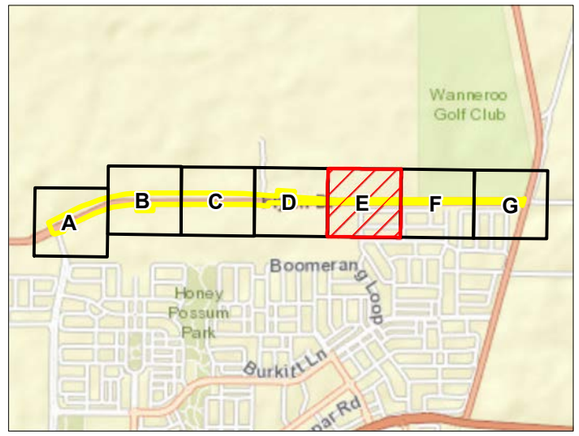
LEGEND

- Survey Area
- Roads
- Quadrats

Vegetation Unit

BAf - *Banksia* spp. and *Allocasuarina fraseriana* low open woodland over *Xanthorrhoea preissii* mid sparse shrubland over *Hibbertia hypericoides* and *Mesomelaena pseudostygia* low open shrubland/sedgeland.

- Cleared/Not vegetated



DATA SOURCES :
AERIAL: NEARMAP (2021)
SERVICE LAYERS: SOURCES: ESRI, HERE, GARMIN, USGS, INTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY

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VEGETATION UNITS AND QUADRAT LOCATIONS

FLYNN DRIVE (STAGE 2)
SPRING BIOLOGICAL SURVEY 2021

City of Wanneroo

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

N

SCALE: 1:1,370 @ A3

0 10 20 30 40 50 m

PROJECT NO: 4665-21

REV	AUTHOR	APPROVED	DATE
00	TJ	SB	21/12/2021

MAP
4E

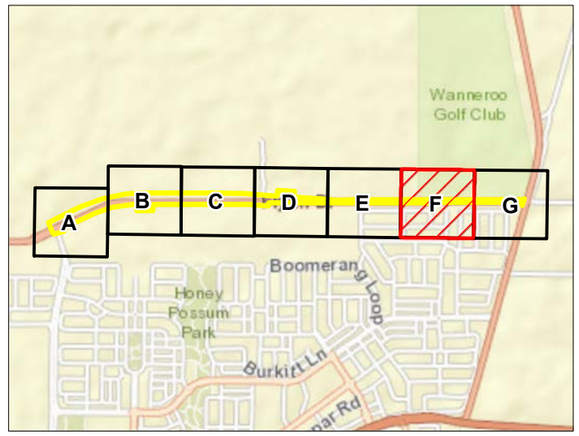
LEGEND

- Survey Area
- Roads
- Quadrats

Vegetation Unit

BAf - *Banksia* spp. and *Allocasuarina fraseriana* low open woodland over *Xanthorrhoea preissii* mid sparse shrubland over *Hibbertia hypericoides* and *Mesomelaena pseudostygia* low open shrubland/sedgeland.

- Cleared/Not vegetated



DATA SOURCES :
AERIAL: NEARMAP (2021)
SERVICE LAYERS: SOURCES: ESRI, HERE, GARMIN, USGS, INTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY

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VEGETATION UNITS AND QUADRAT LOCATIONS

FLYNN DRIVE (STAGE 2)
SPRING BIOLOGICAL SURVEY 2021

City of Wanneroo

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PROJECTION: TRANSVERSE MERCATOR
DATUM: GDA 1994
UNITS: METER

N

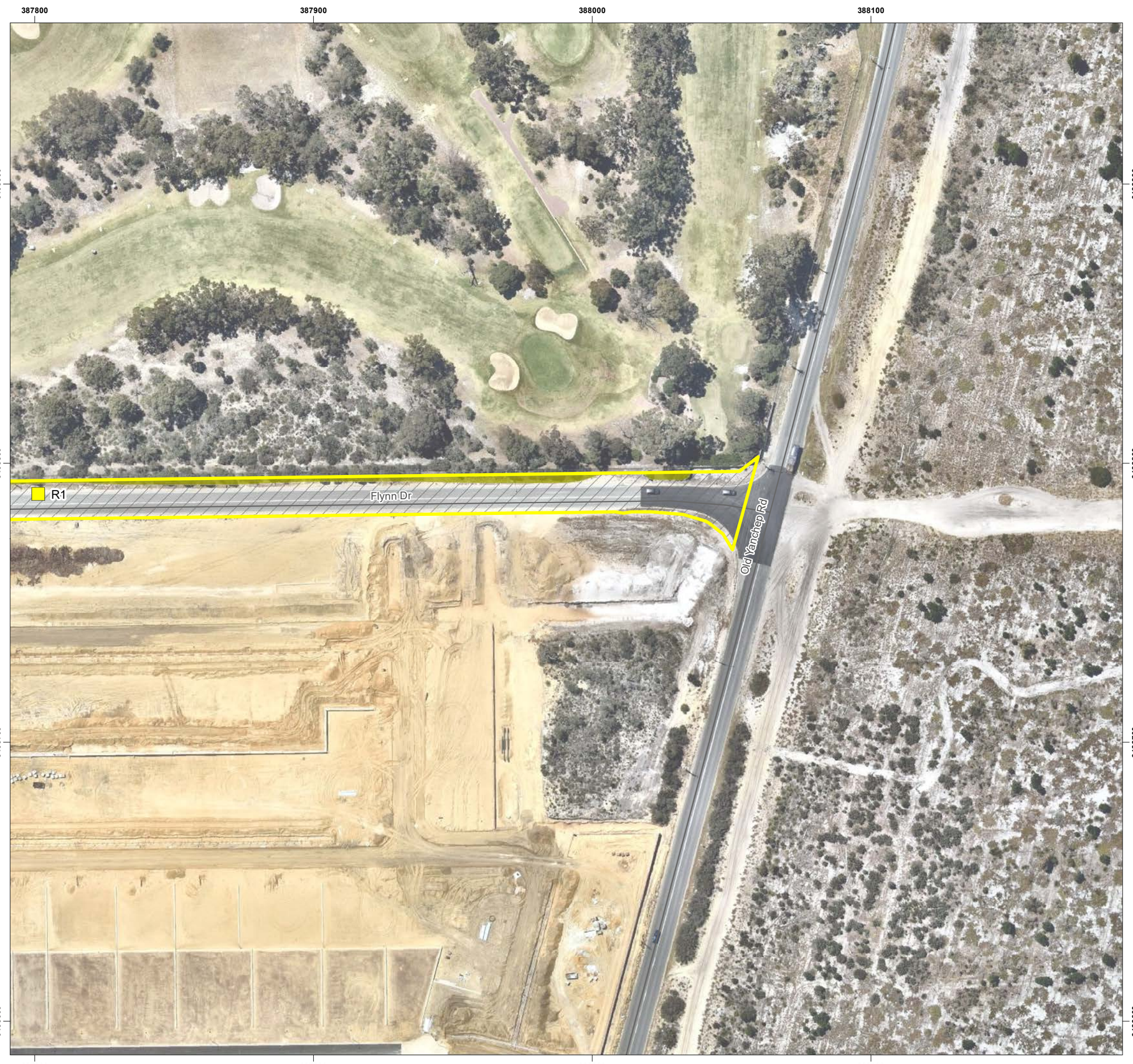
SCALE: 1:1,370 @ A3

0 10 20 30 40 50 m

PROJECT NO: 4665-21

REV	AUTHOR	APPROVED	DATE
00	TJ	SB	21/12/2021

MAP
4F



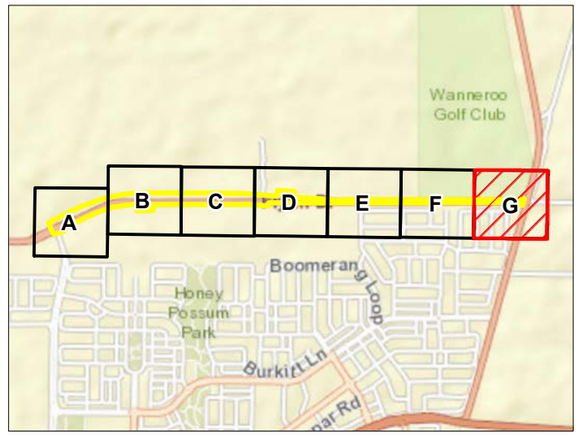
LEGEND

- Survey Area
- Roads
- Quadrats

Vegetation Unit

BAf - *Banksia* spp. and *Allocasuarina fraseriana* low open woodland over *Xanthorrhoea preissii* mid sparse shrubland over *Hibbertia hypericoides* and *Mesomelaena pseudostygia* low open shrubland/sedgeland.

Cleared/Not vegetated



DATA SOURCES :
AERIAL: NEARMAP (2021)
SERVICE LAYERS: SOURCES: ESRI, HERE, GARMIN, USGS, INTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY

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VEGETATION UNITS AND QUADRAT LOCATIONS

FLYNN DRIVE (STAGE 2)
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City of Wanneroo

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PROJECTION: TRANSVERSE MERCATOR
DATUM: GDA 1994
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N

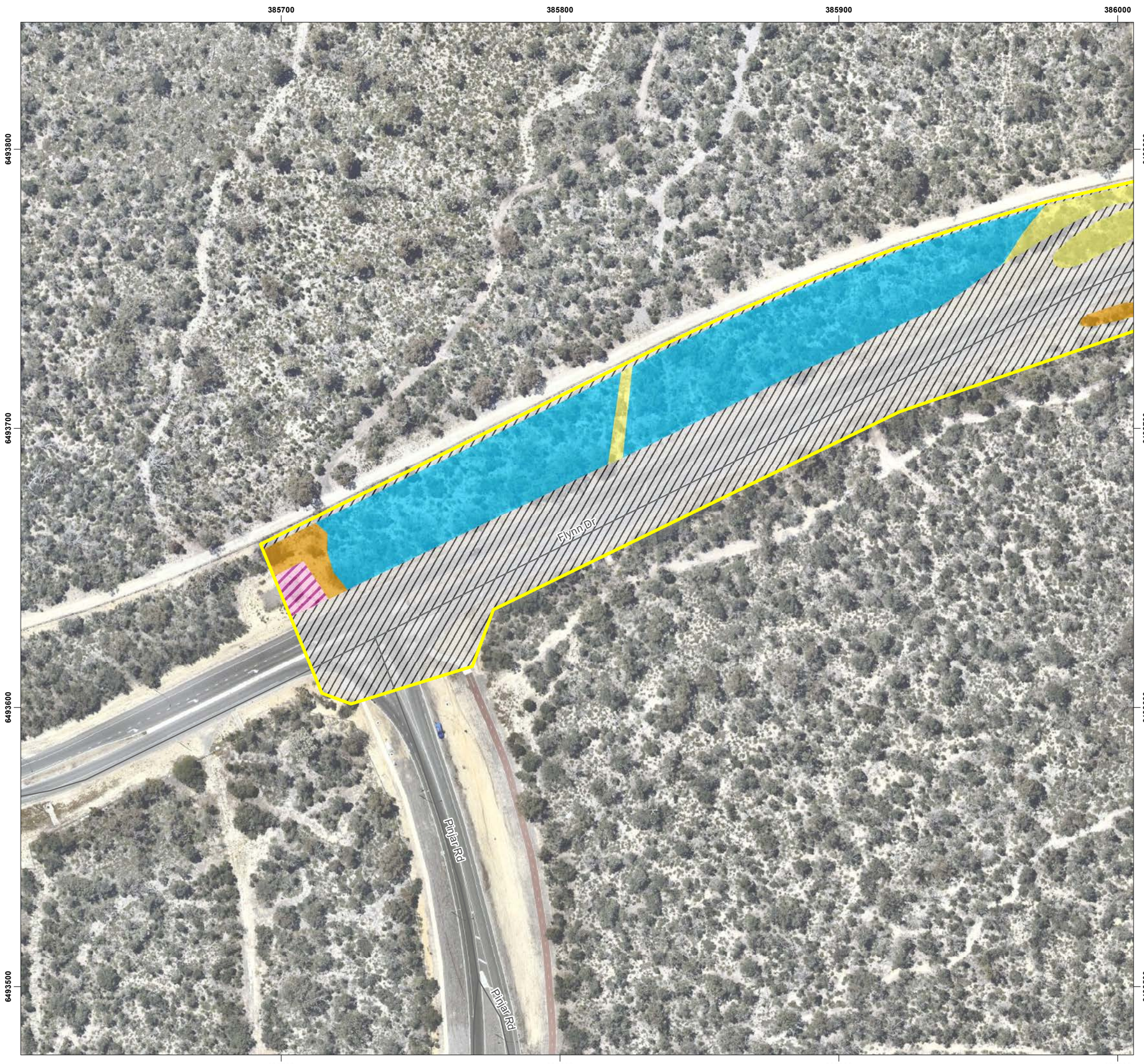
SCALE: 1:1,370 @ A3

0 10 20 30 40 50 m

PROJECT NO: 4665-21

REV	AUTHOR	APPROVED	DATE
00	TJ	SB	21/12/2021

MAP
4G

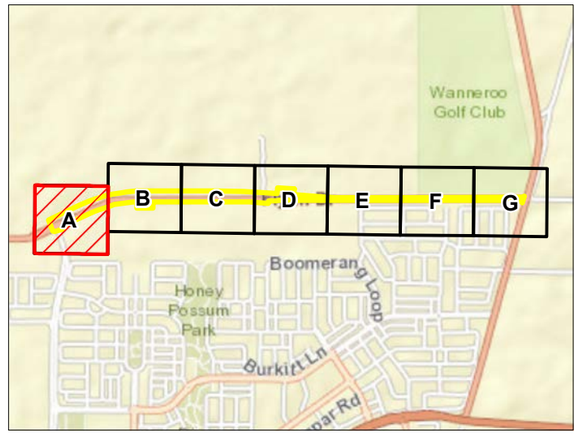


LEGEND

- Survey Area
- Roads

Vegetation Condition

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



DATA SOURCES :
AERIAL: NEARMAP (2021)
SERVICE LAYERS: SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, USGS, INTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY

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VEGETATION CONDITION

FLYNN DRIVE (STAGE 2)
SPRING BIOLOGICAL SURVEY 2021

City of Wanneroo

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

N

SCALE: 1:1,370 @ A3

0 10 20 30 40 50 m

PROJECT NO: 4665-21

REV	AUTHOR	APPROVED	DATE
00	TJ	SB	21/12/2021

MAP
5A

386000 386100 386200 386300

6493900 6493800 6493700 6493600

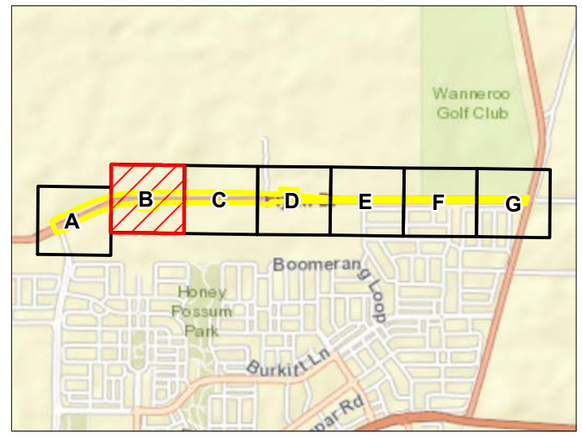
Flynn Dr

LEGEND

- Survey Area
- Roads

Vegetation Condition

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



DATA SOURCES :
AERIAL: NEARMAP (2021)
SERVICE LAYERS: SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, USGS, INTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY

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VEGETATION CONDITION

FLYNN DRIVE (STAGE 2)
SPRING BIOLOGICAL SURVEY 2021

City of Wanneroo

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

N

SCALE: 1:1,370 @ A3

0 10 20 30 40 50 m

PROJECT NO: 4665-21

REV	AUTHOR	APPROVED	DATE
00	TJ	SB	21/12/2021

MAP 5B

386400 386500 386600 386700

6493900 6493800 6493700 6493600

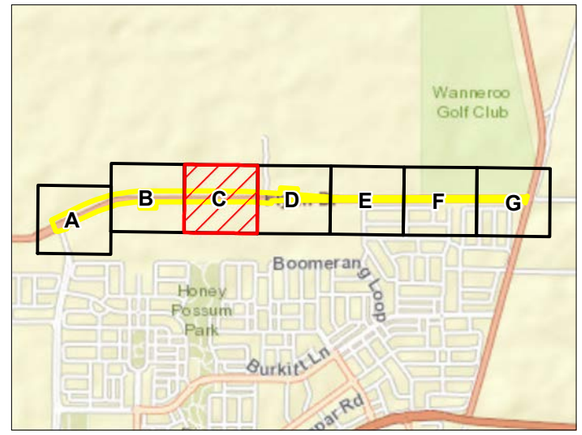
Flynn Dr

LEGEND

- Survey Area
- Roads

Vegetation Condition

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



DATA SOURCES :
AERIAL: NEARMAP (2021)
SERVICE LAYERS: SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, USGS, INTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY

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VEGETATION CONDITION

FLYNN DRIVE (STAGE 2)
SPRING BIOLOGICAL SURVEY 2021

City of Wanneroo

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

N

SCALE: 1:1,370 @ A3

0 10 20 30 40 50 m

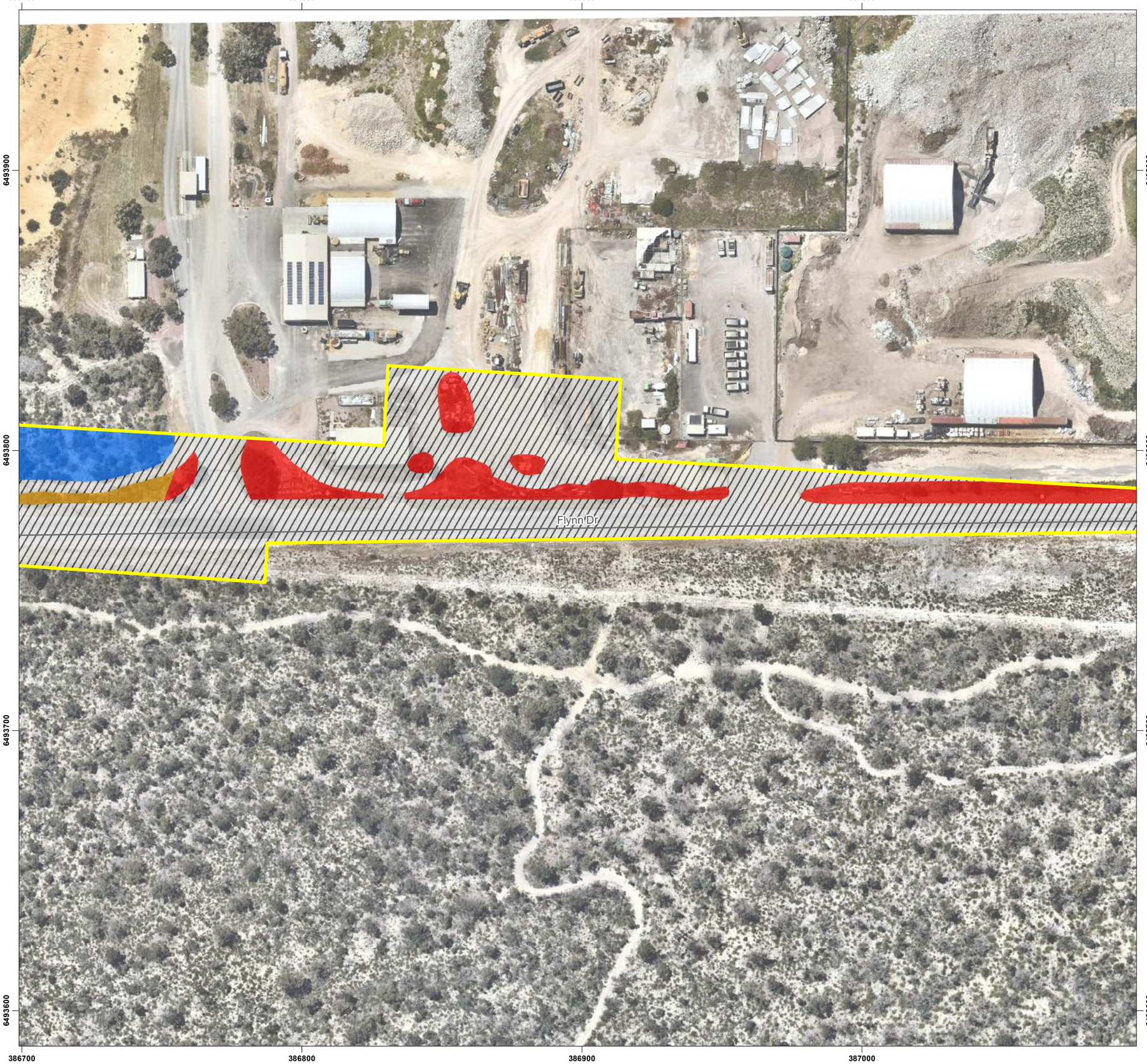
PROJECT NO: 4665-21

REV	AUTHOR	APPROVED	DATE
00	TJ	SB	21/12/2021

MAP 5C

386700 386800 386900 387000

6493900 6493800 6493700 6493600

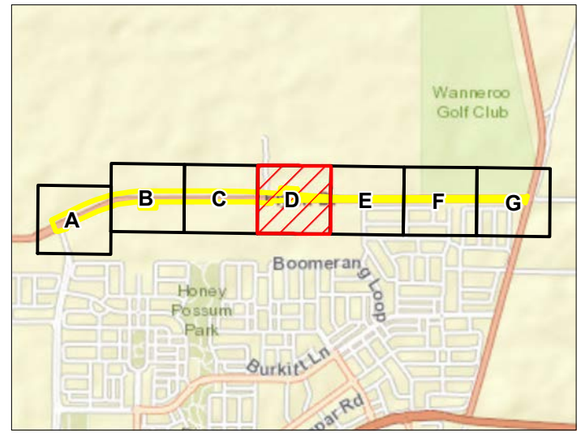


LEGEND

- Survey Area
- Roads

Vegetation Condition

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



DATA SOURCES :
AERIAL: NEARMAP (2021)
SERVICE LAYERS: SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, USGS, INTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY

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VEGETATION CONDITION

FLYNN DRIVE (STAGE 2)
SPRING BIOLOGICAL SURVEY 2021

City of Wanneroo

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PROJECTION: TRANSVERSE MERCATOR
DATUM: GDA 1994
UNITS: METER

N

SCALE: 1:1,370 @ A3

0 10 20 30 40 50 m

PROJECT NO: 4665-21

REV	AUTHOR	APPROVED	DATE
00	TJ	SB	21/12/2021

MAP 5D

387100 387200 387300 387400

6493900 6493800 6493700 6493600

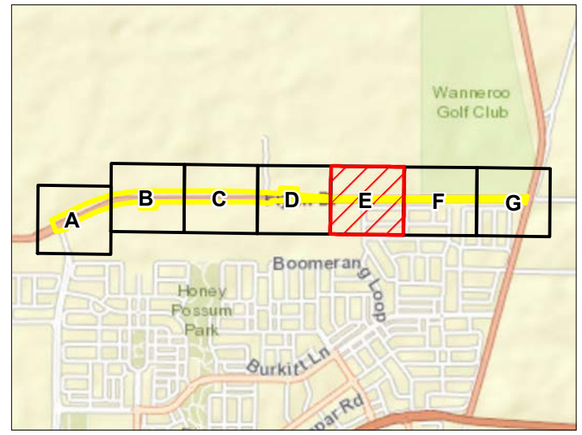
Flynn Dr

LEGEND

- Survey Area
- Roads

Vegetation Condition

- Degraded-Completely Degraded
- Completely Degraded
- Cleared/Not vegetated



DATA SOURCES :
AERIAL: NEARMAP (2021)
SERVICE LAYERS: SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, USGS, INTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY

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VEGETATION CONDITION

FLYNN DRIVE (STAGE 2)
SPRING BIOLOGICAL SURVEY 2021

City of Wanneroo

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

N

SCALE: 1:1,370 @ A3

0 10 20 30 40 50 m

PROJECT NO: 4665-21

REV	AUTHOR	APPROVED	DATE
00	TJ	SB	21/12/2021

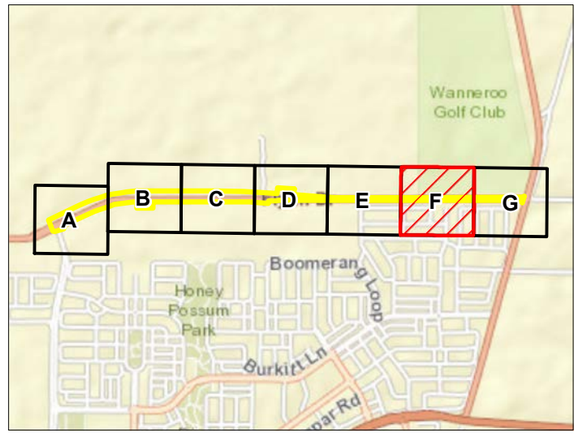
MAP 5E

LEGEND

- Survey Area
- Roads

Vegetation Condition

- Degraded
- Degraded-Completely Degraded
- Cleared/Not vegetated



DATA SOURCES :
AERIAL: NEARMAP (2021)
SERVICE LAYERS: SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, USGS, INTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY

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VEGETATION CONDITION

FLYNN DRIVE (STAGE 2)
SPRING BIOLOGICAL SURVEY 2021

City of Wanneroo

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PROJECTION: TRANSVERSE MERCATOR
DATUM: GDA 1994
UNITS: METER

N

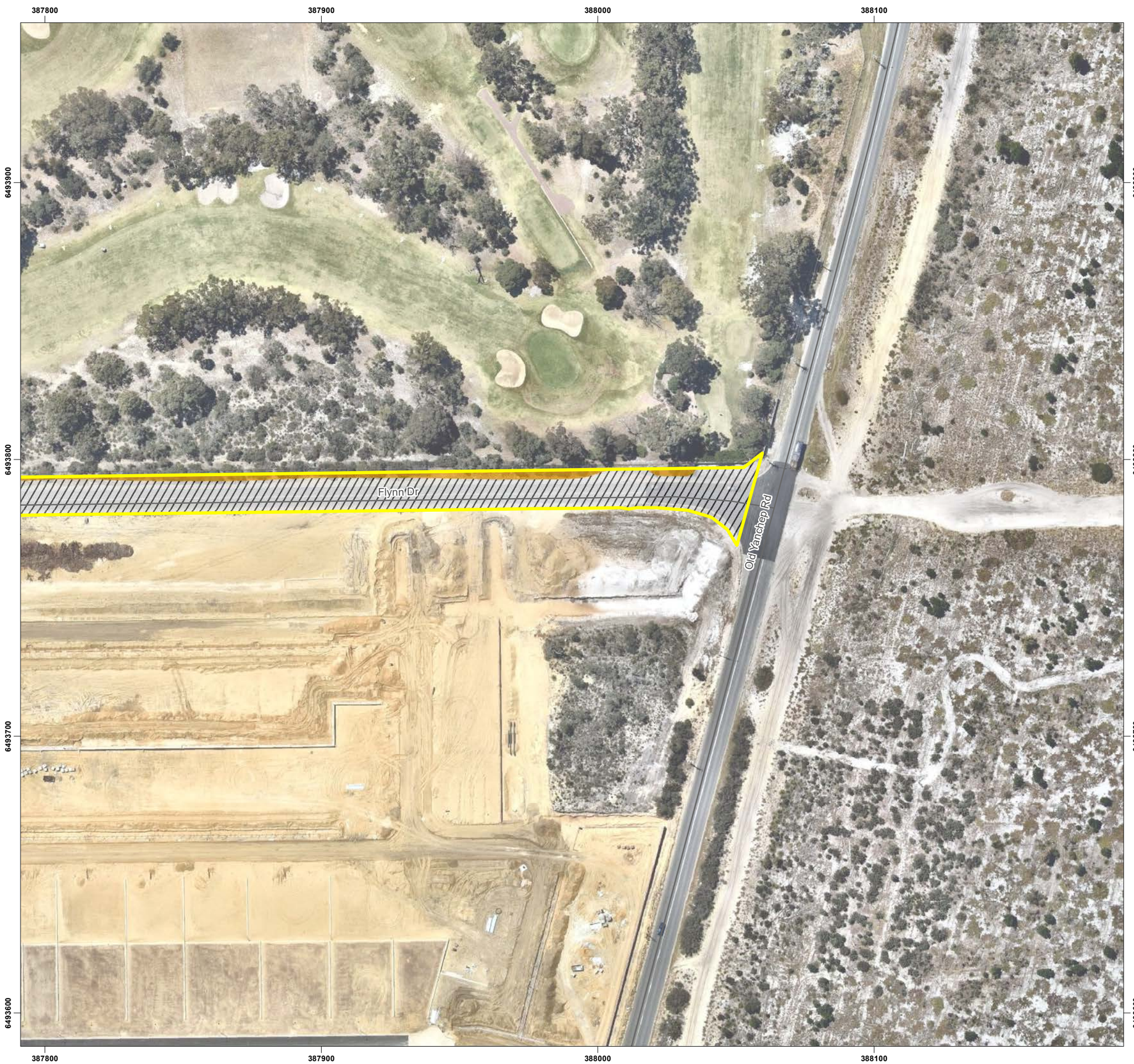
SCALE: 1:1,370 @ A3

0 10 20 30 40 50 m

PROJECT NO: 4665-21

REV	AUTHOR	APPROVED	DATE
00	TJ	SB	21/12/2021

MAP
5F

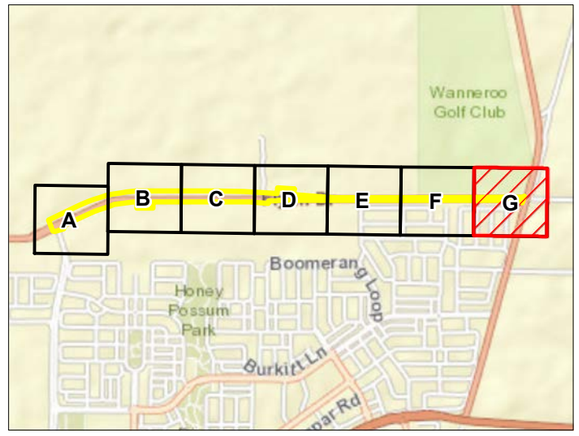


LEGEND

- Survey Area
- Roads

Vegetation Condition

- Degraded
- Cleared/Not vegetated



DATA SOURCES :
AERIAL: NEARMAP (2021)
SERVICE LAYERS: SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, USGS, INTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY

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VEGETATION CONDITION

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DATUM: GDA 1994
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N

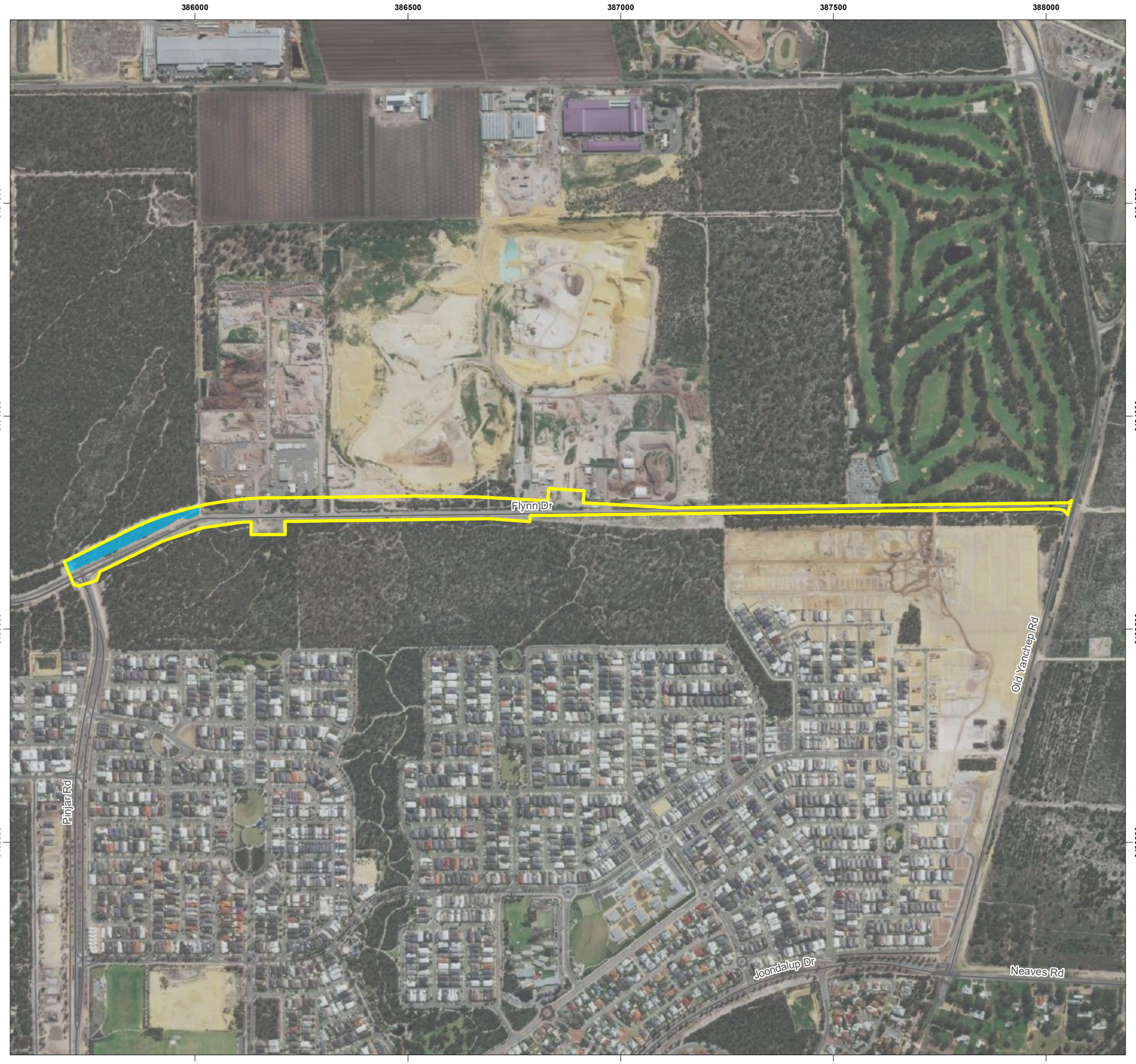
SCALE: 1:1,370 @ A3

0 10 20 30 40 50 m

PROJECT NO: 4665-21

REV	AUTHOR	APPROVED	DATE
00	TJ	SB	21/12/2021

MAP
5G



LEGEND

- Survey
- Roads

TEC Vegetation

- *Banksia woodlands of the Swan Coastal Plain* TEC

DATA SOURCES :
SOURCE DATA: CONSERVATION-LISTED FLORA (DBCA 2021), TEC/PEC (DBCA 2021)
AERIAL: ESRI BASEMAP (2020)
SERVICE LAYERS: SOURCE: ESRI, MAXAR, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRID, IGN, AND THE GIS USER COMMUNITY

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BANKSIA WOODLANDS TEC

FLYNN DRIVE (STAGE 2)
SPRING BIOLOGICAL SURVEY 2021

City of Wanneroo

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

N

SCALE: 1:9,000 @ A3

0 100 200 300 m

PROJECT NO: 4665-21

REV	AUTHOR	APPROVED	DATE
00	TJ	SB	21/12/2021

MAP 6

APPENDIX ONE DEFINITIONS AND CRITERIA

Table 13: 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 14: Conservation codes for Western Australian flora and fauna (DBCA 2019c)

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 15: 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 16: 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 17: 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 18: 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 19: 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.

APPENDIX THREE DESKTOP ASSESSMENT RESULTS AND LIKELIHOOD ASSESSMENTS

Table 20: PMST flora search results

Species	EPBC Status	Species or habitat presence within 10 km of the survey area
Andersonia gracilis	Endangered	Likely to occur
Anigozanthos viridis subsp. *terraspectans*	Vulnerable	Likely to occur
Caladenia huegelii	Endangered	Likely to occur
Chamelaucium lullfitzii	Endangered	May occur
Diuris micrantha	Vulnerable	Likely to occur
Diuris purdiei	Endangered	May 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	Endangered	May occur
Macarthuria keigheryi	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 21: 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	*Andersonia gracilis*	White/grey sand, sandy clay, gravelly loam. Winter-wet areas, near swamps.	Sep-Nov	Highly Unlikely	Highly Unlikely
-	x	*Anigozanthos viridis* subsp. *terraspectans*	Grey sand, clay loam. Winter-wet depressions.	Aug-Sep	Highly Unlikely	Highly Unlikely
x	x	*Caladenia huegelii*	Grey or brown sand, clay loam.	Sep-Oct	Unlikely	Unlikely

DBCA	PMST	Species name	Habitat from *FloraBase* (WAH 1998-2020)	Flowers	Likelihood of occurrence	
					Desktop	Post-survey
-	x	*Chamelaucium lullfitzii*	Restricted to a very small area associated with the Gingin scarp, south of Gingin. Plants grow on white, grey, or yellow sands in low open banksia woodland.	Sep-Dec	Highly Unlikely	Highly Unlikely
-	x	*Diuris micrantha*	Brown loamy clay. Winter-wet swamps, in shallow water.	Sep-Oct	Highly Unlikely	Highly Unlikely
-	x	*Diuris purdiei*	Grey-black sand, moist. Winter-wet swamps.	Sep-Oct	Highly Unlikely	Highly Unlikely
-	x	*Drakaea elastica*	White or grey sand. Low-lying situations adjoining winter-wet swamps.	Oct-Nov	Highly Unlikely	Highly Unlikely
-	x	*Drakaea micrantha*	White-grey sand.	Sep-Oct	Unlikely	Highly Unlikely
-	x	*Eleocharis keigheryi*	Clay, sandy loam. Emergent in freshwater: creeks, claypans	Aug-Nov	Highly Unlikely	Highly Unlikely
x	x	*Eucalyptus argutifolia*	Shallow soils over limestone. On slopes or in gullies of limestone ridges, outcrops.	Mar-Apr	Unlikely	Highly Unlikely
-	x	*Grevillea curviloba*	Grey sand, sandy loam. Winter-wet heath.	Aug-Oct	Highly Unlikely	Highly Unlikely
-	x	*Macarthuria keigheryi*	White or grey sand. Open areas of disturbance.	Sep-Dec, Feb-Mar	Unlikely	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
-	x	*Thelymitra dedmaniarum*	Open eucalypt woodland over granite or gravelly soils.	Nov-Dec	Highly 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
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	Likely	Unlikely
-	x	*Fabronia hampeana*	With Macrozamia spp. on sand.	-	Unlikely	Unlikely
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	Likely

DBCA	PMST	Species name	Habitat from *FloraBase* (WAH 1998-2020)	Flowers	Likelihood of occurrence	
					Desktop	Post-survey
x	-	*Stenanthemum sublineare*	Coastal plains. Sandy soil.	Oct-Dec	Likely	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	Likely	Likely
x	-	*Cyathochaeta teretifolia*	Wetlands, creek edges. Sandy loam or peaty soil.	Jan	Unlikely	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	Unlikely	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	*Anigozanthos humilis* subsp. *chrysanthus*	Grey or yellow sand.	Jul-Oct	Unlikely	Unlikely
x	-	*Jacksonia sericea*	Plains, gentle slopes. Sandy soil, with outcropping limestone.	Dec-Feb	Likely	Likely
-	x	*Schoenus griffinianus*	White sand.	Sep-Oct	Unlikely	Unlikely
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, Oct-Dec	Unlikely	Unlikely

APPENDIX FOUR FIELD SURVEY RESULTS

Table 22: Flora inventory (site x species)

Family	Species	Naturalised	Cons. code	Q01	Q02	Q03	Q04	R01	R02	R03	R04	Opps[1]
Aizoaceae	*Carpobrotus edulis*	*										X
	Carpobrotus sp.			X								X
Amaranthaceae	*Ptilotus polystachyus*											X
Anarthriaceae	*Lyginia imberbis*			X								
Araliaceae	*Trachymene pilosa*			X	X	X						X
Asparagaceae	*Lomandra ?hermaphrodita*				X							
	Lomandra hermaphrodita				X							X
	Lomandra preissii				X							
	Sowerbaea laxiflora					X						X
	Thysanotus thyrsoideus				X							
Asphodelaceae	*Asphodelus fistulosus*	*										X
Asteraceae	*Arctotheca calendula*	*					X	X		X	X	
	Centaurea melitensis	*									X	
	Erigeron sumatrensis	*					X		X		X	
	Gazania linearis	*										X
	Hyalosperma cotula			X	X	X						
	Hypochaeris glabra	*		X		X	X	X		X		
	Lactuca serriola	*						X				
	Monoculus monstrosus	*									X	X
	Oligocarpus calendulaceus	*								X		
	Podotheca gnaphalioides				X	X						
	Pseudognaphalium luteoalbum											X
	Sonchus oleraceus	*					X	X		X	X	X
	Ursinia anthemoides subsp. *anthemoides*	*		X	X	X				X		
	Verbesina encelioides	*										X
	Waitzia suaveolens											X
Brassicaceae	*Brassica* sp.	*								X	X	X
	Heliophila pusilla	*		X								
Campanulaceae	*Wahlenbergia capensis*	*		X								X
Casuarinaceae	*Allocasuarina fraseriana*			X	X	X					X	
Colchicaceae	*Burchardia congesta*			X	X	X						
Crassulaceae	*Crassula colorata*			X	X					X		X
	Crassula glomerata	*									X	
Cyperaceae	*Eleocharis* sp.					X						
	Isolepis marginata			X	X							
	Lepidosperma squamatum				X	X						
	Mesomelaena pseudostygia			X	X	X		X				
Dasypogonaceae	*Calectasia narragara*											X
Dilleniaceae	*Hibbertia huegelii*				X							X

Family	Species	Naturalised	Cons. code	Q01	Q02	Q03	Q04	R01	R02	R03	R04	Opps[1]
	Hibbertia hypericoides subsp. *hypericoides*			X	X	X		X			X	
Droseraceae	*Drosera erythrorhiza*			X	X	X						X
	Drosera marchantii				X							
	Drosera pallida				X			X				
Ericaceae	*?Brachyloma preissii*			X	X							
	Conostephium pendulum			X								
	Lysinema pentapetalum											X
Euphorbiaceae	*Euphorbia peplus*	*						X				
	Euphorbia terracina	*					X	X	X		X	
Fabaceae	*Acacia huegelii*			X								X
	Acacia pulchella											X
	Acacia rostellifera						X					X
	Acacia saligna						X					X
	Bossiaea eriocarpa			X	X	X						X
	Daviesia nudiflora			X	X	X	X					
	Daviesia triflora			X	X	X						
	Gastrolobium linearifolium					X						
	Gompholobium tomentosum				X		X					X
	Hardenbergia comptoniana						X	X				
	Hovea trisperma			X								X
	Isotropis cuneifolia				X	X						X
	Jacksonia floribunda			X							X	
	Jacksonia sternbergiana					X						X
	Kennedia prostrata					X	X		X		X	X
	Lupinus cosentinii	*										X
	Melilotus indicus	*							X	X		
	Trifolium angustifolium	*					X		X			
	Trifolium campestre	*					X	X	X	X		
Geraniaceae	*Erodium botrys*	*					X			X	X	
	Pelargonium capitatum	*					X	X	X		X	
Goodeniaceae	*Dampiera linearis*			X	X	X						X
	Scaevola repens				X	X					X	
Haemodoraceae	*Anigozanthos humilis*				X							X
	Anigozanthos manglesii			X		X						X
	Conostylis aculeata subsp. *cygnorum*			X	X	X					X	X
	Conostylis aurea											X
	Conostylis juncea					X						X
	Conostylis setigera			X								X
	Conostylis setigera subsp. *setigera*				X	X						X
	Conostylis setosa											X
	Conostylis sp.								X			
	Haemodorum laxum			X	X							

Family	Species	Naturalised	Cons. code	Q01	Q02	Q03	Q04	R01	R02	R03	R04	Opps[1]
Haloragaceae	*Gonocarpus pithyoides*											X
Hemerocallidaceae	*Tricoryne elatior*								X			
Iridaceae	*Gladiolus caryophyllaceus*	*		X	X	X		X	X	X	X	
	Patersonia occidentalis					X						
	Romulea rosea	*					X	X		X		
Loranthaceae	*Nuytsia floribunda*											X
Macarthuriaceae	*Macarthuria australis*											X
Myrtaceae	*Chamelaucium uncinatum*			X			X				X	X
	Eremaea violacea			X								X
	Eucalyptus marginata					X			X			X
	Eucalyptus platypus							X				
	Eucalyptus todtiana											X
	Hypocalymma robustum			X								X
	Kunzea ericifolia											X
	Leptospermum laevigatum	*										X
Onagraceae	*Oenothera stricta*	*									X	
Orchidaceae	*Caladenia arenicola*			X								X
	Caladenia flava			X	X	X						
	Caladenia nobilis											X
	Diuris magnifica											X
	Diuris sp.											X
	Elythranthera brunonis					X						
	Pterostylis recurva				X							
	Pterostylis sanguinea					X						X
Oxalidaceae	*Oxalis pes-caprae*	*					X					X
Pittosporaceae	*Billardiera fraseri*				X							
Poaceae	*Aira cupaniana*	*			X							
	Austrostipa elegantissima			X								
	Avena barbata	*					X	X			X	
	Briza maxima	*		X	X	X						X
	Cynodon dactylon	*						X				
	Ehrharta calycina	*						X		X		
	Ehrharta longiflora	*					X	X		X	X	
	Eragrostis curvula	*							X	X		
	Lagurus ovatus	*								X		
	Lolium rigidum	*								X		
	Phleum arenarium	*					X	X			X	
	Stenotaphrum secundatum	*					X					
	Vulpia myuros	*					X		X	X		
Polygalaceae	*Comesperma calymega*											X
Primulaceae	*Lysimachia arvensis*	*					X		X		X	X
Proteaceae	*Adenanthos cygnorum*			X			X	X	X		X	

Family	Species	Naturalised	Cons. code	Q01	Q02	Q03	Q04	R01	R02	R03	R04	Opps[1]
	Banksia attenuata			X	X			X				
	Banksia dallanneyi											X
	Banksia menziesii			X		X						
	Banksia sessilis											X
	Banksia sp.				X				X			
	Conospermum stoechadis			X				X				
	Petrophile linearis				X							
	Petrophile macrostachya											X
	Stirlingia latifolia			X	X	X	X		X			X
Restionaceae	*Alexgeorgea nitens*			X				X				
	Desmocladus fasciculatus			X		X	X	X	X			
	Desmocladus flexuosus				X	X						
	Hypolaena exsulca											X
	Lepidobolus preissianus											X
Rutaceae	*Philotheca spicata*			X	X	X						
Stylidiaceae	*Levenhookia stipitata*				X							
	Stylidium androsaceum				X	X						
	Stylidium neurophyllum			X	X							
	Stylidium piliferum				X							
	Stylidium repens											X
Thymelaeaceae	*Pimelea sulphurea*				X							
Violaceae	*Hybanthus calycinus*			X		X						X
Xanthorrhoeaceae	*Xanthorrhoea preissii*			X	X	X	X	X				
Zamiaceae	*Macrozamia fraseri*							X				

[1]Opps = Opportunistic records

Table 23: Introduced flora (weed) species recorded

Scientific Name	Common Name	Family	WONS	Declared Pest
Aira cupaniana	Silvery Hair Grass	Poaceae	-	-
Arctotheca calendula	Cape Weed	Asteraceae	-	-
Asphodelus fistulosus	Onion Weed	Asphodelaceae	-	-
Avena barbata	Bearded Oat	Poaceae	-	-
Brassica sp.		Brassicaceae	-	-
Briza maxima	Blowfly Grass	Poaceae	-	-
Carpobrotus edulis	Hottentot Fig	Aizoaceae	-	-
Centaurea melitensis	Maltese Cockspur	Asteraceae	-	-
Crassula glomerata		Crassulaceae	-	-
Cynodon dactylon	Couch	Poaceae	-	-
Ehrharta calycina	Perennial Veldt Grass	Poaceae	-	-
Ehrharta longiflora	Annual Veldgrass	Poaceae	-	-

Scientific Name	Common Name	Family	WONS	Declared Pest
Eragrostis curvula	African Love Grass	Poaceae	-	-
Erigeron sumatrensis	Fleabane	Asteraceae	-	-
Erodium botrys	Long Storksbill	Geraniaceae	-	-
Euphorbia peplus	Petty Spurge	Euphorbiaceae	-	-
Euphorbia terracina	Geraldton Carnation Weed	Euphorbiaceae	-	-
Gazania linearis		Asteraceae	-	-
Gladiolus caryophyllaceus	Wild Gladiolus	Iridaceae	-	-
Heliophila pusilla		Brassicaceae	-	-
Hypochaeris glabra	Flat Weed	Asteraceae	-	-
Lactuca serriola	Prickly Lettuce	Asteraceae	-	-
Lagurus ovatus	Hare's Tail Grass	Poaceae	-	-
Leptospermum laevigatum	Victorian Tea Tree, Coast Teatree	Myrtaceae	-	-
Lolium rigidum	Annual Rye Grass	Poaceae	-	-
Lupinus cosentinii	Western Blue Lupin, Sandplain Lupin	Fabaceae	-	-
Lysimachia arvensis	Pimpernel	Primulaceae	-	-
Melilotus indicus		Fabaceae	-	-
Monoculus monstrosus	Stinking Roger	Asteraceae	-	-
Oenothera stricta	Common Evening Primrose	Onagraceae	-	-
Oligocarpus calendulaceus		Asteraceae	-	-
Oxalis pes-caprae	Soursob	Oxalidaceae	-	-
Pelargonium capitatum	Rose Pelargonium	Geraniaceae	-	-
Phleum arenarium		Poaceae	-	-
Romulea rosea	Guildford Grass	Iridaceae	-	-
Sonchus oleraceus	Common Sowthistle	Asteraceae	-	-
Stenotaphrum secundatum	Buffalo Grass	Poaceae	-	-
Trifolium angustifolium	Narrow Leaf Clover	Fabaceae	-	-
Trifolium campestre	Hop Clover	Fabaceae	-	-
Ursinia anthemoides subsp. anthemoides		Asteraceae	-	-
Verbesina encelioides	Crownbeard	Asteraceae	-	-
Vulpia myuros	Rat's Tail Fescue	Poaceae	-	-
Wahlenbergia capensis	Cape Bluebell	Campanulaceae	-	-

WONS = Weed of National Significance

APPENDIX FIVE FLORISTIC QUADRAT DATA

Q01

Staff TCJ **Date** 8/09/2021 **Season** A

Revisit 18/10/2021 E

Type Q 10 m x 10 m

Location Flynn Drive in Lot 900

MGA Zone 50 386698 **mE** 6493808 **mN** **Lat.** -31.6854 **Long.** 115.8046

Habitat Sandplain

Aspect NW **Slope** Very Gentle

Soil Type Grey brown loamy sand over yellow sand

Rock Type

Loose Rock 0 % cover **Litter** 15 % cover ; 2 cm in depth

Bare ground **Weeds** 3 % cover

Vegetation U+ ^^*Banksia attenuata*,*Allocasuarina fraseriana*,*Banksia menziesii*\^tree\6\r;M ^*Adenanthos cygnorum*,^*Xanthorrhoea preissii*\^shrub,grass tree\3\bi;G ^*Hibbertia hypericoides*,^*Mesomelaena pseudostygia*\^shrub,sedge\2\i

Veg. Condition Very Good

Disturbance Nearby tracks and industrial site

Fire Age >5 years

Notes

Species	WA Cons.	Height (m)	Cover (%)	Count
Acacia huegelii		0.4	<1	
Adenanthos cygnorum		1.8	1.5	
Alexgeorgea nitens		0.1	<1	
Allocasuarina fraseriana		9	2	

Anigozanthos manglesii	0.4	<1	
Austrostipa elegantissima	0.5	<1	
Banksia attenuata	5	1	
Banksia menziesii	3	2	
Bossiaea eriocarpa	0.3	<1	
?Brachyloma preissii	0.2	<1	
**Briza maxima*	0.3	<1	
Burchardia congesta	0.4	<1	
Caladenia arenicola	0.3	<1	1
Caladenia arenicola	0.4	<1	2
Caladenia flava	0.1	<1	
Carpobrotus sp.	0.1	<1	
Chamelaucium uncinatum	1	<1	
Conospermum stoechadis	0.3	<1	
Conostephium pendulum	0.6	<1	
Conostylis aculeata subsp. *cygnorum*	0.2	<1	1
Conostylis aculeata subsp. *cygnorum*	0.2	<1	
Conostylis setigera	0.2	<1	
Crassula colorata	0.1	<1	
Dampiera linearis	0.2	<1	
Daviesia nudiflora	0.5	<1	
Daviesia triflora	0.3	<1	
Desmocladus fasciculatus	0.2	1	
Drosera erythrorhiza	0.1	<1	
Eremaea violacea	0.4	1	
**Gladiolus caryophyllaceus*	0.3	<1	
Haemodorum laxum	0.5	<1	
**Heliophila pusilla*	0.1	<1	
Hibbertia hypericoides subsp. *hypericoides*	0.4	3	
Hovea trisperma	0.3	<1	
Hyalosperma cotula	0.1	<1	
Hybanthus calycinus	0.3	<1	
Hypocalymma robustum	0.3	<1	
**Hypochaeris glabra*	0.1	<1	
Isolepis marginata	0.1	<1	
Jacksonia floribunda	1.5	<1	
Lyginia imberbis	0.4	<1	
Mesomelaena pseudostygia	0.4	2	

Philotheca spicata	0.4	<1
Stirlingia latifolia	0.5	<1
Stylidium neurophyllum	0.1	<1
Trachymene pilosa	0.1	<1
**Ursinia anthemoides*	0.1	<1
**Wahlenbergia capensis*	0.3	<1
Xanthorrhoea preissii	1.3	3

Q02

Staff TCJ **Date** 8/09/2021 **Season** A

Revisit 18/10/2021 E

Type Q 10 m x 10 m

Location Flynn Drive western end

MGA Zone 50 385927 **mE** 6493757 **mN** **Lat.** -31.6858 **Long.** 115.7964

Habitat Sandplain

Aspect **Slope** N/A

Soil Type Grey brown loamy sand over yellow sand

Rock Type

Loose Rock 0 % cover **Litter** 75 % cover ; 1 cm in depth

Bare ground 5 % cover **Weeds** <1 % cover

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

Veg. Condition Excellent

Disturbance Road verge to south

Fire Age >5 years

Notes

Species	WA Cons.	Height (m)	Cover (%)	Count
**Aira cupaniana*		0.1	<1	
Allocasuarina fraseriana		2.5	1.5	
Anigozanthos humilis		0.2	<1	
Banksia attenuata		7	2	

Banksia sp.	0.1	<1	5
Billardiera fraseri	0.5	<1	
Bossiaea eriocarpa	0.3	<1	
?Brachyloma preissii	0.7	<1	1
**Briza maxima*	0.2	<1	
Burchardia congesta	0.3	<1	
Caladenia flava	0.2	<1	
Calectasia narragara	0.4	<1	
Conostylis aculeata subsp. *cygnorum*	0.2	<1	1
Conostylis setigera subsp. *setigera*	0.2	<1	12
Crassula colorata	0.1	<1	
Dampiera linearis	0.2	<1	
Daviesia nudiflora	0.6	1	
Daviesia triflora	0.3	<1	
Desmocladus flexuosus	0.1	2	
Drosera erythrorhiza	0.1	<1	
Drosera marchantii	0.2	<1	
Drosera pallida	0.3	<1	
**Gladiolus caryophyllaceus*	0.4	<1	
Gompholobium tomentosum	0.4	<1	
Haemodorum laxum	0.5	<1	
Hibbertia huegelii	0.3	<1	1
Hibbertia hypericoides subsp. *hypericoides*	0.4	18	
Hyalosperma cotula	0.1	<1	
Isolepis marginata	0.1	<1	
Isotropis cuneifolia	0.1	<1	
Lepidosperma squamatum	0.4	<1	
Levenhookia stipitata	0.1	<1	
Lomandra ?hermaphrodita	0.1	<1	5
Lomandra hermaphrodita	0.3	<1	
Lomandra preissii	0.1	<1	
Mesomelaena pseudostygia	0.4	4	
Petrophile linearis	0.3	<1	
Philotheca spicata	0.3	<1	
Pimelea sulphurea	0.3	<1	
Podotheca gnaphalioides	0.2	<1	1
Pterostylis recurva	0.3	<1	
Scaevola repens	0.1	<1	

Stirlingia latifolia	0.6	<1	
Stylidium androsaceum	0.1	<1	30
Stylidium neurophyllum	0.1	<1	
Stylidium piliferum	0.1	<1	
Thysanotus thyrsoideus	0.3	<1	
Trachymene pilosa	0.1	<1	
**Ursinia anthemoides*	0.1	<1	
Xanthorrhoea preissii	1.4	2	

Q03

Staff TCJ **Date** 8/09/2021 **Season** A

Revisit 18/10/2021 E

Type Q 10 m x 10 m

Location Flynn Drive western end

MGA Zone 50 385792 **mE** 6493698 **mN** **Lat.** -31.6864 **Long.** 115.7950

Habitat Sandplain

Aspect N **Slope** Very Gentle

Soil Type Grey brown loamy sand over yellow sand

Rock Type

Loose Rock 0 % cover **Litter** 90 % cover ; 4 cm in depth

Bare ground 2 % cover **Weeds** <1 % cover

Vegetation U+ ^^*Allocasuarina fraseriana*,*Eucalyptus marginata*,*Banksia menziesii*\^tree\6\r;M ^*Xanthorrhoea preissii*\^grass tree\3\r;G ^^*Desmocladus flexuosus*,*Desmocladus fasciculatus*, *Mesomelaena pseudostygia*\^sedge\1\r

Veg. Condition Excellent

Disturbance Roadverge to south

Fire Age >5 years

Notes Old charring on dead tree.

Species	WA Cons.	Height (m)	Cover (%)	Count
Allocasuarina fraseriana		5	2	
Anigozanthos manglesii		0.5	<1	
Banksia menziesii		4	1	
Bossiaea eriocarpa		0.2	<1	

**Briza maxima*	0.2	<1	
Burchardia congesta	0.4	<1	
Caladenia flava	0.2	<1	
Conostylis aculeata subsp. *cygnorum*	0.2	<1	1
Conostylis juncea	0.2	<1	1
Conostylis setigera subsp. *setigera*	0.2	<1	3
Dampiera linearis	0.2	<1	
Daviesia nudiflora	0.3	<1	
Daviesia triflora	0.5	<1	
Desmocladus fasciculatus	0.2	2	
Desmocladus flexuosus	0.2	6	
Drosera erythrorhiza	0.1	<1	
Eleocharis sp.	0.1	<1	
Elythranthera brunonis	0.2	<1	
Eucalyptus marginata	8	1	
Gastrolobium linearifolium	0.1	<1	
**Gladiolus caryophyllaceus*	0.5	<1	
Hibbertia hypericoides subsp. *hypericoides*	0.3	1	
Hyalosperma cotula	0.1	<1	300
Hybanthus calycinus	0.2	<1	
Hybanthus calycinus	0.2	<1	
**Hypochaeris glabra*	0.1	<1	
Isotropis cuneifolia	0.2	<1	
Jacksonia sternbergiana	1.8	2	
Kennedia prostrata	0.1	<1	
Lepidosperma squamatum	0.3	<1	
Mesomelaena pseudostygia	0.4	2	
Patersonia occidentalis	0.5	<1	
Philotheca spicata	0.3	<1	
Podotheca gnaphalioides	0.2	<1	
Pterostylis sanguinea	0.1	<1	
Pterostylis sanguinea	0.2	<1	
Scaevola repens	0.1	<1	
Sowerbaea laxiflora	0.4	<1	
Stirlingia latifolia	0.4	1	
Stylidium androsaceum	0.1	<1	300
Trachymene pilosa	0.1	<1	
**Ursinia anthemoides*	0.1	<1	

Xanthorrhoea preissii	1.2	4

Q04

Staff TCJ **Date** 9/09/2021 **Season** A

Revisit

Type Q 10 m x 10 m

Location Flynn Drive at south side sump

MGA Zone 50 386178 **mE** 6493754 **mN** **Lat.** -31.6859 **Long.** 115.7991

Habitat Sandplain

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

Soil Type Brown sandy loam

Rock Type

Loose Rock 0 % cover **Litter** 25 % cover ; 2 cm in depth

Bare ground 35 % cover **Weeds** 20 % cover

Vegetation 6M+ ^*Acacia rostellifera*\^shrub\3\r;G ^*Pelargonium capitatum*\^Forb\\

Veg. Condition Degraded

Disturbance Road verge to north.

Fire Age

Notes Has been cleared recently for development as sump, now with regeneration/revegetation.

Species	WA Cons.	Height (m)	Cover (%)	Count
Acacia rostellifera		1.5	2.5	
Acacia saligna		1.3	1	
Adenanthos cygnorum		0.3	<1	
**Arctotheca calendula*		0.1	<1	
**Avena barbata*		0.6	<1	
Chamelaucium uncinatum		0.3	<1	

Daviesia nudiflora	0.3	<1
Desmocladus fasciculatus	0.2	<1
**Ehrharta longiflora*	0.5	<1
**Erigeron sumatrensis*	0.3	<1
**Erodium botrys*	0.1	<1
**Euphorbia terracina*	0.2	<1
Gompholobium tomentosum	0.3	<1
Hardenbergia comptoniana	0.1	<1
**Hypochaeris glabra*	0.1	<1
Kennedia prostrata	0.1	<1
**Lysimachia arvensis*	0.1	1
**Oxalis pes-caprae*	0.1	<1
**Pelargonium capitatum*	0.2	6
**Phleum arenarium*	0.1	<1
**Romulea rosea*	0.1	<1
**Sonchus oleraceus*	0.3	<1
**Stenotaphrum secundatum*	0.1	1
Stirlingia latifolia	0.5	<1
**Trifolium angustifolium*	0.2	<1
**Trifolium campestre*	0.1	<1
**Vulpia myuros*	0.2	<1
Xanthorrhoea preissii	0.3	<1

R01

Staff TCJ **Date** 7/09/2021 **Season** A

Revisit 18/10/2021 E

Type R 10 m x 10 m

Location Flynn Dr eastern end

MGA Zone 50 387801 **mE** 6493789 **mN** **Lat.** -31.6857 **Long.** 115.8162

Habitat Plain

Aspect N **Slope** Very Gentle

Soil Type Brown sandy loam

Rock Type

Loose Rock 0 % cover **Litter** 20 % cover

Bare ground 15 % cover **Weeds** 35 % cover

Vegetation U ^*Eucalyptus platypus*\^tree\6\i;M+ ^*Adenanthos cygnorum*,^*Xanthorrhoea preissii*\^shrub,grass tree\3\r;G ^*Hibbertia hypericoides*,^*Ehrharta longiflora*\^shrub,tussock grass\1\i

Veg. Condition Degraded

Disturbance Rd verge

Fire Age

Notes North side verge, lots of small rubbish present

Species	WA Cons.	Height (m)	Cover (%)	Count
Adenanthos cygnorum		2	5	
Alexgeorgea nitens		0.1	<1	
**Arctotheca calendula*		0.1	<1	
**Avena barbata*		0.5	<1	
Banksia attenuata		3	<1	

Conospermum stoechadis	0.7	<1
**Cynodon dactylon*	0.1	<1
Desmocladus fasciculatus	0.3	<1
Drosera pallida	0.15	<1
**Ehrharta calycina*	0.3	1
**Ehrharta longiflora*	0.15	2
Eucalyptus platypus	4	8
**Euphorbia peplus*	0.02	<1
**Euphorbia terracina*	0.3	1
**Gladiolus caryophyllaceus*	0.4	<1
Hardenbergia comptoniana	1.2	<1
Hibbertia hypericoides subsp. *hypericoides*	0.25	2
**Hypochaeris glabra*	0.15	1.5
**Lactuca serriola*	0.01	<1
Macrozamia fraseri	1.3	<1
Mesomelaena pseudostygia	0.5	<1
**Pelargonium capitatum*	0.3	1.5
**Phleum arenarium*	0.1	<1
**Romulea rosea*	0.5	<1
**Sonchus oleraceus*	0.4	<1
**Trifolium campestre*	0.1	1
Xanthorrhoea preissii	1.5	5

R02

Staff TCJ **Date** 9/09/2021 **Season** A

Revisit 18/10/2021 E

Type R

Location Flynn Drive

MGA Zone 50 385883 **mE** 6493690 **mN** **Lat.** -31.6864 **Long.** 115.7960

Habitat Crest

Aspect N **Slope** Very Gentle

Soil Type Brown sandy loam

Rock Type

Loose Rock 0 % cover **Litter** 15 % cover

Bare ground 40 % cover **Weeds** 45 % cover

Vegetation G+ ^^*Trifolium campestre*,*Eragrostis curvula*,*Pelargonium capitatum*\^forb,tussock grass\1\c

Veg. Condition Completely Degraded

Disturbance Rd verge

Fire Age

Notes South side verge, western end, rubbish present

Species	WA Cons.	Height (m)	Cover (%)	Count
Adenanthos cygnorum		0.05	<1	
Banksia sp.		0.05	<1	
Conostylis sp.		0.2	<1	
Desmocladus fasciculatus			<1	
**Eragrostis curvula*		0.4	5	
**Erigeron sumatrensis*		0.15	<1	

Eucalyptus marginata	12	<1
**Euphorbia terracina*	0.25	<1
**Gladiolus caryophyllaceus*	0.4	<1
Kennedia prostrata	0.05	<1
**Lysimachia arvensis*	0.1	<1
**Melilotus indicus*	0.1	<1
**Pelargonium capitatum*	0.25	1
Stirlingia latifolia	0.2	<1
Tricoryne elatior	0.3	<1
**Trifolium angustifolium*	0.1	<1
**Trifolium campestre*	0.05	25
**Vulpia myuros*	0.2	<1

R03

Staff TCJ **Date** 9/09/2021 **Season** A

Revisit 18/10/2021 E

Type R 10 m x 10 m

Location Flynn Drive at northern roadverge near bush forever site.

MGA Zone 50 387332 **mE** 6493788 **mN** **Lat.** -31.6857 **Long.** 115.8113

Habitat Sandplain

Aspect E **Slope** N/A

Soil Type Brown loamy sand

Rock Type

Loose Rock 0 % cover **Litter** 10 % cover ; 1 cm in depth

Bare ground 10 % cover **Weeds** 85 % cover

Vegetation G *Trifolium campestre*\^forb\1\c

Veg. Condition

Disturbance Roadverge

Fire Age

Notes

Species	WA Cons.	Height (m)	Cover (%)	Count
**Arctotheca calendula*		0.1	1	
**Brassica* sp.		0.3	<1	
Crassula colorata		0.1	1	
**Ehrharta calycina*		0.2	2	
**Ehrharta longiflora*		0.2	2	
**Eragrostis curvula*		0.4	1	

**Erodium botrys*	0.1	<1
**Gladiolus caryophyllaceus*	0.4	<1
**Hypochaeris glabra*	0.1	2
**Lagurus ovatus*	0.2	<1
**Lolium rigidum*	0.3	1
**Melilotus indicus*	0.3	<1
**Osteospermum calendulaceum*	0.2	<1
**Romulea rosea*	0.2	1
**Sonchus oleraceus*	0.2	<1
**Trifolium campestre*	0.1	20
**Ursinia anthemoides*	0.2	<1
**Vulpia myuros*	0.2	12

R04

Staff TCJ **Date** 9/09/2021 **Season** A

Revisit 18/10/2021 E

Type R 10 m x 10 m

Location Flynn Drive south side opposite 150

MGA Zone 50 386775 **mE** 6493756 **mN** **Lat.** -31.6859 **Long.** 115.8054

Habitat Dunes

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

Soil Type Grey brown loamy sand

Rock Type

Loose Rock 0 % cover **Litter** 2 % cover

Bare ground 70 % cover **Weeds** 15 % cover

Vegetation G+ ^*Ehrharta longiflora*\^tussock grass\1\i

Veg. Condition Completely Degraded

Disturbance Road verge

Fire Age

Notes West of reveg

Species	WA Cons.	Height (m)	Cover (%)	Count
Adenanthos cygnorum		0.3	0.5	
Allocasuarina fraseriana		0.1	<1	
**Arctotheca calendula*		0.1	<1	
**Avena barbata*		0.9	<1	
**Brassica* sp.		0.3	<1	
**Centaurea melitensis*		0.4	<1	

Chamelaucium uncinatum	0.3	<1	
Conostylis aculeata subsp. *cygnorum*	0.2	<1	5
**Crassula glomerata*		<1	
**Ehrharta longiflora*	0.3	<1	
**Erigeron sumatrensis*	0.3	<1	
**Erodium botrys*	0.1	1	
**Euphorbia terracina*	0.2	1	
**Gladiolus caryophyllaceus*	0.4	<1	
Hibbertia hypericoides subsp. *hypericoides*	0.4	<1	
Jacksonia floribunda	0.2	<1	
Kennedia prostrata	0.1	<1	
**Lysimachia arvensis*	0.1	2	
**Oenothera stricta*	0.2	<1	
**Osteospermum clandestinum*	0.2	<1	
**Pelargonium capitatum*	0.2	3	
**Phleum arenarium*	0.2	<1	
Scaevola repens	0.1	<1	
**Sonchus oleraceus*	0.2	<1	

APPENDIX SIX DBCA REPORT FORMS

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, east of Pinjar Rd, Neerabup WA.

Partially 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: 6493700.23

Long / Easting: 385856.26

Zone: 50

METHOD USED:

GPS ☒ Differential GPS ☐ Map ☐

No. satellites: Map used:

Boundary polygon captured: ☐ Map used:

LAND TENURE:

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

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 ☒ 20% Degraded ☐ _____%

Excellent ☒ 80% 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 ☒	
Outcrop ☐	Ironstone ☐	10-30% ☐	Clay loam ☐	White ☒	Permanently inundated ☐
Slope ☐	Limestone ☐	30-50% ☐	Light clay ☐	Grey ☐	Tidal ☐
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. Banksia spp. and Allocasuarina fraseriana low open woodland
	2. Xanthorrhoea preissii mid sparse shrubland
	3. Hibbertia hypericoides and Mesomelaena low open shrubland/sedgeland
	4.

FIRE HISTORY:

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

Actual Occurrence Landuse:

Please return form to:

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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 spp., Desmocladus flexuosus, Drosera erythrorhiza, Drosera macrantha, Eucalyptus marginata, Hibbertia hypericoides, Lepidobolus preissianus, Lomandra hermaphrodita, Mesomelaena pseudostygia, Petrophile linearis, Stirlingia latifolia, Stylidium androsaceum, Stylidium piliferum, Xanthorrhoea preissii.

Associated Fauna Species:

Australian Ringneck

Brown Honeyeater

Carnaby's Black Cockatoo

Galah

Golden Whistler

New Holland Honeyeater

Rainbow Bee-eater

Red Wattlebird

Singing Honeyeater

Willie Wagtail

OTHER COMMENTS:

Department of Parks and Wildlife

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

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:**	**21/1/2022**

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:*_____