



Main Roads WA
Mitchell Freeway Extension Hester Avenue to Romeo Road
Biological Survey

June 2019

Executive summary

Main Roads Western Australia (Main Roads) is currently developing the Mitchell Freeway Extension from Hester Avenue to Romeo Road, which includes an upgrade to Wanneroo Road from Dunstan Road to Trian Road.

GHD Pty Ltd (GHD) was commissioned by Main Roads to undertake a biological assessment, including a targeted Black Cockatoo habitat assessment of the proposed project area. The purpose of the survey is to delineate key flora, vegetation, fauna, soil, groundwater and surface water values (wetlands) and potential sensitivity to impact to Black Cockatoo foraging and breeding habitat. The outcome of the survey and information supplied in the biological survey and targeted fauna assessment will be used to inform the environmental assessment and approvals process.

The following definitions are referred to throughout this report:

- **Survey area:** Includes the proposed road corridors for Mitchell Freeway extension and Wanneroo Road upgrade plus a 50 metre (m) buffer. Covers a total area of 399.97 hectares (ha)
- **Extended survey area:** An approximate 500 m extension from the survey area where vegetation is present. Covers approximately 646.49 ha
- **Study area:** 5 kilometre (km) biological desktop search of the survey area.

This report is subject to, and must be read in conjunction with, the limitations set out in section 1.6 and the assumptions and qualifications contained throughout this report.

Key findings for survey area

Vegetation

Fourteen vegetation types were identified and described for the survey area, not including open water (lakes) or cleared and/or highly degraded areas. Approximately 43 % (170.90 ha) of the survey area is mapped as cleared/highly disturbed. Remnant vegetation remaining within the survey area is largely dominated by *Banksia* woodlands, mixed *Eucalyptus* woodlands and mixed heathlands. These vegetation types are generally associated with the landforms upon which they lie, with tall woodlands occurring in lower-lying areas with deep sandy soils, heathlands and shrublands on shallow soils on undulating dune systems, hilltops and ridges associated with limestone outcropping and *Banksia* woodlands in intermediate landforms associated with deep sandy soils.

The condition of the vegetation within the survey area ranged from Excellent to Completely Degraded. A large proportion of the survey area is in Degraded to Completely Degraded condition (243.85 ha, 61%). Remnant vegetation ranged in condition from Excellent to Degraded (scattered native trees/shrubs over weeds).

Five conservation significant ecological communities were identified within the survey area. The conservation significant ecological communities are:

- *Banksia* Woodlands of the Swan Coastal Plain Threatened Ecological Community (TEC) listed under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) - 85.98 ha
- *Banksia* dominated woodlands of the Swan Coastal Plain IBRA region Priority 3 Priority Ecological Community (PEC) listed by Department of Biodiversity, Conservation and Attractions (DBCA) - 102.13 ha

- *Melaleuca huegelii* - *Melaleuca systema* shrublands on limestone ridges (Floristic Community Type (FCT) 26a) TEC listed under the *Biodiversity Conservation Act 2016* (BC Act) - 3.87 ha
- Northern Spearwood shrublands and woodlands (FCT24) Priority 3 PEC listed by DBCA - 44.08 ha
- Tuart (*Eucalyptus gomphocephala*) woodlands of the Swan Coastal Plain Priority 3 PEC listed by DBCA - 11.88 ha.

Flora

Two hundred and ninety three flora taxa (including subspecies and varieties) representing 68 families and 177 genera were recorded from the survey area during the field survey. This total comprised 213 native taxa and 80 introduced flora taxa. Of the 80 introduced taxa, eight are listed as Declared Pests under the *Biosecurity and Management Act 2007*. Four of these taxa are also listed as Weeds of National Significance.

No EPBC Act or BC Act listed flora were recorded within the survey area. Six DBCA Priority (P) listed flora species were recorded within the survey area during the field survey:

- *Baeckea* sp. Limestone (N. Gibson & M.N. Lyons 1425) – P1
- *Acacia benthamii* – P2
- *Leucopogon* sp. Yanchep (M. Hislop 1986) – P3
- *Hibbertia spicata* subsp. *leptotheca* – P3
- *Pimelea calcicola* – P3
- *Stylidium maritimum* – P3.

Fauna

The survey area consists of nine broad fauna habitat types: Mixed heathland on limestone outcrops or heavy loams, Banksia woodland on grey/brown sand, Tuart (*Eucalyptus gomphocephala*) Forest in deep dark brown sand, Jarrah (*E. marginata*) woodland on grey/brown sand, Acacia Shrublands on dunes and deep sands, Parabolic dunes, Plantations, Rehabilitation areas and Scattered natives over weeds, Cleared/highly disturbed. Habitat values ranged from high to low value, with the low value site areas that are degraded or modified.

Within the survey area 124 vertebrate fauna species were recorded, including 17 mammals, 74 birds, 32 reptiles and one frog. Five conservation significant fauna species were identified as present and a further two likely to be present in the survey area based on a combination of observations and habitat assessment. The five conservation significant fauna species recorded within the survey area included:

- Carnaby's Cockatoo (*Calyptorhynchus latirostris*) – listed as Endangered under the BC Act and Endangered under the EPBC Act
- Forest Red-tailed Black-Cockatoo (*Calyptorhynchus banksii naso*) – listed as Vulnerable under the BC Act and Vulnerable under the EPBC Act
- Peregrine Falcon (*Falco peregrinus*) – listed as Other specially protected fauna under the BC Act
- Southern Brown Bandicoot (*Isodon fusciventer*) – listed as P4 by DBCA
- Western Brush Wallaby (*Notamacropus Irma*) – listed as P4 by DBCA.

Species likely to be present in the survey area:

- Black-striped Snake (*Neelaps calonotos*) – listed as P3 by DBCA
- Jewelled southwest Ctenotus (Swan Coastal Plain population) (*Ctenotus gemmula*) – listed as P3 by DBCA.

Targeted Black Cockatoo Assessment

Two species of Black Cockatoo, Carnaby's Cockatoo and Forest Red-tailed Black Cockatoo, were recorded in the survey. Of the 570 identified potential breeding trees 20 were identified to have medium to/or large hollows present suitable for Black Cockatoo breeding or demonstrating signs of historical use. These trees had from 1 to 4 hollows present and were assessed via visual inspection and/or via a pole cam (if within 12 m from ground) in August 2018, November 2018, and January/February 2019. No Black Cockatoo were recorded utilising the identified hollows over the assessment period.

Feeding evidence was recorded in the survey area on *Banksia sessilis*, *B. attenuata*, *B. grandis* and Jarrah. Approximately 217.06 ha of suitable foraging habitat is mapped within the survey area.

Key findings for extended survey area

Twelve of the vegetation types identified in the survey area, not including Cleared/highly disturbed, also occurred in the extended survey area. The extended survey area did not contain *Eucalyptus decipiens* tall woodland or Pine plantation, but did contain Typha tall rushland and *Eucalyptus/Melaleuca* tall isolated clumps of trees, in addition to open water (Lake Nowergup). The condition of the vegetation within the extended survey area ranged from Excellent to Completely Degraded, however the overall condition was better than the survey area, with significantly less Completely Degraded vegetation present.

The five conservation significant ecological communities identified within the survey area were also mapped in the extended survey area. With the exception of the Tuart (*Eucalyptus gomphocephala*) woodlands of the Swan Coastal Plain PEC, all communities had a larger extent within the extended survey area compared to the survey area.

The six Priority flora species recorded within the survey area were also recorded in the extended survey area. In addition to the Priority species, one BC Act listed taxon, *Melaleuca* sp. Wanneroo (G.J. Keighery 16705) (Endangered) was recorded within an isolated patch in the extended survey area.

Eight of the nine fauna habitat types identified in the survey area also occurred in the extended survey area. Pine plantation was not represented, whereas Open water with riparian vegetation and weeds is an additional fauna habitat present in the extended survey area, in association with Lake Nowergup. Within the extended survey area 96 species were recorded and included 15 mammals, 57 birds, 22 reptiles and 2 frogs. Many of the species recorded in the survey and extended survey areas were the same, which is not unexpected given the similarity in habitats and proximity. The five conservation significant fauna species identified as present in the survey area were also identified in the extended survey area. There are an additional eight conservation significant species likely to be present in the extended survey area, which includes the two species considered likely to occur in the survey area. The larger number of species considered likely to occur is associated with the extended survey area incorporating Nowergup Lake, which provides habitat not found in the survey area.

Table of contents

1.	Introduction	1
1.1	Project background	1
1.2	Purpose of this report.....	1
1.3	Survey areas	1
1.4	Scope of works	2
1.5	Relevant legislation, conservation codes and background information.....	3
1.6	Report limitations and assumptions.....	3
2.	Methodology.....	4
2.1	Desktop Assessment	4
2.2	Field survey.....	5
2.3	Limitations.....	18
3.	Desktop assessment.....	21
3.1	Regional biogeography	21
3.2	Hydrology.....	21
3.3	Landforms and soils.....	22
3.4	Land use	23
3.5	Vegetation and Flora.....	24
3.6	Fauna	30
3.7	Previous survey results.....	31
4.	Survey results	34
4.1	Vegetation and flora.....	34
4.2	Fauna	59
5.	References	85

Table index

Table 2-1	Survey timing and effort.....	5
Table 2-2	Data collected during the field survey.....	6
Table 2-3	List of SWA sites used in the PRIMER analysis.....	7
Table 2-4	Details of Surveys Undertaken	10
Table 2-5	Camera trap locations.....	12
Table 2-6	Bat Detector locations.....	13
Table 2-7	Fauna references.....	15
Table 2-8	Survey Effort Undertaken	16
Table 2-9	Survey limitations.....	19
Table 3-1	Geomorphic wetlands mapped within the study area.....	21

Table 3-2	Soil descriptions occurring within the survey area (DAFWA 2007)	23
Table 3-3	Extents of vegetation associations mapped within the survey area (GoWA 2018b).....	26
Table 3-4	Extent of vegetation complexes on the SWA mapped within the survey area (GoWA 2018c)	26
Table 3-5	Extent of vegetation complexes within the City of Wanneroo for the survey area (GoWA 2018c)	26
Table 3-6	SWA dataset FCTs within the study area	27
Table 3-7	Threatened and Priority Ecological Communities identified within the study area	27
Table 4-1	Vegetation types within the survey areas	36
Table 4-2	Vegetation condition ratings within the survey areas	43
Table 4-3	Extent of Banksia Woodlands of the SCP TEC within the survey areas	46
Table 4-4	Extent of the Banksia dominated woodlands of the SCP IBRA region PEC within the survey areas	49
Table 4-5	Extent of the <i>Melaleuca huegelii</i> - <i>Melaleuca systema</i> shrublands of limestone ridges TEC within the survey areas	50
Table 4-6	Extent of the Northern Spearwood shrublands and woodlands PEC within the survey areas	51
Table 4-7	Extent of the Tuart Woodlands of the Swan Coastal Plain PEC within the survey areas	52
Table 4-8	Conservation significant flora location and count	54
Table 4-9	Taxa likely to or possible to occur within the survey areas.....	59
Table 4-10	Fauna habitats in the survey areas.....	61
Table 4-11	Mammal families recorded during the field surveys	73
Table 4-12	Bird families recorded during field surveys	73
Table 4-13	Reptile families recorded during the field surveys	74
Table 4-14	Comparison of numbers of species per previous surveys.....	75
Table 4-15	Summary of species known or likely to occur in the survey area	78
Table 4-16	Summary of Black Cockatoo findings	81
Table 4-17	Potential breeding trees with suitable size hollows within survey area	83
Table 4-18	Tree Plots undertaken in the extended survey area	84

Appendices

Appendix A – Figures

Appendix B – Relevant legislation, background information and conservation code

Appendix C – Desktop searches

Appendix D – Flora data

Appendix E – Fauna data

1. Introduction

1.1 Project background

Main Roads Western Australia (Main Roads) is currently developing Mitchell Freeway Extension Hester Avenue to Romeo Road which includes the upgrade to Wanneroo Road from Dunstan Road to Trian Road.

The proposed works are located within the City of Wanneroo approximately 30 kilometres (km) north of Perth central business district and 12 km south of the coastal suburb of Yanchep.

The Mitchell Freeway provides the primary road access route from the Perth north-west corridor towards the City of Perth. The freeway currently terminates at Hester Avenue. The freeway has been constructed in several stages since the 1960s, with further extension from Hester Avenue to Romeo Road being investigated. Duplication of Wanneroo Road to dual carriageway in both directions, extending from Dunstan Road to Trian Road Straight Line Kilometre (SLK) 34.50-40.40, is also being investigated.

Freeway extension and road duplication works will require installation of signs and lights, upgrade of services and access roads. The project is at a concept stage with no preliminary design.

Flora, vegetation, fauna, heritage and dieback assessment have been previously undertaken for some sections of the above projects. WA Metropolitan Region Scheme Amendment 992/33 was approved under Ministerial Statement 629 in 2003 and is applicable to portions of both projects.

1.2 Purpose of this report

GHD Pty Ltd (GHD) was commissioned by Main Roads to undertake a biological assessment, including a targeted Black Cockatoo habitat assessment of the proposed Mitchell Freeway extension and Wanneroo Road upgrade project areas as well as a designated extended survey area. The purpose of the survey is to delineate key flora, vegetation, fauna, soil, groundwater and surface water values (wetlands) and potential sensitivity to impact to Black Cockatoo foraging and breeding habitat.

The outcome of the survey and information supplied in the biological survey and targeted fauna assessment will be used to inform the environmental assessment and approvals process. The results of the biological survey may also assist in the preparation of a Clearing Impact Assessment and Vegetation Management Plan and may be used in State or Commonwealth approval documentation.

1.3 Survey areas

1.3.1 Survey area

The survey area for the project includes the proposed road corridors for Mitchell Freeway extension and Wanneroo Road upgrade plus a 50 metre (m) buffer, located approximately 35 km north of Perth in the City of Wanneroo. The freeway extension works are located between Hester Avenue, Clarkson and Romeo Road, Alkimos. The Wanneroo Road upgrade works are located from Dunstan Road to train Road Straight Line Kilometre (SLK) 35.50-40.40. The survey area (including a 50 m buffer) covers a total area of 399.97 hectares (ha). A single season detailed and targeted vegetation and flora assessment and Level 2 fauna survey, including a targeted Black Cockatoo assessment, was undertaken in the survey area.

The survey area boundary is shown on Figure 1, Appendix A.

1.3.2 Extended survey area

The extended survey area covers a larger area and extends between the two road alignments within the Neerabup National Park, between Hester Avenue and Karaborup Road and includes a part of the Neerabup Nature Reserve, east of Wanneroo Road and a larger area around Romeo Road in the north. The extended survey area covers approximately 646.49 ha. The biological survey conducted in the extended survey area included a reconnaissance survey to provide a local context of environmental constraints identified in the survey area, as per the Environmental Protection Authority (EPA) *Technical Guidance Flora and Vegetation Surveys for Environmental Impact Assessment* (2016a) for linear corridor surveys.

The extended survey area boundary is also shown on Figure 1, Appendix A.

1.3.3 Study area

A study area¹ was defined for the biological desktop based searches and includes a 5 km buffer of the survey area (Figure 1, Appendix A).

1.4 Scope of works

The scope of works was to undertake a desktop assessment and biological survey of the survey area and extended survey area. The following actions were completed to fulfil the scope:

- A desktop assessment of the study area prior to the field survey to identify biological features and constraints, which may be in, or near the survey area
- A review of relevant environmental reports
- A field survey to verify/ground truth the desktop assessment findings through a combination of detailed, targeted and reconnaissance survey
- Identification and mapping of vegetation types to a scale appropriate for the bioregion and described according to the National Vegetation Information System (NVIS) structure and floristics
- Identification and mapping of Threatened and/or Priority Ecological Communities (TECs or PECs) inferred through the use of quadrats and relevés
- Assess the survey areas flora species diversity, density, composition, structure and weed cover, recording the percentage of each in nominated quadrats
- Mapping of Black Cockatoo habitat and potential or known breeding trees in accordance with the Commonwealth guidelines
- Monitor identified potential Black Cockatoo hollows over the 2018\19 breeding season, via three assessments - August, November and January\February
- Delineation and mapping of fauna habitat types
- A flora and fauna likelihood of occurrence assessment based on the vegetation units and fauna habitat present within the survey area
- Mapping using Geographic Information Systems (GIS) mapping software
- A concise report (this document) on the findings of the biological survey
- Raw survey data at project completion in electronic form.

¹ The 5 km radius boundary of the study area has been defined by the Main Roads brief for the project.

1.5 Relevant legislation, conservation codes and background information

In WA some ecological communities, flora and fauna are protected under both Federal and State Government legislation. In addition, regulatory authorities also provide a range of guidance and information on expected standards and protocols for environmental surveys.

An overview of key legislation and guidelines, conservation codes and background information relevant to this biological survey is provided in Appendix B.

1.6 Report limitations and assumptions

This report has been prepared by GHD for Main Roads and may only be used and relied on by Main Roads for the purpose agreed between GHD and the Main Roads as set out in section 1.2 of this report.

GHD otherwise disclaims responsibility to any person other than Main Roads arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report (including species listings). GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared this report on the basis of information provided by Main Roads and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

The opinions, conclusions and any recommendations in this report are based on information obtained from specific sample points. Site conditions at other parts of the site may be different from the site conditions found at the specific sample points.

Investigations undertaken in respect of this report are constrained by the particular site conditions, such as the location of access tracks, operational works, services and vegetation. As a result, not all relevant site features and conditions may have been identified in this report.

Site conditions may change after the date of the field survey. GHD does not accept responsibility arising from, or in connection with, any change to the site conditions. GHD is also not responsible for updating this report if the site conditions change.

This report has assessed the flora and fauna within the survey area and extended survey area (Figure 1, Appendix A). Should the survey area or extended survey area change or be refined, further assessment may be required.

2. Methodology

2.1 Desktop Assessment

Prior to the commencement of the field survey, a desktop assessment was undertaken to identify relevant environmental information pertaining to the study area and to assist in survey design. This included a review of:

- The Department of the Environment and Energy (DotEE) Protected Matters Search Tool (PMST) to identify communities and species listed under the *Environment Protection and Biodiversity Act 1999* (EPBC Act) potentially occurring within the study area (DotEE 2018a) (Appendix C)
- The Department of Biodiversity, Conservation and Attractions (DBCA) TEC and PEC database to determine the potential for conservation significant communities to be present within the study area
- The DBCA *NatureMap* database for flora and fauna species previously recorded within the study area (DBCA 2018) (Appendix C)
- The DBCA Threatened (Declared Rare) and Priority Flora (TPFL) database and the WA Herbarium database (WAHERB) for Threatened flora listed under the *Biodiversity Conservation Act 2016* (BC Act) and listed as Priority by the DBCA, previously recorded within the study area
- Existing datasets including previous pre-European vegetation mapping of the survey area (Beard 1979; Heddle et al. 1980 and Webb et al. 2016), aerial photography, hydrology information to provide background information on the variability of the environment, likely vegetation units and fauna habitats and to identify areas that potentially contain TECs and PECs
- Existing reports and/or data:
 - *Level 2 Flora and Level 1 Fauna Assessment for Mitchell Freeway extension: Burns Beach Road to Romeo Road* (GHD 2014a)
 - *Level 2 Fauna Survey for Neerabup Road Extension* (GHD (2014b)
 - *Black Cockatoo Assessment for the Mitchell Freeway Extension* (GHD 2013a)
 - *Black Cockatoo Assessment – Update* (GHD 2013b)
 - *Preliminary Environmental Impact Assessment (PEIA) and Gap Analysis for the Mitchell Freeway Extension (Hester Avenue to Romeo Road) and Wanneroo Road Upgrade (Dunstan Road to train Road)* (GHD 2018)
 - *Trapping results for Neerabup National Park, Central Section in vicinity of Hester Ave, Raw data provided* (DPaW 2013)
 - *Fauna studies in Water Supply reserve 34537, Adjacent to Neerabup National Park. Prepared for Water Authority of Western Australia by Conservation and Land Management (CALM 1993)*
 - Raw data for Level 1 Herpetofauna assessments on Pipidiny Road from 1996 to 2004 (Maryan, B. Pers comm)
 - *Fauna clearance trapping program for the Wanneroo Road Extension Burns Beach to Neerabup Roads 2017 to 2018* (MRIA 2018).

2.2 Field survey

2.2.1 Flora and vegetation

GHD botanists Angela Benkovic (flora licence no. SL012366) and Erin Lynch (flora licence no. SL012374) completed a single season detailed and targeted vegetation and flora assessment of the survey area and a reconnaissance survey of the extended survey area. Targeted surveys for conservation significant flora based on desktop assessments and habitat availability were undertaken across the survey area and extended survey area. Parts of the survey area were located within DBCA managed lands (Figure 3, Appendix A), therefore a Regulation 4 Authority was issued to Angela Benkovic and Erin Lynch (CE005785) authorising them to survey in these areas.

The detailed, reconnaissance and targeted surveys were undertaken over multiple visits between early spring and late spring (September – November 2018) with an additional targeted flora survey undertaken in early summer (December 2018). The timing and survey effort undertaken for the survey area and extended survey area are shown in Table 2-1. A total of 28 survey days were undertaken across the survey area and extended survey area.

Table 2-1 Survey timing and effort

Date	Botanist	Survey type	Area	Total survey effort
17-19 September 2018	Angela Benkovic and Erin Lynch	Detailed and targeted flora survey	Survey area	6 days
25-26 September 2018	Angela Benkovic and Erin Lynch	Detailed and targeted flora survey	Survey area	4 days
15-17 October 2018	Angela Benkovic and Erin Lynch	Detailed and targeted flora survey	Survey area and extended survey area	6 days
5-7 November 2018	Angela Benkovic and Erin Lynch	Detailed, targeted flora and reconnaissance survey	Survey area and extended survey area	6 days
10-12 December 2018	Angela Benkovic and Erin Lynch	Targeted flora survey	Survey area and extended survey area	6 days

The field survey was undertaken to identify and describe the dominant vegetation units, assess vegetation condition, and identify and record vascular flora taxa present at the time of survey. Searches for conservation significant or other significant ecological communities and flora taxa were also undertaken during the field survey.

The survey methodology employed by GHD was undertaken with reference to the Environmental Protection Authority (EPA) *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016a).

Data collection

Field survey methods involved a combination of sampling quadrats, relevés, photographic reference points located in identified vegetation units and walking transects.

Forty-four non-permanent quadrats and seven relevés were described throughout the survey area and extended survey area. The location of the quadrats and relevés were concentrated within the survey area. Additional representative quadrats and relevés were undertaken within the extended survey area to represent vegetation types not present or of limited size within the

survey area. Quadrat and relevé locations are shown on Figure 5, Appendix A and the data is provided in Appendix D.

Quadrats (measuring 10 m x 10 m – area of 100 m²) were located within each identified vegetation unit. A minimum of three quadrats were located within each identified vegetation unit, where possible. Quadrats were not established in vegetation units that had been significantly altered by clearing and weeds. Relevés (unmarked area) were performed to supplement quadrat data and in areas where the vegetation was highly modified or size of the vegetation type was restricted. Field data at each quadrat was recorded on a pro-forma data sheet and included the parameters detailed in Table 2-2.

Table 2-2 Data collected during the field survey

Aspect	Measurement
Collection attributes	Site code, personnel/recorder; date, quadrat dimensions, photograph of the quadrat.
Physical features	Aspect, slope, landform, soil attributes, ground surface cover, leaf and wood litter.
Location	Coordinates recorded in GDA94 datum using a hand-held GPS tool to accuracy approximately ± 5 m.
Vegetation condition	Vegetation condition was assessed using the condition rating scale adapted by EPA (2016a) for the South West Botanical Province.
Disturbance	Level and nature of disturbances (e.g. weed presence, fire and time since last fire, impacts from grazing, exploration activities).
Flora	List of dominant flora from each structural layer. List of all species within the quadrat including average height and cover (using NVIS)

A flora inventory was compiled from taxa listed in described quadrats and relevés and from opportunistic floristic records throughout the survey area.

Vegetation units

Vegetation units were identified and boundaries delineated using a combination of aerial photography, topographical features and field data/observations.

Vegetation units were described based on structure, dominant taxa and cover characteristics as defined by quadrat and relevé data and field observations. Vegetation unit descriptions follow NVIS and are consistent with NVIS Level V (Association). At Level V up to three taxa per stratum are used to describe the association (NVIS Technical Working Group 2017).

Statistical analysis

PRIMER v6 (Clarke and Gorley 2006) was used to examine the similarity between sites using collected data. A presence/absence matrix was created of all taxa (including perennials and annuals) present in the quadrats recorded within the survey area. The dissimilarity between quadrats was determined using the Bray-Curtis measure and the Resemblance function in PRIMER. A Cluster analysis (using Agglomerative Hierarchical Clustering technique) based on group average was undertaken using the Bray-Curtis similarity matrix and results presented as a dendrogram. In addition, a nonmetric multi-dimensional scaling analysis (MDS) was undertaken using the Bray-Curtis similarity matrix and results presented as a two dimensional scatter plot. The analysis was repeated removing all weed and singleton taxa. The outputs of the PRIMER analysis were used to inform decisions on vegetation units.

Comparison of vegetation units with regional datasets

Statistical analysis

The Swan Coastal Plain bioregion (abbreviated as SWA) dataset (accessed through *NatureMap*) is derived from a database compiled and maintained over many years, combining the results of a number of floristic studies (conducted between 1990 and 1996) on plant communities of the SWA, south of Moore River. The SWA dataset includes sampling site details, the flora collected at these sampling sites and the floristic community type (FCT) assigned to these sampling sites. The taxonomy of the flora in the SWA dataset used is current as of December 2018 (updated by GHD).

PRIMER v6 (Clarke and Gorley 2006) was used to compare the GHD quadrats to existing data (where available) for FCTs described on the SWA. SWA site locations within a 5 km buffer of the survey area were located and the FCTs represented by these sites were identified. All site locations for these FCTs from the SWA dataset were extracted, along with those identified in the desktop searches (e.g. TEC and PEC searches). Representative quadrats from each FCT selected for the analysis are shown in Table 2-3.

The GHD quadrat data and SWA quadrat data was combined, reconciled to align nomenclature and a presence/absence matrix created of all taxa (including perennials and annuals). Singleton taxa (those occurring in only one quadrat) were removed from the matrix as well as taxa that were only identified to family or genus level. The dissimilarity between quadrats was determined using the Bray-Curtis measure and the Resemblance function in PRIMER. A Cluster analysis (using Agglomerative Hierarchical Clustering technique) based on group average was undertaken using the Bray-Curtis similarity matrix and results presented as a dendrogram. In addition, a nonmetric MDS was undertaken using the Bray-Curtis similarity matrix and results presented as a two dimensional scatter plot. A factor was added to the output to define sample groups by FCT. The outputs of the PRIMER analysis were used to inform decisions on vegetation units.

It is noted that PRIMER can be limited in use for this purpose as analysis is based on all species recorded in quadrats and does not take into account dominance of species. Further interpretation of statistical results, coupled with multiple field surveys and desktop information is needed to determine whether the vegetation units are representative of a certain FCT.

The Aquatic Root Mat Community Number 1 of Caves of the Swan Coastal Plain (Caves SCP01) TEC and *Spinifex longifolius* grasslands and low shrublands (FCTS14) was removed from the analysis as there were no established caves or *Spinifex* within the survey area or extended survey area. The Aquatic Root Mat Community in Caves of the Swan Coastal Plain TEC is an assemblage of aquatic invertebrates living in mats of fine tree rootlets and their associated microflora in caves containing previously permanent streams and pools in Yanchep National Park. The closest extent of the survey areas is approximately 4 km south south-east of a 1000 m buffer area of the cave entrances, where this TEC is known to occur.

Table 2-3 List of SWA sites used in the PRIMER analysis

Floristic Community Type Name and ID	Status	Quadrats
Woodlands over sedgeland in Holocene dune swales (FCT19b)	TEC [^]	19bcool 09, 19bcool14, 19bcool15, 19bxyan10
Northern Spearwood shrublands and woodlands (FCT24)	PEC [*]	24bold07, 24bold09, 24BOLD-1, 24bold12, 24bold13, 24bold14, 24BOLD-2, 24bold23, 24BOLD-3, 24BOLD-4, 24buck01, 24CHIDPT-1, 24cool 02, 24cool 03, 24cool 08, 24Hepb03, 24KERO-1, 24KERO-2, 24MI23, 24MTB-1,

Floristic Community Type Name and ID	Status	Quadrats
		24MTB-2, 24MTB-3, 24MTB-4, 24NAVB-3, 24NAVB-4, 24NEER-1, 24NEER-10, 24NEER-11, 24NEER-7, 24NEER-9, 24PTWALT-1, 24star01, 24star02, 24THOM-2, 24TRIG-5, 24TRIG-6, 24xbeer01
<i>Melaleuca huegelii</i> – <i>Melaleuca systema</i> shrublands on Limestone ridges (FCT26a)	TEC	26aCLIFT02, 26aCLIFT03, 26aSHE-4, 26aSHE-5, 26aSVH-1, 26aWABL-1, 26aYAN-12, 26aYAN-13, 26aYAN-15, 26aYAN-2, 26aYAN-24, 26azYAN4, 26azYAN5
Species poor mallees and shrublands on Limestone (FCT27)		27bold18, 27bold22, 27BU03, 27PAR1, 27SVH-2, 27WHILL-3, 27WHILL-4, 27wilb05, 27YALG-3, 27YALG-4, 27YALG-5, 27YALG-8
Spearwood <i>Banksia attenuata</i> or <i>Banksia attenuata</i> – <i>Eucalyptus</i> woodlands (FCT28)	*	284M03, 28beel01, 28BULL-1, 28BULL-10, 28BULL-11, 28BULL-4, 28BULL-9, 28DEPOT-1, 28HARRY-1, 28HARRY-2, 28Hepb01, 28KING-1, 28KING-2, 28leda02, 28MILT-4, 28moore01, 28moore02, 28moore03, 28much01, 28much03, 28NEER-2, 28NEER-20, 28NEER-21, 28NEER-22, 28NEER-23, 28NEER-3, 28NEER-4, 28NEER-5, 28NEER-6, 28NEER-8, 28Pinn01, 28Pinn03, 28quinn02, 28sams01, 28sand01, 28SEAB-6, 28SHE-2, 28SHENT-1, 28star03, 28tokyu03, 28TRIG-3, 28TRIG-4, 28WABL-4, 28WARI-1, 28WARI-2, 28WATERRD1, 28wilb06, 28wilb07, 28wire01, 28wire02, 28WOODV-1, 28WOODV-2, 28YAN-25, 28YAN-3, 28YAN-4, 28YAN-6, 28YAN-8, 28YAN-9, 28yela01, 28yuri02
Coastal shrublands on shallow soils (FCT29a)	PEC	29aBMaid02, 29aBU01, 29aBU02, 29aBU04, 29aBURN-1, 29aBURN-2, 29aGARD02, 29aMI21, 29aNAVB-2, 29aNMAid01, 29aNMAid03, 29aPinn02, 29aPRES-1, 29arich02, 29arott02, 29aSEAB-4, 29aSEAB-5, 29aSEAB-8, 29aTRIG-2, 29awilb11
Acacia shrublands on taller dunes (FCT29b)	PEC	29bbold08, 29bbold10, 29bbold11, 29bGuild02, 29bGuild06, 29bMI01, 29bMI02, 29bMI03, 29bMI06, 29bMI07, 29bMI09, 29bMI18, 29bNPRES-1, 29bNWIL-1, 29bNWIL-3, 29bPB-2, 29bPB-3, 29bPB-4, 29bPB-5, 29bSEAB-2, 29bSEAB-3, 29bSEAB-7, 29bSW06, 29bSW07, 29bSW11, 29btokyu04, 29btokyu06, 29btokyu07, 29bTRIG-1, 29bWHILL-1, 29bWHILL-2, 29bwilb01, 29bwilb03, 29bwilb08, 29bwilb09, 29bwilb10, 29bwilb12
Quindalup <i>Eucalyptus gomphocephala</i> and/or <i>Agonis flexuosa</i> woodlands (FCT30b)	PEC**	30bLESCH-1, 30bLESCH-2, 30bLESCH-3, 30bLESCH-4, 30bLESCH-5, 30bNMAid04, 30bPEPB-1, 30bpip01, 30bPossum3, 30bPossum4
Northern <i>Acacia rostellifera</i> – <i>Melaleuca systema</i> shrublands (FCTS11)		S11bold05, S11m4601, S11m4602, S11MI04, S11MI05, S11MI08, S11rott01, S11SW05, S11SW08, S11SW09, S11SW10, S11TR06, S11TR07, S11TR08
Northern <i>Olearia axillaris</i> – <i>Scaevola crassifolia</i> shrublands (FCTS13)		S13MI11, S13MI12, S13MI17, S13MI19, S13MI22, S13SW02, S13SW03, S13SW04, S13TR03, S13TR04, S13TR05, S13wilb02

^ A sub-community of the Critically Endangered Sedgelands in Holocene dune swales of the southern Swan Coastal Plain EPBC listed TEC.

* A component of the Endangered *Banksia* Woodlands of the Swan Coastal Plain EPBC listed TEC.

** Can be a component of the Endangered *Banksia* Woodlands of the Swan Coastal Plain EPBC listed TEC.

Single site insertion analysis

A single site insertion (SSI) analysis was conducted on GHD quadrats that were considered to align with FCT26a. The SSI analysis involved analysing GHD quadrats Q9, Q14, Q23, Q26,

Q27 and Q37 individually against the SWA dataset. This type of analyses is considered a more powerful method of grouping each quadrat with the SWA data and therefore enables a more robust result.

Vegetation condition

The vegetation condition was assessed and mapped in accordance with the vegetation condition rating scale for the South West and Interzone Botanical Provinces of Western Australia (IBRA) (devised by Keighery (1994) and adapted by EPA (2016a)). The scale recognises the intactness of vegetation and consists of six rating levels. The vegetation condition rating scale is located in Appendix B.

Surveys for conservation significant flora

Prior to the field survey, information obtained from the desktop assessments (e.g. previous surveys, aerial photography, geology, soils and topography data, EPBC Act PMST (DotEE 2018), TPFL, *NatureMap* (DBCA 2018) and the WAHERB databases search results) were reviewed to determine conservation significant flora taxa potentially present within the study area. Additionally, ecological information (e.g. habitat, associated flora taxa and phenology) was sourced from *FloraBase* (WA Herbarium 1998–) to provide further details.

Potential habitats and locations of previous records were searched by walking transects spaced approximately 100 metres (m) apart across the study area and extended study area. Locations within the survey area with differing hydrology, fire or disturbance history to the surrounding areas were also searched where identified. Where individuals were identified, the location and number of plants present were recorded using handheld GPS units. When conservation significant flora were recorded, fine scale transects and meandering was performed.

Flora identification and nomenclature

Species well known to the survey botanist were identified in the field; all other species were collected and assigned a unique collection number to facilitate tracking. All specimens collected during the field assessment were dried and processed in accordance with the requirements of the WA Herbarium. Species were identified by the use of taxonomic literature, electronic keys and online electronic databases.

The conservation status of all recorded flora was compared against the current lists available on *FloraBase* (WA Herbarium 1998–) and the EPBC Act Threatened species database provided by DotEE (2018b). Nomenclature used in this report follows that used by the WA Herbarium as reported on *FloraBase* (WA Herbarium 1998–).

2.2.2 Fauna

Survey details and timing

Four field surveys were undertaken between August 2018 and February 2019. Field surveys consisted of three to 12 days and are demonstrated below in Table 2-4.

Table 2-4 Details of Surveys Undertaken

Field Trip	Dates	Task	Duration	Zoologist/Ecologist
1	28 August - 6 September 2018	Potential Black Cockatoo breeding trees, identification and mapping and monitor selected large hollows	8 days	Glen Gaikhorst Madi Roberts
2	29 October - 7 November 2018	Level 2 fauna trapping within the survey area and assessments within the extended survey area	10 days	Glen Gaikhorst Madi Roberts Brad Maryan Tim Moulds Robert Browne-Cooper
3	8 - 9 November 2018	Monitoring of identified potential Black Cockatoo breeding hollows	2 days	Glen Gaikhorst Madi Roberts Brad Maryan
4	15 - 17 January and 1 February 2019	Monitoring of identified potential Black Cockatoo breeding hollows	4 days	Madi Roberts Robert Browne-Cooper

Permits and ethics

A Regulation 17 licence to Take Fauna for Scientific Purposes was obtained from the DBCA prior to undertaking the fauna survey (Licence Number: 08-002838-1). The fauna survey (specifically trapping and animal handling) was undertaken in accordance with Standard Operating Procedures (SOPs) which were required to be followed under the conditions of GHD's fauna trapping permit. At the time of survey, compliance with these SOPs was accepted by DBCA as evidence of ethical treatment of animals.

Guiding documents

The fauna habitat and species survey was undertaken with reference to the EPA *Technical Guidance – Sampling methods for terrestrial vertebrate fauna* (EPA 2016b) and *Technical Guidance – Terrestrial Fauna Surveys* (EPA 2016c). The black cockatoo species habitat assessment was conducted in accordance with the EPBC Act referral guidelines for three threatened black cockatoo species: Carnaby's Cockatoo (Endangered) *Calyptorhynchus latirostris*, Baudin's Cockatoo (Vulnerable) *Calyptorhynchus baudinii*, Forest Red-tailed Black Cockatoo (Vulnerable) *Calyptorhynchus banksii naso*, (Department of Sustainability, Environment, Water, Populations, and Communities (DSEWPaC 2012).

Habitat assessment

A field data checklist was used to document the type, condition and extent of habitats within the survey area. The following information was collected:

- Habitat structure (e.g. vegetation type, presence/absence of structural layers such as ground cover and mid storey)
- Presence/absence of refuge including: density of ground covers, fallen timber, hollow-bearing trees and stags and rocks/boulder piles, and the type and extent of each refuge
- Presence/absence of waterways including type, extent and habitat quality within waterways
- Location of the habitat within the survey area in comparison to the habitat within the surrounding landscape

- Habitat connectivity and identification of wildlife corridors within and immediately adjacent to the survey area
- Current land use and disturbance history
- Identification and evaluation of key habitat features and types identified during the desktop assessment relevant to fauna of conservation significance
- Evaluation of the Likelihood of Occurrence of conservation significant fauna within the habitat (based on presence if suitable habitat and observations)
- A representative photograph of each habitat type.

Trapping program

Trapping for terrestrial fauna was undertaken using a series of standardised systematic trapping quadrat sites comprising pit-fall traps, Elliott box traps, cage traps and funnel traps within the survey area. Details of each trap type used are provided below. A total of nine quadrats were used throughout the survey area and each quadrat was systematically surveyed (trapped) for 9 to 11 nights. Trapping locations are depicted in Figure 9, Appendix A.

Pit-trap with drift fence

Seven pit-traps were established at each quadrat within the survey area. Pit-traps comprised of 20 litre plastic buckets (30 centimetre (cm) diameter, 40 cm deep) at each quadrat. A 50 metre (m) long flywire drift fence (30 cm high) bisected the pits; directing fauna into them. Pits were spaced at seven meter intervals along the fence. Soil and an egg carton were placed within each pit to provide shade and protection for captured animals.

Funnel traps

Ten funnel traps were used along each drift fence. Traps were placed such that animals were directed into them from the drift fence in between the pit traps. Funnel traps were covered with insulating materials to minimise heat or cold exposure to animals.

Elliott box traps

Ten Elliott box traps were used at each quadrat site. Traps were placed approximately ten metres apart and baited with universal bait (a mixture of peanut butter, rolled oats and sardines). Elliott traps were located within shady areas or covered with vegetation to minimise heat exposure to captured animals. A single line of 10 Elliott traps was used per site, positioned 50 m on one side of (and parallel to) the drift fence.

Cage traps

Two cage traps were located at each quadrat site. These traps were placed at each end of the line of Elliott traps. Cage traps were baited with universal bait. Additionally two extra quadrats of only cage traps were placed down the eastern and western flank of the road alignments adjoining Neerabup National Park. Each line had 10 cages that were placed at 200 m intervals.

Avifauna

Avifauna surveys were undertaken at each of the quadrat sites. Each survey comprised of a 20 minute census of birds within an unbounded 2 ha area, which is the standard method used by Birds Australia for the Bird Atlas project. Birds detected visually (using binoculars) and/or aurally over a 20 minute period were recorded. Numbers of each species observed were also recorded.

All systematic bird surveys were undertaken within four hours of dawn or two hours of dusk, as these are the times of day when birds are most active. In addition to systematic surveys, observations of birds were also made opportunistically.

Camera traps

Eighteen motion sensor cameras (Reconyx-Hyperfire) were deployed for a period of at least 29 to 32 nights within the survey area (6) and extended survey areas (12). Cameras were positioned in areas where potentially significant species might be recorded i.e. hollow logs or utilising species access tracks. Cameras were baited with sardines and or universal animal bait to attract fauna species within the survey area. For each camera location the time and date deployed and recovered, and the GPS coordinates were recorded (Table 2-5). Camera locations are depicted in Figure 9, Appendix A. Data from the cameras were downloaded to a computer and analysed for the presence of animals following the field survey.

Table 2-5 Camera trap locations

Camera number	Survey Location	Habitat type	Location		Nights deployed
			Easting	Northing	
Camera g	Survey area	<i>Banksia</i> Woodland	377609.82	6500724.49	32
Camera ghd1	Extended	<i>Banksia</i> Woodland	377074.54	6501227.22	31
Camera sg6	Extended	Tuart Woodland	379153.37	6499675.77	31
Camera sg7	Extended	Tuart Woodland	379470.44	6499310.65	31
Camera 3	Extended	Tuart Woodland	379674.28	6498822.93	31
Camera sg5	Extended	Tuart Woodland	378143.34	6500692.55	31
Camera sg10	Survey area	Jarraah Woodland	377778.52	6502123.85	31
Camera ghd13	Survey area	Jarraah Woodland	377950.03	6500424.86	31
Camera ghdc	Extended	<i>Banksia</i> Woodland	378067.7	6500170.64	31
Camera r14	Extended	Jarraah Woodland	378646.59	6499205.03	31
Camera ghd4	Extended	<i>Banksia</i> Woodland	378280.43	6499043.31	31
Camera sg4	Survey area	<i>B. sessilis</i> shrubland	378618.85	6498051.55	31
Camera 11	Extended	<i>Banksia</i> Woodland	379031.95	6497731.45	29
Camera 18	Extended	<i>Banksia</i> Woodland	379457.26	6497963.12	29
Camera r5	Extended	<i>Banksia</i> Woodland	379992.08	6496216.59	29
Camera 0	Survey area	<i>Banksia</i> Woodland	378662.32	6497741.35	29
Camera 6	Survey area	<i>B. sessilis</i> shrubland	380010.39	6497456.45	29
Camera sg1	Extended	Tuart Woodland	380307.84	6496396.70	29
Total					547

Bat Surveys

Bat Detectors (SM2 and SM4 Songmeters) were deployed at 14 survey location for either one or two nights. Survey locations were in both the survey area (10) and extended survey area (4). Bat detectors were positioned in areas where bat species might be recorded i.e. utilising water bodies, fly ways or tracks. Bat detectors were set to record from 25 minutes pre-dusk to 25 minutes post-dawn. For each detector the time and date deployed and recovered, and the GPS coordinates were recorded (Table 2-6). Bat detector locations are shown in Figure 9, Appendix A.

Data from the bat detectors were downloaded to a computer and analysed for the presence of animals following the field survey. Data from the detectors was assessed by Glen Gaikhorst for the presence of bat species.

Table 2-6 Bat Detector locations

Bat detector sites	Survey Location	Habitat type	Location		Nights deployed
			Easting	Northing	
Site 1	Survey area	<i>Banksia</i> Woodland	377698.60	6500541.92	2
Site 2	Survey area	Tuart Woodland	376925.67	6500879.96	2
Site 3	Survey area	Mixed shrubland	376008.51	6501090.86	2
Site 4	Survey area	<i>Banksia</i> Woodland	377686.15	6500159.61	2
Site 5	Survey area	Jarraah Woodland	378020.15	6499012.11	2
Site 6	Survey area	Mixed shrubland	378202.07	6498581.61	2
Site 7	Survey area	<i>Banksia</i> Woodland	379974.29	6495476.75	2
Site 8	Survey area	Tuart Woodland	379477.00	6498464.71	2
Site 9	Survey area	<i>Banksia</i> Woodland	378605.75	6499807.78	2
Nth Wanneroo Rd	Survey area	Jarraah Woodland	377785.74	6502093.89	2
Lake 1	Extended	Tuart Woodland	379273.83	6499443.02	2
Lake 2	Extended	Tuart Woodland	379560.46	6499250.73	1
South Track Neerabup	Extended	<i>Banksia</i> Woodland	380211.31	6495792.11	1
Central track Neerabup	Extended	<i>Banksia</i> Woodland	378444.66	6499214.09	1
Total					25

Other Searches

Rare and threatened species may have a patchy, disparate distribution through landscapes. To provide the best opportunity to determine the presence and relative prevalence of these species, this survey employed a variety of sampling methods. The systematic sampling was applied throughout the trapping program with additional sampling methods also applied at these sites. Furthermore, other areas that were not assessed through the systematic trapping effort were also surveyed using non-systematic techniques.

Diurnal searching

Each trapping site and supplementary areas was surveyed within the survey area (14 sites). Additional survey effort was undertaken within the extended survey area of 12 sites. Surveys comprised of searching the ground layer (overturning logs, rocks and leaf litter) and low vegetation (under bark and in tree stumps) and recording all individuals of amphibians, reptiles, and mammals. Species presence was also determined via secondary evidence, in the form of scats, tracks, feathers, burrows and remains. A minimum of one hour was spent at each site including the general area around it.

Nocturnal searching

Spot lighting was undertaken to locate nocturnal species that may otherwise remain undetected using other survey techniques. Hand held or head mounted spotlights were used for a minimum of one hour at each trapping line and within the general area.

Opportunistic observations

Opportunistic observations involve the recording of fauna taxa (physical presence and/or signs of presence) spatially throughout the Project Area. Opportunistic observations include physical observations (sighting or hearing fauna), and indirect evidence (scats, tracks, diggings, nests, feathers, bones, pellets) which indicate the current or recent activity of a species. Wherever possible, numbers of individuals, microhabitat use and other relevant information was recorded.

Opportunistic observations were recorded outside of the diurnal, nocturnal or general trap site surveys (for example when driving, walking to a site, checking camera traps and bat detectors).

Targeted Black Cockatoo habitat assessment

A Black Cockatoo habitat assessment (for Carnaby's Cockatoo and Forest Red-tailed Black Cockatoo) was undertaken for the survey area to assess the presence, quality and extent of habitat. The assessment involved visual and aural assessment of the survey area, identifying breeding habitat (presence/absence of actual and potential breeding trees), foraging habitat, roosting areas, current activity and any other signs of use by Black Cockatoos. For the purpose of this assessment, the DSEWPaC (2012) Black Cockatoo referral guidelines were used to define breeding, foraging and night roosting habitat.

The Black Cockatoo habitat assessment method followed with the survey area and extended survey area varied:

- Survey area - Breeding habitat was identified within the survey area by identifying, recording and marking each potentially suitable cockatoo breeding tree (based on Diameter Breast Height (DBH) suitability) with a differential GPS. For each breeding tree, details of the tree species, size and number of hollows observed, evidence of use and any other significant observations were recorded. Where trees were recorded to have a suitable large hollow that could be used or had signs of being used, these trees were selected for continued monitoring in August 2018, November 2018 and January/February 2019. The monitoring involved visiting each tree with suitable hollows and visually inspecting for observations for presence, use and hollow persistence. Additionally each hollow up to 12 meters high was inspected for nesting Black Cockatoos with a Pole View Camera (Nestview Pole Camera NV4 – Faunatech).
- Extended survey area - Additionally within the extended survey area 29 plots of 0.25 ha (50 x 50 m) survey tree plots were undertaken, recording all potential Black Cockatoo trees within the bound area. Breeding habitat can then be extrapolated using averaged results from these plot surveys throughout the broader Neerabup National Park. Within each plot all potential Black Cockatoo breeding habitat was recorded according to the presence of suitable breeding trees (including the presence and size of hollow entrances).

Information collected during the field survey included:

- Foraging habitat - the location and extent of suitable Black Cockatoo species foraging habitat was identified and mapped for the survey area and extended survey area, based on the vegetation associations and presence/absence of known foraging species. During the field surveys any direct or indirect evidence of foraging by Black Cockatoos was recorded via GPS.
- Breeding habitat - suitable breeding habitat for Black Cockatoos is defined by DSEWPaC (2012) as trees of species known to support breeding within the range of the species which either have a suitable nest hollow or are of a suitable Diameter at Breast Height (DBH) to develop a nest hollow. For most tree species, suitable DBH is 500 mm. For Salmon Gum (*Eucalyptus salmonophloia*) and Wandoo (*Eucalyptus wandoo*), suitable DBH is 300 mm (DSEWPaC 2012). On average, Carnaby's Black Cockatoos are known to nest in hollows with an entrance diameter greater than 20 - 30 cm (Johnstone and Storr 1998; Groom 2011). While the Forrest Red-tailed Black Cockatoo is known to nest in hollows with an entrance of greater than 12 cm (Johnstone and Storr 1998). Therefore, during the field survey hollows were graded into small (up to 6 cm) Medium (6 to 10 cm) and Large (10+ cm).

- Night roosting habitat - suitable roosting habitat is defined by DSEWPaC (2012). Suitable roosting habitat was identified based on the presence of suitable tall trees, evidence of roosting (feathers, twig clips etc.) and proximity of known roosting sites in the survey area and extended survey area.
- Opportunistic observations - both visual and aural observations of Black Cockatoos within the survey area and surrounding region were noted during the survey. This information was used to calculate the amount of foraging habitat, potential breeding habitat and night roosting habitat within the survey area. Any area containing known foraging species or potential nesting trees was considered as habitat for Black Cockatoos.

This information was used to calculate the amount of foraging habitat, potential breeding habitat and night roosting habitat within the survey area and a guide to the habitats available within the extended survey area.

Species Identification and nomenclature

Identification of fauna species was made in the field using available field guides and electronic guides (Table 2-7). Where identification was not possible, photographs of specimens were collected to be later identified.

Table 2-7 Fauna references

Fauna group	Field guide
Mammals	Menkhorst and Knight (2004), Van Dyck and Strahan (2008)
Bats	Churchill (2008), Menkhorst and Knight (2010)
Birds	Morcombe (2004), Storr (1991)
Reptiles	Wilson and Swan (2017), Storr et al. (1999), Storr et. al. (2002)
Amphibians	Tyler and Doughty (2009)

Nomenclature used in this report follows that used by the WA Museum as reported on *NatureMap*. This nomenclature is deemed the most up-to-date species information for WA fauna, with the exception of birds, which follows Christidis and Boles (2008).

Survey effort

Survey effort is described as the amount and type of survey that is undertaken during an assessment. Each of the nine trapping sites was sampled for 9 to 11 consecutive trap-nights including bucket, cage, funnel and Elliott traps. Two additional cage trap sites ran for five nights. Bat acoustic recorders were set for 18 nights, 60 to 120 minutes of night search, 60 to 300 minutes of active search and 60 to 80 minutes of bird assessments undertaken at each site.

The total trapping effort consisted of 2690 trap-nights (total trap effort), 640 minutes of bird assessments, 1500 minutes of active searches, 730 minutes of night searches, 25 nights of Bat detection and 547 camera nights. Table 2-8 shows the survey effort undertaken for this assessment.

Table 2-8 Survey Effort Undertaken

Fauna Tapping			Location	Nights	Elliot traps		Pit Traps		Cage Traps		Funnel traps		Bat Detector	Birds search	Active search	Night search
Sites	Easting	Northing	(area)	Open	(total)		(total)		(total)		(total)		(nights)	(minutes)	(minutes)	(minutes)
Trap line 1	377626.33	6500532.27	Survey	10	10	100	7	70	2	20	10	100	2	60	120	90
Trap line 2	377129.98	6500620.91	Survey	10	10	100	7	70	2	20	10	100	2	80	150	90
Trap line 3	376084.69	6501116.74	Survey	11	10	110	7	77	2	22	10	110	2	60	150	120
Trap line 4	377715.28	6500100.71	Survey	11	10	110	7	77	2	22	10	110	2	60	180	90
Trap line 5	378010.15	6499032.11	Survey	10	10	100	7	70	2	20	10	100	2	80	300	80
Trap line 6	378263.17	6498523.50	Survey	10	10	100	7	70	2	20	10	100	2	80	300	80
Trap line 7	379935.98	6495502.07	Survey	9	10	90	7	63	2	18	10	90	2	60	120	60
Trap line 8	379497.47	6498501.08	Survey	9	10	90	7	63	2	18	10	90	2	80	120	60
Trap line 9	378609.49	6499832.51	Survey	10	10	100	7	70	2	20	10	100	2	80	180	60
Cages 1	379253.31	6499065.05	Survey	5					8	40						
Cages 2	377945.56	6499108.53	Survey	5					8	40						
Search 1	377810.64	6501931.22	Survey												120	
Search 2	378364.84	6499101.05	Survey												60	
Search 3	378632.50	6497759.23	Survey												120	
Search 4	377810.59	6501933.16	Survey										2		120	
Search 5	379381.50	6499484.78	Extended												120	
Search 6	377699.81	6499546.77	Extended												120	
Search 7	377660.42	6500395.10	Extended												120	
Search 8	378137.06	6500176.74	Extended												120	
Search 9	379408.86	6499710.76	Extended										2		60	
Search 10	379499.59	6499424.01	Extended										1		60	
Search 11	380044.65	6495611.11	Survey										1		120	
Search 12	380221.43	6495769.97	Extended										1		60	
Search 13	379319.19	6498089.71	Extended												60	
Search 14	376881.75	6501456.16	Extended												60	
Search 15	376716.89	6501347.29	Extended												60	
Search 16	376076.43	6501489.69	Extended												60	
Search 17	375829.81	6500689.56	Extended												60	
				TOTAL		900		630		260		900	25	640	1500	730

Comparison of species recorded to other surveys

GHD has undertaken Level 1 and Level 2 surveys of the Neerabup National Park in 2013 focusing on the alignment of the now operational Neerabup Road (GHD 2013a, 2014a). The Department of Parks and Wildlife (DPaW) (now DBCA) undertook a fauna survey in conjunction with this survey but focused on areas around Hester Ave (DPaW 2013). Conservation and Land Management (CALM) (now DBCA) in 1993 undertook a Level 2 survey of the Water reserve in the southern section of the Neerabup National Park (CALM 1993). Brad Maryan undertook herpetofauna assessments of Pipidiny Road from 1996 to 2004 for research on burrowing snake research (Maryan, B. Pers comm). The Metropolitan Road Infrastructure Alliance (MRIA 2018) undertook fauna clearance trapping along Wanneroo Road over approximately a 12 month period during 2017/2018. These reports and data have been reviewed and included in the report.

Fauna data analysis

Species accumulation

The number and type of species trapped each day was recorded and a species accumulation curve was created for the survey area using PRIMER v6 (Clarke and Gorley 2006). The species accumulation curve represent the successfulness of the trapping program for its duration. Typically, the longer the trapping program the more complete the representation of species sampled per trapping location or habitat type. Accumulation curves should show “levelling” of the groups species counts prior to the completion of the survey. Many limitations can influence the results of a curve and should be considered when interpreting the curve shape, and should be used as a guide to the effectiveness of systematic trapping methods. One curve was created for this survey within the survey area.

The data was run through Primer v6 against 8 existing models, these models are:

- Sobs - Curve of observed species counts
- Chao 1 - Chao's estimator based on number of rare species
- Chao 2 - Chao's estimator using just presence-absence data
- Jackknife 1 - Jackknife estimator based on species that only occur in one sample
- Jackknife 2 - Second order jackknife estimator
- Bootstrap - Bootstrap estimator based on proportion of quadrats containing each species
- MM (Michaelis-Menton) - Curve fitted to observed Sobs curve
- UGE - Calculated species accumulation curve based on (Ugland, Gray and Ellingsen 2003).

The best fit model was selected and discussed.

Scatter Plots

PRIMER v6 (Clarke and Gorley 2006) was used to examine the similarity between trapping sites using collected data. A matrix was created of all species (based on abundance) recorded at each trap site. The dissimilarity between sites was determined using the Bray-Curtis measure and the Resemblance function in PRIMER. A Cluster analysis (using Agglomerative Hierarchical Clustering technique) based on group average was undertaken using the Bray-Curtis similarity matrix and results presented as a dendrogram. In addition, a nonmetric MDS was undertaken using the Bray-Curtis similarity matrix and results presented as a two dimensional scatter plot. A factor was added to the output to define trap sites by habitat type.

2.3 Limitations

2.3.1 Desktop limitations

The EPBC Act PMST is based on bioclimatic modelling for the potential presence of species. As such, this does not represent actual records of the species within the area. The records from the DBCA searches of Threatened fauna provide more accurate information for the general area and local occurrence. However, some collection, sighting or trapping records cannot be dated and often misrepresent the current range of Threatened species.

2.3.2 Field survey limitations

The EPA (2016a, b) states that flora and fauna survey reports for environmental impact assessment in WA should contain a section describing the limitations of the survey methods used. The limitations and constraints associated with this field survey are discussed in Table 2-9.

Table 2-9 Survey Limitations

Aspect	Constraint	Comment
Sources of information and availability of contextual information.	Nil	Adequate information is available for the survey area, this includes: <ul style="list-style-type: none"> • Broad scale (1:250,000) mapping by Beard (1979) and digitised by Shepherd <i>et al.</i> (2002) • Vegetation mapping by Heddle <i>et al.</i> 1980 and Webb (DBCA) (2016) • Regional biogeography (Mitchell <i>et al.</i> 2002).
Scope (what life forms were sampled etc.)	Nil	Vascular flora and terrestrial vertebrate fauna were sampled during the survey. Non-vascular flora, invertebrate and aquatic fauna were not surveyed.
Proportion of flora collected and identified (based on sampling, timing and intensity) Proportion of fauna identified, recorded and/or collected	Nil	The vegetation survey was a single season survey and was undertaken over multiple visits between September and November 2018 (Spring). An additional targeted survey was undertaken in December (summer) targeting conservation significant flora. Spring is considered the most optimal time to undertake vegetation surveys in the Swan Coastal Plain bioregion. The vegetation survey was a broad scale and targeted assessment, undertaken to identify and describe the dominant vegetation units and map conservation significant flora. The fauna survey (Level 2) was undertaken in October/November 2018 and Black Cockatoo assessments undertaken in August 2018, November 2018 and January/February 2019. The Level 2 survey was undertaken within the survey area with additional effort (of active searches, cameras and bat detectors) within the extended survey area. Moderate to high numbers of fauna were identified during the survey period and the Black Cockatoo assessments were undertaken throughout the breeding season.
Flora determination	Minor	Flora determination was undertaken by GHD ecologists in the field and at the WA Herbarium. Three taxa could only be identified to family level only, fifteen taxa could be identified to genus level only, and four taxon could be tentatively identified to species level, due to lack of flowering and/or fruiting material required for identification. None of these species were considered to be potential conservation significant flora. The taxonomy and conservation status of the WA flora is dynamic. This report was prepared with reliance on taxonomy and conservation status current at the time of report development, but it should be noted this may change in response to ongoing research and review of the International Union for Conservation Nature criteria.
Completeness and further work which might be needed (e.g. was the relevant area fully surveyed)	Minor	The majority of the survey area was accessible and was accessed by foot or by vehicle. Some sections of the survey area were not accessible as they were fenced off and/or occurred on private property. The Public Transport Authority (PTA) rail corridor is completely fenced off and access prohibited, therefore observations were made at the fenced boundary. For the remainder of the survey area access tracks created as a result of infrastructure development (road, water and electrical services) and fire breaks, allowed access to the majority of the survey area.
Mapping reliability	Nil	The vegetation was mapped using high-resolution ESRI aerial imagery obtained from Landgate, topographical features, previous broad scale mapping (Beard 1979) and field data.

Aspect	Constraint	Comment
		Data was recorded in the field using hand-held GPS tools (e.g. Nomad Juno and Garmin GPS). Certain atmospheric factors and other sources of error can affect the accuracy of GPS receivers. The Garmin GPS units used for this survey are accurate to within ± 5 metres on average. Therefore the data points consisting of coordinates recorded from the GPS may contain inaccuracies.
Timing/weather/season/cycle	Minor	<p>The field surveys were conducted in August, October/November and January 2019. In the three months prior to the flora survey (June to August), Perth weather station (Bureau of Meteorology (BoM) 2019) recorded a total of 411 mm of rainfall. This rainfall total is slightly lower than the long term average for the same period (June-August; 430.6 mm) (BoM 2019).</p> <p>The weather conditions recorded during the survey are within the observed climatic conditions previously recorded for the months of August, October/November and January 2019 (years 1899 to 2019) at the Perth weather station (BoM 2019). The weather conditions recorded during the survey were considered unlikely to have impacted the survey results.</p> <p>The survey timings were considered appropriate for the flora and fauna field surveys.</p>
Disturbances (e.g. fire, flood, accidental human intervention)	Minor	<p>Much of the survey area has been subjected to historical disturbance events (e.g. clearing, rubbish dumping); however, these disturbances did not impact the survey.</p> <p>For the fauna surveys nocturnal surveys were difficult due to increased undesirable activity. During one night a suspected stolen car continually drove past while trying to survey for fauna. Due to the inherent risk the night survey was cut short. The vehicle traversed the site and was found burnt out in the morning. Illegal activity (rubbish dumping) and public disturbance occurred almost daily.</p>
Resources	Nil	Adequate resources were employed during the field survey. Seven staff and 97 person days were spent undertaking the survey using dedicated botanists and zoologists.
Access restrictions	Nil	No access problems were encountered during the survey. The majority of the survey area was accessed on foot during the survey. Access to the fenced off rail corridor and private properties was prohibited.
Experience levels	Nil	The ecologists who executed the survey were practitioners suitably qualified in their respective fields. Angela Benkovic and Erin Lynch are Ecologists (botanist) with over 10 years' experience in undertaking ecological surveys in Western Australia. Glen Gaikhorst (Zoologist) is an Ecologist with over 24 years' experience in undertaking ecological surveys in Western Australia. Glen was supported by Brad Maryan, Robert Browne Cooper, Tim Moulds and Madi Roberts.

3. Desktop assessment

3.1 Regional biogeography

The study area is situated in the South West Botanical Province of Western Australia (Beard 1990) within the Swan Coastal Plain bioregion and Perth sub-region described by the Interim Biogeographic Regionalisation of Australia (IBRA) (DotEE 2018c).

The Swan Coastal Plain bioregion is a low lying coastal plain, mainly covered with woodlands. The Perth sub-region is characterised by colluvial and aeolian sands, alluvial river flats and coastal limestone. Heath and/or Tuart woodlands occur on limestone, Banksia and Jarrah-Banksia woodlands on Quaternary marine dunes of various ages, and Marri on Colluvial and alluvials. The region also includes a complex series of seasonal wetlands (Mitchell et al. 2002).

3.2 Hydrology

3.2.1 Groundwater

The Department of Water and Environmental Regulation Perth Groundwater Map indicates the study area is located in the Perth Groundwater Area under the *Rights in Water and Irrigation Act 1914* and the Perth Coastal and Gwelup Underground Pollution Control Area public drinking water source area (Priority 3 Protection Zone) proclaimed under the *Metropolitan Water Supply, Sewerage and Drainage Act 1909* (Figure 4, Appendix A). Priority 3 areas are declared over land where water supply sources need to coexist with other land uses such as residential, commercial and light industrial developments.

3.2.2 Surface water

There are no wetlands, watercourses or drainage lines located within the survey area. The Geomorphic Wetlands Swan Coastal Plain dataset (Hill *et al.* 1996) identified 13 wetlands within the study area, none of these are located within or intersect the survey area (Table 3-1 and Figure 4, Appendix A). One geomorphic wetland, Lake Nowergup, is located approximately 200 m east of the Wanneroo Road upgrade survey area, within the extended survey area.

No wetlands of national or international importance (Ramsar) are present within the study area (DotEE 2018a).

Table 3-1 Geomorphic wetlands mapped within the study area

Name	Unique feature identifier	Category	Location relative to survey area
Neerabup Lake	8019	Resource Enhancement	600 m east of the southern end of the Wanneroo Road upgrade survey area
unknown	8018	Multiple Use	330 m east of the southern end of the Wanneroo Road upgrade survey area
unknown	8017	Resource Enhancement	580 m east of the southern end of the Wanneroo Road upgrade survey area
Camel Swamp	7938	Resource Enhancement	3.5 km east of the survey area
Nowergup Lake	8021	Conservation	200 m west of the Wanneroo Road upgrade survey area within the extended survey area

Name	Unique feature identifier	Category	Location relative to survey area
unknown	8020	Resource Enhancement	620 m east of the Wanneroo Road upgrade survey area
Carabooda Lake	8009	Resource Enhancement	200 m east of the northern end of the Wanneroo Road upgrade survey area
Beonaddy Swamp	8016	Resource Enhancement	2.9 km north of the survey area
Coogee Swamp	8015	Resource Enhancement	2.2 km north of the survey area
Pippidinny Swamp	8012	Conservation	3.8 km north of the survey area
unknown	8014	Multiple Use	2.5 km north of the survey area
Mindarie Lake	8013	Multiple Use	2.9 km north of the survey area
Wilgarup Lake	8022	Conservation	4.2 km north of the survey area

3.3 Landforms and soils

The SWA is comprised of five major geomorphological units, which lie more or less parallel to the coast. These geomorphological units are the Quindalup, Spearwood and Bassendean Dunes, the Pinjarra Plain and the Ridge Hill Shelf (McArthur and Bettenay 1960, Churchwood and McArthur 1980). The majority of the survey areas lie within the Spearwood Dunes, with the western end of Romeo Road occurring within the Quindalup Dunes. These land systems are broadly described as follows:

- Spearwood Dunes: Pleistocene and aeolian sands overlying Tamala limestone. Low dunes and swales of shallow pale grey sands over yellow sands are characteristic of the Spearwood system. Wetlands are associated with peats and carbonate sands, occasionally with clay overlaying sands
- Quindalup Dunes: Aeolian origin and are the youngest of the dune systems on the SCP. This system is characterised by large parabolic dunes north of the Swan River with broad to narrow swales and sand sheets between the dunes.

Churchwood and McArthur (1980) identified the soils within the survey areas as consisting of the following soil units:

- Cottesloe: Low hilly landscape with shallow brown sands over limestone, much exposed limestone
- Herdsman: Peaty swamps associated with Bassendean and Karrakatta units.

The Department of Primary Industries and Regional Development (previously Department of Agriculture and Food Western Australia (DAFWA)) soil mapping indicates there are five different soil subsystems within the survey area (DAFWA 2007). A description of the soil types present is provided in Table 3-2.

The soil types listed in Table 3-2 are also mapped to occur in the extended survey area, with the addition of 211SpW_SWAMP (Spearwood wet, swamp phase) and 211Qu_Qp (Quindalup South deep sand flat phase) (DAFWA 2007).

Table 3-2 Soil descriptions occurring within the survey area (DAFWA 2007)

Soil ID	Name	Description
211Sp_Kls	Karrakatta shallow soils Phase	Low hills and ridges. Bare limestone or shallow siliceous or calcareous sand over limestone. Dense low shrub dominated by <i>Dryandra sessilis</i> , <i>Melaleuca huegelii</i> and species of <i>Grevillea</i> .
211Sp_Ky	Karrakatta sand yellow phase	Low hilly to gently undulating terrain. Yellow sand over limestone at 1-2 m. <i>Banksia</i> spp. woodland with scattered emergent <i>E. gomphocephala</i> and <i>E. marginata</i> and a dense shrub layer
211Sp_Sp	Spearwood sand phase	Irregular banks of karst depressions. Some limestone outcrop. Shallow brown sands. <i>Banksia</i> spp. woodland with emergent <i>E. gomphocephala</i> and <i>E. marginata</i> ; dense shrub layer
211Qu_Q2	Quindalup South second dune phase	The second phase. A complex pattern of dunes with moderate relief. Calcareous sands have organic staining to about 20 centimetres (cm), passing into pale brown sand; some cementation below 1 m.
211Qu_Qp	Quindalup South deep sand flat phase	Undulating landscapes with deep calcareous sands overlying limestone. Soils have dark grey-brown sand to about 50 cm and then pale brown sand. Remnants of hummocks are often present.

3.4 Land use

3.4.1 Conservation reserves and estates

There are four conservation reserves located within the study area (Figure 3, Appendix A). Of these, two of the reserves are located within the boundaries of the survey areas. Neerabup National Park (Class A Reserve, R 27575) is located along the entire eastern boundary of the proposed Mitchell Freeway extension and extends east to the proposed Wanneroo Road upgrade survey area. The proposed Wanneroo Road upgrade survey area intersects Neerabup Nature Reserve (Class A Nature Reserve, R 24581), which is situated on the eastern side of Wanneroo Road.

There are 11 Bush Forever Sites located within the study area. Of these, the following two Bush Forever sites occur within the survey areas (Government of Western Australia 2000) (Figure 3, Appendix A).

- Bush Forever Site 383 – Neerabup National Park, Lake Nowergup Nature Reserve and adjacent bushland (361.42 ha occurs within the survey area)
- Bush Forever Site 130 – Link between Yanchep and Neerabup National Parks (2.66 ha occurs within the survey area).

3.4.2 Environmentally Sensitive Areas

The majority of the survey areas are classified as an Environmentally Sensitive Area (ESA) (Figure 3, Appendix A). The ESAs mapped over the survey areas are likely to be associated with the Bush Forever Sites, National Park and TECs.

3.4.3 Regional Ecological linkages

Two Regional Ecological Linkages transect the survey areas (Figure 3, Appendix A). Greenways linkage I.D number 6 and I.D number 8 (Tingay, Alan and Associates 1998) are part of a regionally significant contiguous bushland/wetland linkage (GoWA 2000). Greenways linkage I.D number 6 links Neerabup National Park (Bush Forever Site 383) to Lake Joondalup (Bush Forever Site 299) in the south and Yanchep and Neerabup National Parks (Bush Forever Site 130) in the north. Greenways linkage I.D number 8 provides an eastern linkage between Neerabup National Park (Bush Forever Site 383) and Hopkins Road Bushland, Nowergup (Bush Forever Site 190). Linkage I.D number 8 already has a significant barrier in the form of Wanneroo Road that affects the continuity of this corridor. Linkage I.D number 6 is interrupted by Hester Avenue and Neerabup Road to the south, however fauna underpasses have been constructed to reduce potential impacts to fauna and provide ecological continuity.

3.5 Vegetation and Flora

3.5.1 Broad vegetation mapping and extents

Vegetation associations

Broad scale (1:250,000) pre-European vegetation mapping of the study area has been completed by Beard (1979) at an association level. The mapping indicates the survey areas intersects three vegetation associations:

- Low woodland; *Banksia* (association 949) (majority of the Mitchell Freeway extension section of the survey area)
- Medium woodland; Tuart (association 998) (majority of the Wanneroo Road upgrade section of the survey area)
- Mosaic: shrublands; *Acacia lasiocarpa* and *Melaleuca systena* heath/ shrublands; *A. rostellifera* and *A. cyclops* thicket (association 1007) (north-western section of the survey area, along Romeo Road)

The extended survey area also intersects association 51: Sedgeland; reed swamps, occasionally with heath.

The pre-European mapping has been adapted and digitised by Shepherd *et al.* (2002). The extent of the vegetation associations have been determined by the state-wide vegetation remaining extent calculations maintained by the DBCA (current as of March 2019 –Government of Australia (GoWA) 2018b). As shown in Table 3-3, the current extents of all vegetation associations that intersect the survey area are above 30 % of their pre-European extents at the State, IBRA bioregion, IBRA subregion and Local Government Authority (LGA) levels.

Vegetation complexes

Regional vegetation complex mapping has been completed by Heddle *et al.* (1980) with updates from Webb *et al.* (2016) based on major landform boundaries within the SWA and forested region of south-west Western Australia. The mapping indicates two vegetation complexes are present within the survey area:

- Cottesloe Complex - Central and South: Consists of a mosaic of woodland of *Eucalyptus gomphocephala* (Tuart) and open forest of *E. gomphocephala* – *E. marginata* (Jarrah) – *Corymbia calophylla* (Marri); closed heath on the limestone outcrops (majority of survey area)
- Quindalup Complex: is restricted to the coastal dunes and can be subdivided mainly into two alliances. The strand and fore dune alliance contain *Angianthus cunninghamii*,

Trachyandra divaricatum, *Arctotheca populifolia*, *Atriplex isatidea*, *Cakile maritima*, *Leucophyta brownii*, *Carpobrotus virescens*, *Pelargonium capitatum*, *Senecio lautus*, *Actites megalocarpus*, *Spinifex longifolius*, *Tetragonia implexicoma*, *T. decumbens*. The mobile and stable dune alliance contains *Acacia cyclops*, *Anthocercis littorea*, *Lepidosperma gladiatum*, *Myoporum insulare*, *Nitraria billardiarei*, *Olearia axillaris*, *Scaevola crassifolia*, *S. nitida*, *Spyridium globulosum*, *Westringia rigida* and *Wilsonia backhousei*. The vegetation differs in its physiognomy and species composition from one place to another because of the variations in the dune environment caused by edaphic and topographical factors and the degree of shelter from salt-laden winds (McArthur 1957; Smith 1957). The low closed-forest of *Melaleuca lanceolata*, *Callitris preissii* is restricted to small localised pockets (Table 3.5). This formation was once more widespread along the coast (Baird 1958, Seddon 1972). Other local variations include remnant occurrences of *E. foecunda*, *Pittosporum ligustrifolium*, *Santalum acuminatum*, *Exocarpos sparteus* and *Acacia rostellifera* (Seddon 1972). Within Geographe Bay a low closed Peppermint forest extends directly to the fore dune and is characterised by an understory of *Spyridium globulosum*, *Hibbertia cuneiformis*, *Acacia littorea*, *Pimelea argentea* and *Lepidosperma gladiatum*

One additional vegetation complex is mapped from the eastern extent of the extended survey area: Herdsman Complex: described as sedgelands and fringing woodland of *E. rudis*-*Melaleuca* spp.

GoWA (2018c) has assessed the vegetation complexes mapped by Heddle *et al.* (1980) and Webb *et al.* (2016) against presumed pre-European extents within the SWA IBRA bioregion (Table 3-4) and LGA levels (

Table 3-5). These tables show the current extent of all the vegetation complexes within the survey area are above 30 % of their pre-European extents remaining within the SWA IBRA bioregion and the City of Wanneroo.

Swan Coastal Plain Floristic Studies

Floristic studies on the SWA include those completed by Gibson *et al.* (1994) and other unpublished data collected as part of the System 6 and Part System 1 Update program and from various sources (e.g. Weston *et al.* 1993, Griffin 1994, DEP 1996 and Keighery 1996). This data has been compiled into a dataset, referred to in this report as the SWA dataset. A search of the SWA dataset identified 10 FCTs that are known to occur within a 5 km buffer of the survey area (Table 3-6).

3.5.2 Conservation significant ecological communities

The EPBC Act PMST identified three EPBC Act-listed TECs potentially occurring within the study area. These TECs were also identified in a search of the DBCA TEC/PEC database along with one additional TEC and six PECs. Details of these communities are provided in Table 3-7. The extents of TEC and PEC buffers, where available, are presented in Figure 2, Appendix A.

Table 3-3 Extents of vegetation associations mapped within the survey area (GoWA 2018b)

Vegetation association	Scale	Pre-European extent (ha)	Current extent (ha)	Remaining (%)	Remaining within DBCA managed lands (%)	Hectares (ha) within the survey area	% of current extent within the survey area
949	State: WA	218,193.94	123,104.02	56.42	55.86	249.71	0.20
	IBRA bioregion: Swan Coastal Plain	209,983.26	120,287.93	57.28	56.40	249.71	0.21
	Sub-region: Perth	184,475.82	104,128.96	56.45	58.99	249.71	0.24
	LGA: City of Wanneroo	37,138.40	17,196.34	46.30	70.10	249.71	1.45
998	State: WA	51,015.33	18,492.63	36.25	48.68	142.43	0.77
	IBRA bioregion: Swan Coastal Plain	50,867.50	18,492.32	36.35	48.68	142.43	0.77
	Sub-region: Perth	50,867.50	18,492.32	36.35	48.68	142.43	0.77
	LGA: City of Wanneroo	4,635.30	2,787.40	60.13	52.75	142.43	5.11
1007	State: WA	30,407.75	20,691.11	68.05	14.75	7.83	0.04
	IBRA bioregion: Swan Coastal Plain	30,109.89	20,679.62	68.68	14.75	7.83	0.04
	Sub-region: Perth	30,109.89	20,679.62	68.68	14.75	7.83	0.04
	LGA: City of Wanneroo	8,058.91	4,830.52	59.94	1.94	7.83	0.16

Table 3-4 Extent of vegetation complexes on the SWA mapped within the survey area (GoWA 2018c)

Vegetation complex	Pre-European extent (ha)	Current extent (ha)	Remaining (%)	Remaining within DBCA managed lands (%)	Hectares (ha) within the survey area	% of current extent within the survey area
Cottesloe Complex – Central and South	45,299.61	14,567.87	32.16	14.58	385.02	2.64
Quindalup Complex	54,573.87	33,011.4	60.49	10.98	14.64	0.04

Table 3-5 Extent of vegetation complexes within the City of Wanneroo for the survey area (GoWA 2018c)

Vegetation complex	Pre-European extent (ha)	Current extent (ha)	Remaining (%)	Proportion of the vegetation complex within the the LGA (%)
Cottesloe Complex – Central and South	13,313.58	5,545.39	41.65	29.39
Quindalup Complex	8,818.26	5,352.77	60.70	16.16

Table 3-6 SWA dataset FCTs within the study area

FCT	Description
Seasonal wetlands	
19b	Woodlands over sedgeland in Holocene dune swales
Uplands centred on Spearwood Dunes	
24	Northern Spearwood shrublands and woodlands
26a	<i>Melaleuca huegelii</i> – <i>Melaleuca systema</i> shrublands on Limestone ridges
27	Species poor mallees and shrublands on Limestone
28	Spearwood <i>Banksia attenuata</i> or <i>Banksia attenuata</i> – <i>Eucalyptus</i> woodlands
Uplands centred on Quindalup Dunes	
29a	Coastal shrublands on shallow soils
29b	<i>Acacia</i> shrublands on taller dunes
30b	Quindalup <i>Eucalyptus gomphocephala</i> and/or <i>Agonis flexuosa</i> woodlands
S11	Northern <i>Acacia rostellifera</i> – <i>Melaleuca systema</i> shrublands
S13	Northern <i>Olearia axillaris</i> – <i>Scaevola crassifolia</i> shrublands

Table 3-7 Threatened and Priority Ecological Communities identified within the study area

Community type	EPBC Act	BC Act/ DBCA	Description	Location from the survey area
Aquatic Root Mat Community in Caves of the Swan Coastal Plain	Endangered	Critically Endangered	The Aquatic Root Mat Community in Caves of the Swan Coastal Plain ecological community occurs in caves of the Swan Coastal Plain in southwest Western Australia. Known occurrences are in seven caves in Yanchep National Park. The habitat for the aquatic root mat community is within the seven individual caves, where there are cave streams, and the roots of tuart trees that extend into each of the caves and streams, plus the catchments for the streams that flow through the caves. This includes areas of the Gnangara mound catchment between the caves and the top of the mound, and the superficial water table that supplies the water to the cave-streams. Caves containing the aquatic root mat community occur where sandy soils underlie superficial limestone and where the waters of the Gnangara Mound seep through the	The northern extent of the survey area intersects the 5 km buffer of these cave systems.

Community type	EPBC Act	BC Act/ DBCA	Description	Location from the survey area
			sand to form a system of subterranean pools and streams, a few of which have been permanent in historical times (DotEE 2017).	
Woodlands over sedgeland in Holocene dune swales of the southern Swan Coastal Plain (SCP19b)	Endangered	Critically Endangered	The community occurs in linear damplands and occasionally sumplands, between Holocene dunes. Typical and common native species are the shrubs <i>Acacia rostellifera</i> , <i>A. saligna</i> , <i>Xanthorrhoea preissii</i> , the sedges <i>Baumea juncea</i> , <i>Ficinia nodosa</i> , <i>Lepidosperma gladiatum</i> , and the grass <i>Poa porphyroclados</i> . Several exotic weeds are found in this community but generally at low cover values. Two sub-groups of SCP19 have been identified as follows: <ul style="list-style-type: none"> Community type 19a is termed 'sedgeland in Holocene dune swales' and generally occurs in the younger swales. Community type 19b is termed 'woodlands over sedgeland in Holocene dune swales' and tends to occur in older swales. This subgroup has an overstorey of woodlands including <i>Eucalyptus gomphocephala</i>, <i>Melaleuca raphiophylla</i> and <i>Banksia littoralis</i>. 	Closest occurrence is 2.9 km north of the survey area.
Northern Spearwood shrublands and woodlands – (SCP24)*	Endangered TEC (part)	Priority 3	Heaths with scattered <i>Eucalyptus gomphocephala</i> occurring on deeper soils north from Woodman Point. Most sites occur on the Cottesloe unit of the Spearwood system. The heathlands in this group typically include <i>Banksia sessilis</i> , <i>Calothamnus quadrifidus</i> , and <i>Schoenus grandiflorus</i> (DBCA 2019)	Multiple occurrences within and surrounding the survey area.
<i>Melaleuca huegelii</i> - <i>Melaleuca systema</i> shrublands on limestone ridges (SCP26a)		Endangered	Species rich thickets, heaths or scrubs dominated by <i>Melaleuca huegelii</i> , <i>M. systema</i> , <i>Banksia sessilis</i> over <i>Grevillea preissii</i> , <i>Acacia lasiocarpa</i> and <i>Spyridium globulosum</i> , occurring on skeletal soil on ridge slopes and ridge tops. Broadly occurs on Spearwood Sands (Tamala Limestone) on large limestone ridges (Threatened Species Scientific Committee (TSSC) 2005)	Multiple occurrences within and surrounding the survey area.
Coastal shrublands on shallow sands, southern Swan Coastal Plain (SCP29a)		Priority 3	Mostly heaths on shallow sands over limestone close to the coast. No single dominant but important species include <i>Spyridium globulosum</i> , <i>Rhagodia baccata</i> and <i>Olearia axillaris</i> .	Closest occurrence is 4.2 km south west of the survey area.

Community type	EPBC Act	BC Act/ DBCA	Description	Location from the survey area
<i>Acacia</i> shrublands on taller dunes, southern Swan Coastal Plain (SCP29b)		Priority 3	Community is dominated by <i>Acacia</i> shrublands or mixed heaths on the larger dunes. This community stretches from Seabird to south of Mandurah. No consistent dominant but species such as <i>Acacia rostellifera</i> , <i>Acacia lasiocarpa</i> , and <i>Melaleuca systema</i> were important	Closest occurrence is 3.3 km south west of the survey area.
Quindalup <i>Eucalyptus gomphocephala</i> and / or <i>Agonis flexuosa</i> woodlands (SCP30b)**		Priority 3	This community is dominated by either Tuart or <i>Agonis flexuosa</i> . The presence of <i>Hibbertia cuneiformis</i> , <i>Geranium retrorsum</i> and <i>Dichondra repens</i> differentiate this group from other Quindalup community types. The type is found from the Leschenault Peninsular south to Busselton	Closest occurrence is approximately 4 km north of the survey area.
<i>Banksia</i> woodlands of the Swan Coastal Plain (TEC) <i>Banksia</i> dominated woodlands of the Swan Coastal Plain IBRA region (PEC)	Endangered	Priority 3	The ecological community is a woodland associated with the Swan Coastal Plain. A key diagnostic feature is a prominent tree layer of <i>Banksia</i> , with scattered eucalypts and other tree species often present among or emerging above the <i>Banksia</i> canopy. The understorey is a species rich mix of sclerophyllous shrubs, graminoids and forbs. The ecological community is characterised by a high endemism and considerable localised variation in species composition across its range (TSSC 2016).	Closest occurrences range from 3 to 4 km north and east of the survey area
Tuart (<i>Eucalyptus gomphocephala</i>) woodlands of the Swan Coastal Plain (PEC)		Priority 3	Mostly confined to Quindalup Dunes and Spearwood Dunes from Jurien Bay to the Sabina River, with outliers along some rivers. Tuart is the key dominant canopy species however Tuart communities comprise a variety of flora and fauna assemblages. Flora commonly occurring with Tuart include <i>Agonis flexuosa</i> , <i>Banksia attenuata</i> , <i>B. grandis</i> , <i>Allocasuarina fraseriana</i> , <i>Xylomelum occidentale</i> , <i>Macrozamia riedlei</i> , <i>Xanthorrhoea preissii</i> , <i>Spyridium globulosum</i> , <i>Templetonia retusa</i> and <i>Diplolaena dampieri</i> (DBCA 2019)	Data not available

*A component of the Endangered *Banksia* woodlands of the Swan Coastal Plain EPBC listed TEC

**Can form a component of the Endangered *Banksia* Woodlands of the Swan Coastal Plain EPBC listed TEC

3.5.3 Flora diversity

The *NatureMap* database identified 337 flora taxa, representing 67 families and 189 genera previously recorded within the study area. This total comprised 272 native flora taxa and 65 naturalised (introduced) flora taxa. Dominant families recorded included Fabaceae (42 taxa), Asteraceae (30 taxa) and Proteaceae (22 taxa).

The *NatureMap* database search is provided in Appendix C.

3.5.4 Conservation significant flora

The EPBC Act PMST, *NatureMap* and DBCA Threatened and Priority Flora databases identified the presence/potential presence of 26 conservation significant flora taxa within the study area (Appendix C). The desktop searches recorded:

- 12 Threatened flora taxa listed under the EPBC Act and/or WC Act
- Two Priority 1 taxon
- Three Priority 2 taxa
- Seven Priority 3 taxa
- Two Priority 4 taxa

The locations of conservation significant flora registered on the DBCA databases are mapped on Figure 2, Appendix A.

3.6 Fauna

3.6.1 Fauna diversity

The *NatureMap* database identified 252 terrestrial vertebrate fauna species previously recorded within the study area. This total comprised of 163 birds, 54 reptiles, 30 mammals and 5 amphibians. Of the 252 fauna species previously recorded, 239 are native species and 13 are naturalised (introduced) species.

The *NatureMap* database search is provided in Appendix C.

3.6.2 Conservation significant fauna

The EPBC Act PMST and DBCA *NatureMap* database and GHD observations identified the presence/ potential presence of 25 conservation significance fauna taxa within the study area (Appendix C). This total does not include species identified by the PMST as marine and/or migratory marine. These species have been excluded from this assessment as no marine habitat was present within or immediately adjacent to the survey area.

The species listed included:

- 13 species listed as Threatened under the EPBC Act and/or as Threatened under the BC Act (six are also listed as Migratory under the EPBC Act)
- Five bird species listed as Migratory only (terrestrial and wetland) under the EPBC Act and/or as Migratory species under the BC Act
- One species listed as Other specially protected fauna under the BC Act
- Five species listed as Priority by DBCA

One additional species not identified in the desktop searches has been identified by GHD as potentially occurring within the study area:

- Jewelled Ctenotus (*Ctenotus gemmula*) – listed as Priority 3 by the DBCA.

For the purpose of assessing the species likely to be impacted by the proposed project, only those species identified or likely to occur within the survey area are discussed in the Likelihood of occurrence assessment in Section 4.2.10.

3.7 Previous survey results

3.7.1 Mitchell Freeway extension: Burns Beach Rd to Romeo Rd Level 2 Flora and Level 1 Fauna assessment (GHD 2014a)

The biological survey was completed during May to July and September to October in 2013 to identify the environmental values of the proposed Mitchell Freeway extension and associated works between Burns Beach Road and Romeo Road. The project was broken down into three stages and covered a total area of 438 ha.

- Stage 1 – Freeway extension from Burns Beach Road and Hester Avenue and the connecting roads (Neerabup Road and Hester Avenue)
- Stage 2 – Freeway extension from Hester Avenue to Romeo Road and connecting road (Romeo Road)
- Stage 3 – Wanneroo Road duplication from Joondalup Drive to Hall Road.

Vegetation and flora

Six vegetation types (and an additional mosaic vegetation type) were mapped across the study area: *Banksia* woodland (VT1), Jarrah–*Banksia* woodland (VT2), Tuart woodland (VT3), Mixed low heath on limestone (VT4), *Melaleuca huegelii*–*M. systema* shrubland on limestone (VT5), *Banksia sessilis* closed tall scrub (VT6) and mosaic of VT1 and VT4.

Vegetation types 3, 4 and 6 appeared to correspond with the Priority 3 PEC “Northern Spearwood Shrublands and Woodlands”. Vegetation type 5 appeared to correspond with the State listed Endangered TEC “*Melaleuca huegelii*–*M. acerosa* [now *M. systema*] shrublands on limestone ridges”.

The GHD survey identified a total of 392 flora species from 79 families and 234 genera within the study area. This number included 246 native species and 146 introduced/planted species. No Threatened flora were identified within the study area during the survey. Five Priority flora taxa listed by DBCA were recorded within the study area: *Acacia benthamii* (Priority 2), *Eucalyptus caesia* (Priority 4) (roadside plantings), *Jacksonia sericea* (Priority 4), *Pimelea calcicola* (Priority 3) and *Stylidium maritimum* (Priority 3).

Fauna

Six broad fauna habitat types were identified in the study area, including planted/highly degraded/cleared areas. The fauna habitat types within the study area consisted predominantly of a combination of mixed eucalypt woodlands and *Banksia* woodlands dominated by an overstorey of *E. gomphocephala* (Tuart), *E. marginata* (Jarrah), *Corymbia calophylla* (Marri), *Banksia attenuata* and *B. menziesii* and were generally associated with grey sandy soils on plains or low undulating dune systems. The eucalypt and *Banksia* woodlands ranged from Degraded to Excellent condition and provided particularly high habitat value for fauna species due to the variety of microhabitats and various resource niches available (i.e. fallen logs, hollows, leaf litter, sandy soil).

A total of 61 fauna species, consisting of 47 birds, seven reptiles and seven mammals were recorded within the study area during the field surveys. Of these, nine were introduced (feral) species. Two conservation significant fauna species were recorded during the survey:

- Carnaby's Cockatoo (*Calyptorhynchus latirostris*) listed as Endangered under the EPBC Act and Threatened under the former WC Act (now BC Act)
- Carpet Python (*Morelia spilota imbricata*) listed as Schedule 4 under the former WC Act.

The Carpet Python is no longer listed under the current BC Act. The survey also identified from potential diggings the likely presence of the DBCA Priority 5 species, Quenda/Southern Brown Bandicoot (*Isoodon obesulus fusciventer*).

Ten bird species recorded during the survey were considered to be significant birds of the Swan Coastal Plain portion of the Perth Metropolitan Region, including the Brown Goshawk, Carnaby's Black Cockatoo, Emu, Splendid Fairy-wren, New Holland Honeyeater, White-cheeked Honeyeater, Grey Shrike-thrush, Golden Whistler and Scarlet Robin. These species are either habitat specialists with a reduced distribution on the Swan Coastal Plain or are wide-ranging species with reduced populations on the Swan Coastal Plain. Additionally the Carpet Python and Echidna were also considered to be locally significant fauna as even though they have large distributions they have declined on the Swan Coastal Plain. The study area is also considered to contain suitable habitat for a number of other fauna species identified as locally significant, including the Honey Possum, White-striped Bat, Speckled Granite Gecko (Swan Coastal Plain population) and Little Eagle.

3.7.2 Neerabup Road Extension: Level 2 Fauna Survey (GHD 2014b)

A Level 2 fauna study for the proposed Neerabup Road extension was completed in November and December 2013. Methods employed for the survey were developed in conjunction with regional science staff of the former Department of Parks and Wildlife (now DBCA). Three types of woodland habitat were present in the study area which was considered to be generally in Good to Excellent condition. The survey resulted in 114 vertebrate fauna species being recorded comprising 1485 individuals. This included 70 birds, 29 reptiles, one amphibian, eight native mammals (including bats) and six introduced mammals.

Five species of conservation significance were recorded, including Carnaby's Black Cockatoo, Rainbow Bee-eater, Carpet Python, Southern Brown Bandicoot and the Western Brush Wallaby. A further six conservation significant species were considered likely or possible to occur in the study area.

3.7.3 Mitchell Freeway Extension Black Cockatoo Assessment (GHD 2013a and 2013b)

A targeted black cockatoo assessment of the proposed Mitchell Freeway extension and associated works between Burns Beach Road and Romeo Road (total survey area of 437.3 ha) was undertaken in May and July 2013 (GHD 2013a). The assessment followed the EPBC Act referral guidelines for three Threatened Black Cockatoo species: Carnaby's Cockatoo (*Calyptorhynchus latirostris*), Baudin's Black Cockatoo (*Calyptorhynchus baudinii*) and Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii* subsp. *naso*) (DSEWPaC 2012). The key results of the field assessment included:

- 207.01 ha of suitable feeding habitat was mapped
- Evidence (in the form of direct observation of the birds, chewed Marri nuts and chewed-off branches and nuts from *Banksia* species) that Carnaby's Cockatoo forages extensively across the study area
- The assessment identified a total of 836 trees with a diameter at breast height (DBH) of >500 mm within the study area. A total of 198 trees contained at least one hollow which may provide suitable breeding habitat now, or in the future for black cockatoos. This total includes 153 trees that contain hollows that were not of a suitable size and were not

currently considered suitable for black cockatoo nesting, but may provide suitable breeding habitat in the future. The remaining 45 trees contained hollows that were currently considered to provide suitable nesting habitat (>20 cm entrance size)

- A follow-up survey was undertaken in September 2013 (GHD 2013b) to re-visit the 198 previously identified trees within the study area during the breeding season for Black Cockatoos. All three species of Black Cockatoo were recorded during the survey period and were regularly seen in the area. No evidence of Black Cockatoos breeding within the study area were identified at the time of the survey. Breeding records and use of hollows in the study area by other species (including European honey bees, Corellas and Galahs) demonstrated that there is competition for hollows in the area.

4. Survey results

4.1 Vegetation and flora

4.1.1 Vegetation types and condition within the survey area

Fourteen vegetation types were identified and described for the survey area, not including Cleared/highly disturbed areas (Table 4-1 and Figure 5, Appendix A).

Remnant vegetation within the survey area is dominated by VT01 *Banksia* woodlands (24%, 96.82 ha) and VT08 Mixed low heathland (7%, 27.89 ha). These vegetation types are generally associated with the landforms upon which they lie, with tall woodlands occurring in lower-lying areas with deep sandy soils, heathlands and shrublands on shallow soils on undulating dune systems, hilltops and ridges associated with limestone outcropping and *Banksia* woodlands in intermediate landforms associated with deep sandy soils. The vegetation types were often distributed in a mosaic like pattern within the survey area as the soil landscapes and dune landforms changed. Areas which have been completely cleared of native vegetation such as roads, tracks, railway, planted non-natives and building structures have been mapped as cleared.

The condition of the vegetation within the survey area ranged from Excellent to Completely Degraded. The survey area is predominantly located along existing transport corridors (Wanneroo Road, Joondalup line railway and Romeo Road) as well as established residential areas. Therefore a large proportion of the survey area has been highly disturbed and/or cleared. Areas containing scattered remnant natives over an understorey dominated by weed species have been assigned conditions of Degraded to Completely Degraded. Approximately 43 % (170.90 ha) of the survey area is mapped as Cleared/highly disturbed, with 61% in Degraded or worse condition (243.85 ha). The extents of the vegetation condition ratings mapped within the survey area are detailed in Table 4-2 and mapped in Figure 6, Appendix A.

Large amounts of rubbish dumping (including household goods, asbestos, car parts, boats, building materials, household rubbish and garden waste) was observed throughout the survey area, particularly along Romeo Road. It appears the tracks within the extension of Romeo Road are regularly used by the public for off-road bikes and four wheel drives. In general, the greater the distance from roads, tracks and built up areas, the better the condition of the native vegetation. The heathland vegetation types generally remained in Very Good condition due to the dense understorey restricting weed invasion.

4.1.2 Vegetation types and condition within extended survey area

Twelve of the 14 vegetation types identified in the survey area, not including Cleared/highly disturbed, also occurred in the extended survey area (Table 4-1 and Figure 5, Appendix A). The extended survey area did not contain VT05 *Eucalyptus decipiens* tall woodland or VT16 Pine plantation, but did contain VT13 Typha tall rushland and VT14 *Eucalyptus/Melaleuca* tall isolated clumps of trees. These additional vegetation types are associated with Lake Nowergup, east of Wanneroo Road.

When compared to the survey area, much less of the extended survey area in relative and absolute terms is mapped as Cleared/highly disturbed at 6 % (39.95 ha). Similar to the survey area, the extended survey area was dominated by VT01 *Banksia* woodlands (40%, 259.12 ha) and VT08 Mixed low heathland (13%, 85.66 ha). Vegetation types VT10 *Lomandra maritima* low forbland and VT11 *Acacia* closed shrubland are predominantly mapped within the extended survey area with only a very small areas occurring within the survey area.

The condition of the vegetation within the extended survey area ranged from Excellent to Completely Degraded. Illegal rubbish dumping was observed within the extended survey area, particularly along tracks within Neerabup National Park. The majority of the vegetation remaining within Neerabup National Park is in Excellent to Very Good condition, particularly in heathland vegetation and areas away from access tracks. The heathland vegetation types generally remained in Very Good condition due to the dense understorey restricting weed invasion. The majority of the vegetation within Neerabup Nature Reserve was in Degraded condition with the vegetation structure severely altered. The area around Lake Nowergup was mostly cleared with weedy grasses and herbs completely dominating the ground cover. The extents of the vegetation condition ratings mapped within the extended survey area are detailed in Table 4-2 and mapped in Figure 6, Appendix A.

Table 4-1 Vegetation types within the survey areas

Vegetation Types	Vegetation association	Landform and substrate	Location (survey area/extended survey area) and extent (ha)	Sample locations (quadrat/releve) and FCT alignment	Representative photograph
<i>Banksia</i> low woodland (VT01)	Low woodland of <i>Banksia attenuata</i> and <i>B. menziesii</i> with occasional <i>Allocasuarina fraseriana</i> and <i>Eucalyptus tottiana</i> over a mid to low shrubland of <i>Hibbertia hypericoides</i> , <i>Xanthorrhoea preissii</i> and <i>Acacia pulchella</i> var. <i>glaberrima</i> over open sedgeland and forbland of <i>Mesomelaena pseudostygia</i> , <i>Conostylis aculeata</i> and <i>Desmocladius flexuosus</i> .	Grey to brown sandy plains and gently undulating terrain.	Survey area – 96.82 ha Extended survey area – 259.12 ha	Q3, Q8, Q10, Q16, Q17, Q18, Q19, Q31, & Q32 FCT: Spearwood <i>Banksia attenuata</i> or <i>Banksia attenuata</i> – <i>Eucalyptus</i> woodlands (FCT28)	
Tuart/Banksia open woodland (VT02)	Tall open woodland of <i>Eucalyptus gomphocephala</i> , <i>Banksia attenuata</i> and <i>Allocasuarina fraseriana</i> over a mid to low shrubland of <i>Hibbertia hypericoides</i> , <i>Xanthorrhoea preissii</i> and <i>Acacia pulchella</i> var. <i>glaberrima</i> over open sedgeland and weedy grassland of <i>Mesomelaena pseudostygia</i> , <i>*Bromus diandrus</i> and <i>*Briza maxima</i> .	Brown sandy soil on upper slopes.	Survey area – 5.39 ha Extended survey area – 6.78 ha	Q12, Q13 & Q35, FCT: Spearwood <i>Banksia attenuata</i> or <i>Banksia attenuata</i> – <i>Eucalyptus</i> woodlands (FCT28)	

Vegetation Types	Vegetation association	Landform and substrate	Location (survey area/extended survey area) and extent (ha)	Sample locations (quadrat/releve) and FCT alignment	Representative photograph
Jarrah tall woodland (VT03)	Tall woodland of <i>Eucalyptus marginata</i> , <i>Banksia</i> spp. and <i>Allocasuarina fraseriana</i> over shrubland of <i>Hibbertia hypericoides</i> , <i>Xanthorrhoea preissii</i> and <i>Acacia pulchella</i> var. <i>glaberrima</i> over a forbland/ grassland of <i>Mesomelaena pseudostygia</i> , <i>Desmocladus flexuosus</i> and weedy grasses (<i>*Ehrharta longiflora</i> and <i>*Briza maxima</i>).	Plains with grey to brown sand.	Survey area – 12.83 ha Extended survey area – 20.41 ha	Q11, Q24 & Q25 FCT: refer to Table foot note *	
Tuart tall woodland (VT04)	Woodland of <i>Eucalyptus gomphocephala</i> over sparse shrubland of <i>Xanthorrhoea preissii</i> , <i>Acacia saligna</i> and <i>Rhagodia baccata</i> over a sparse forbland/grassland of weeds (<i>*Carpobrotus edulis</i> , <i>*Euphorbia terracina</i> and <i>*Ehrharta longiflora</i>).	Brown sand on upper slopes.	Survey area – 11.88 ha Extended survey area – 7.05 ha	Q21, Q22, Q34, R1 & R6	
<i>Eucalyptus decipiens</i> tall woodland (VT05)	Tall woodland of <i>Eucalyptus decipiens</i> , <i>Allocasuarina fraseriana</i> and <i>Banksia</i> spp. over low shrubland of <i>Xanthorrhoea preissii</i> , <i>Hibbertia hypericoides</i> and <i>Acacia pulchella</i> var. <i>glaberrima</i> over a dense understorey of <i>Mesomelaena pseudostygia</i> and weedy grasses and herbs (<i>*Lagurus ovatus</i> , <i>*Avena barbata</i> and <i>*Sonchus oleraceus</i>).	Brown sand in low-lying plains.	Survey area – 0.44 ha	Q40 FCT: refer to Table foot note *	

Vegetation Types	Vegetation association	Landform and substrate	Location (survey area/extended survey area) and extent (ha)	Sample locations (quadrat/releve) and FCT alignment	Representative photograph
Jarrah/Marri tall woodland (VT06)	Tall woodland of <i>Eucalyptus marginata</i> and <i>Corymbia calophylla</i> and <i>Allocasuarina fraseriana</i> with the occasional <i>Eucalyptus gomphocephala</i> over open shrubland of <i>Xanthorrhoea preissii</i> , <i>Acacia pulchella</i> var. <i>glaberrima</i> and <i>Hibbertia hypericoides</i> over open herbs and sedges of <i>Mesomelaena pseudostygia</i> , <i>Desmocladius flexuosus</i> and <i>Orthrosanthus laxus</i> var. <i>laxus</i> .	Brown sandy plains and mid to upper slopes.	Survey area – 3.13 ha Extended survey area – 70.32 ha	Q36, Q39 & R2 FCT: refer to Table foot note *	
<i>Banksia sessilis</i> tall closed shrubland (VT07)	Tall closed shrubland of <i>Banksia sessilis</i> , <i>Melaleuca systema</i> and <i>Calothamnus quadrifidus</i> subsp. <i>quadrifidus</i> over shrubland of <i>Xanthorrhoea preissii</i> , <i>Hibbertia hypericoides</i> and <i>Hakea trifurcata</i> over Forbland/Sedgeland of <i>Desmocladius flexuosus</i> , <i>Conostylis aculeata</i> and <i>Mesomelaena pseudostygia</i> .	Grey/brown shallow sand over limestone, some outcropping.	Survey area – 16.19 ha Extended survey area – 32.51 ha	Q1, Q2, Q20 & R7 FCT: Northern Spearwood shrublands and woodlands (FCT24)	
Mixed low heathland (VT08)	Low heath of mixed species dominated by <i>Melaleuca systema</i> , <i>Calothamnus quadrifidus</i> subsp. <i>quadrifidus</i> , <i>Acacia lasiocarpa</i> var. <i>lasiocarpa</i> over a mixed dense understorey (dominated by <i>Desmocladius flexuosus</i> , <i>Mesomelaena pseudostygia</i> and <i>Lomandra maritima</i>).	Shallow grey sand with limestone outcropping.	Survey area – 27.89 ha Extended survey area – 85.66 ha	Q4, Q5, Q6, Q7, Q15, Q28, Q29, Q30, Q33 & Q43 FCT: Northern Spearwood shrublands and woodlands (FCT24)	

Vegetation Types	Vegetation association	Landform and substrate	Location (survey area/extended survey area) and extent (ha)	Sample locations (quadrat/releve) and FCT alignment	Representative photograph
<i>Melaleuca huegelii</i> / <i>M. systema</i> mid shrubland (VT09)	Mid shrubland of <i>Melaleuca huegelii</i> , <i>M. systema</i> and <i>Grevillea preissii</i> subsp. <i>preissii</i> over an open understorey of <i>Desmocladus flexuosus</i> , <i>Banksia dallanneyi</i> and <i>Stylidium maritimum</i> P3. Small isolated occurrences within VT08.	Limestone ridges.	Survey area - 3.87 ha Extended survey area – 4.83 ha	Q9, Q14, Q23, Q26, Q27 & Q37 FCT: <i>Melaleuca huegelii</i> – <i>Melaleuca systema</i> shrublands on Limestone ridges (FCT26a)	
<i>Lomandra</i> low forbland (VT10)	Scattered low shrubs of <i>Melaleuca systema</i> over a low forbland of <i>Lomandra maritima</i> , <i>Acanthocarpus preissii</i> and <i>Conostylis candicans</i> subsp. <i>candicans</i> over a groundcover dominated by <i>Desmocladus flexuosus</i> and introduced grasses and herbs (<i>*Euphorbia terracina</i> , <i>*Avena barbata</i> and <i>*Lagurus ovatus</i>).	Upper slopes of coastal dunes.	Survey area – 0.49 ha Extended survey area – 5.47 ha	Q38, Q41 & Q42	
<i>Acacia</i> closed shrubland (VT11)	<i>Acacia rostelifera</i> , <i>Melaleuca systema</i> and <i>Spyridium globulosum</i> closed shrubland over <i>Hibbertia hypericoides</i> and <i>Acanthocarpus preissii</i> with an understorey dominated by introduced herbs (<i>*Euphorbia terracina</i> , <i>*Carpobrotus edulis</i> and <i>*Asparagus asparagoides</i>) and grasses (<i>*Vulpia myuros</i> forma <i>myuros</i> , <i>*Bromus diandrus</i> and <i>*Ehrharta calycina</i>).	Coastal dunes.	Survey area – 0.07 ha Extended survey area- 13.23 ha	Q44 FCT: Northern <i>Acacia rostelifera</i> – <i>Melaleuca systema</i> shrublands (FCTS11)	

Vegetation Types	Vegetation association	Landform and substrate	Location (survey area/extended survey area) and extent (ha)	Sample locations (quadrat/releve) and FCT alignment	Representative photograph
Scattered natives over weeds (VT12)	Areas that have been impacted by previous clearing or grazing and consist of scattered native trees and/or shrubs including <i>Eucalyptus marginata</i> , <i>E. gomphocephala</i> , <i>Corymbia calophylla</i> , <i>Banksia</i> spp., <i>Allocasuarina fraseriana</i> with a scattered mid and lower storey including <i>Acacia</i> spp., <i>Xanthorrhoea preissii</i> and <i>Hibbertia hypericoides</i> over a groundcover completely dominated by introduced grasses (<i>Avena barbata</i> , <i>Bromus diandrus</i> and <i>Ehrharta calycina</i>) and herbs (<i>Euphorbia terracina</i> , <i>Carpobrotus edulis</i> and <i>Pelargonium capitatum</i>).	Grey/brown sand, some limestone outcrops, gently undulating terrain.	Survey area – 36.06 ha Extended survey area – 65.67 ha	R4 & R5	
Typha tall rushland (VT13)	Tall rushland to isolated clumps of rushes of <i>Typha orientalis</i> along the lake edge over a grassland/ herbland of <i>Bromus diandrus</i> <i>Ehrharta longiflora</i> and <i>Pelargonium capitatum</i> .	Open water	Extended survey area - 15.29 ha	n/a	

Vegetation Types	Vegetation association	Landform and substrate	Location (survey area/extended survey area) and extent (ha)	Sample locations (quadrat/releve) and FCT alignment	Representative photograph
<i>Eucalyptus/Melaleuca</i> tall isolated clumps of trees (VT14)	Tall isolated clumps of trees of <i>Eucalyptus rudis</i> and <i>Melaleuca raphiophylla</i> over a grassland/herbland of <i>*Bromus diandrus</i> <i>*Ehrharta longiflora</i> and <i>*Pelargonium capitatum</i> .	Deep grey sandy soils in low lying areas surrounding the lake.	Extended survey area – 11.61 ha	R3	
Natural regrowth (VT15)	Previously cleared areas where natural regrowth of some native plant species has occurred. Natural regrowth is scattered with an understorey dominated by introduced grasses and herbs. Evidence of revegetation of native trees and shrubs (revegetation plant bags) was also present in some areas.	Sandy plain and low undulating dunes.	Survey area – 13.58 ha Extended survey area – 3.53 ha	n/a	
Pine plantation (VT16)	Planted pine plantation.	Sandy plain	Survey area – 0.43 ha	n/a	

Vegetation Types	Vegetation association	Landform and substrate	Location (survey area/extended survey area) and extent (ha)	Sample locations (quadrat/releve) and FCT alignment	Representative photograph
Open water	Inland freshwater lake	Lake	Extended survey area - 5.07 ha	n/a	
Cleared/highly disturbed	Generally completely cleared of native vegetation and consists of roads, railway, tracks, planted non-native vegetation and building structures.	-	Survey area – 170.90 ha Extended survey area – 39.95 ha	n/a	

Note: * FCT alignment - These quadrats aligned closest to FCT28, however the canopies of these communities were dominated by *Eucalyptus* spp. with emerging *Banksia* spp. Therefore field observation determined that these communities were not representative of a Banksia Woodland

Table 4-2 Vegetation condition ratings within the survey areas

Vegetation Condition	Extent in the survey area (ha) (%)	Extent in the extended survey area (ha) (%)
Excellent	4.18 (1%)	51.21 (8%)
Excellent - Very Good	21.48 (5%)	161.89 (25%)
Very Good	59.51 (15%)	132.72 (21%)
Very Good - Good	18.01 (5%)	46.82 (7%)
Good	36.17 (9%)	40.71 (6%)
Good - Degraded	16.77 (4%)	24.37 (4%)
Degraded	36.23 (9%)	26.28 (4%)
Degraded – Completely Degraded	29.60 (7%)	117.14(18%)
Cleared	178.02 (45%)	40.28 (6%)
Not rated	0	5.07 (1%)
Total	399.97	646.49

4.1.3 Floristic analysis

The similarity between GHD quadrat data, from both the survey area (39 quadrats) and extended survey area (five quadrats), were examined using PRIMER analysis and run using three scenarios:

- All species (base quadrat data)
- Native species only (weed species removed from each quadrat)
- Species that occur only once (singles) removed from each quadrat.

All these scenario's produced a stress value of 0.19 indicating poor/ random representation. 'Species that occur only once' scenario has been selected to demonstrate the groupings. The cluster analysis and resulting dendrogram for the 'species that occur only once' scenario is shown in Appendix D. The two dimensional MDS scatter plot for this scenario is illustrated in Plate 4-1. The MDS scatter plot shows quadrats that loosely group together with their representative vegetation type. The vegetation types were mapped using a combination of statistical analysis, dominant species, landforms and field observations.

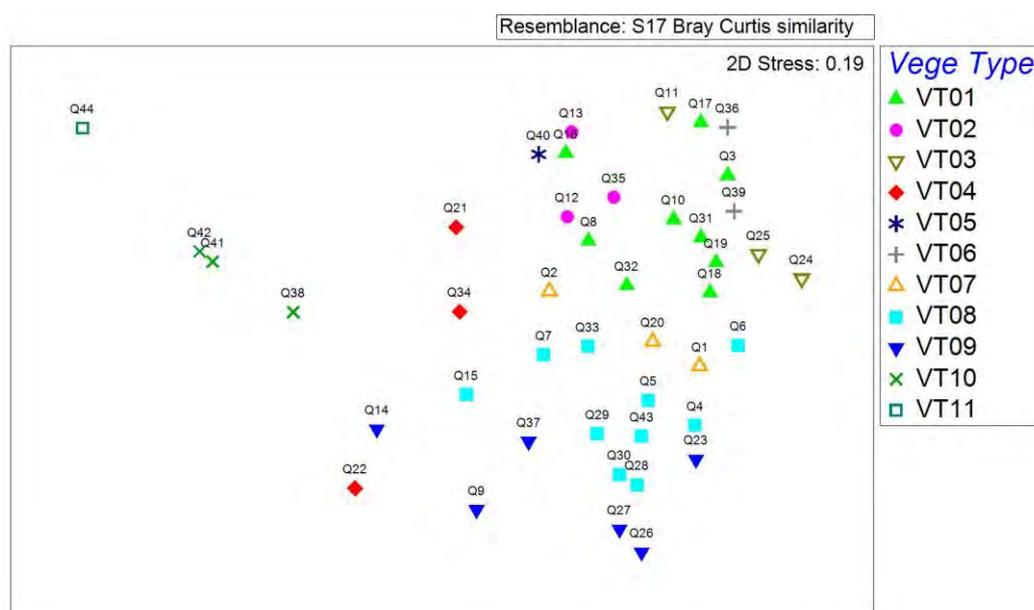


Plate 4-1 MDS showing broad clustering of quadrats

The GHD quadrats were compared to the SWA dataset for sites within a 5 km buffer of the survey area (see section 2.1) to assist in FCT assignment. Once again all scenarios produced a poor/ random representation with a stress value of 0.22. The 'species that occur only once' scenario was selected again to demonstrate the groupings. The cluster analysis and resulting dendrogram for the 'species that occur only once' scenario is shown in Appendix D. The two dimensional MDS scatter plot for this scenario is illustrated in Plate 4-2. Even though the two dimensional MDS scattered plot produced a high stress value, some similarities can be observed between GHD quadrats and the following FCTs:

- Northern Spearwood shrublands and woodlands FCT24 (PEC)
- *Melaleuca huegelii* – *Melaleuca systema* shrublands on Limestone ridges- FCT26a (TEC listed under the BC Act)
- Spearwood *Banksia attenuata* or *Banksia attenuata* – *Eucalyptus* woodlands- FCT28 (this is a component of the Endangered *Banksia* woodlands of the Swan Coastal Plain TEC listed under the EPBC Act).

Field observations inferred GHD VT09 may align with FCT26a, but the multiple site analysis showed a poor representation overall. Therefore, a SSI analysis using quadrats represented by VT09 (Q09, Q14, Q23, Q26, Q27 & Q37) was performed. Six two-dimensional MDS scatter plots were produced and are provided in Appendix D. All stress values were >0.2 for the SSI analysis. Quadrats Q26, Q27 and Q37 were most similar to FCT26a, however, each of the VT09 quadrats showed a similarity of > 32% with one or more quadrats of the SWA dataset. All quadrats for VT09 were established within the survey area. The similarity for each quadrat when compared to FCT26a was:

- Q09 – 16.0 < 34.7%
- Q14 - 16.4 < 32.8%
- Q23 – 16.0 < 32.9%
- Q26 – 21.2 < 45.6%
- Q27 - 20.7 < 33.8%
- Q37 – 27.5 < 50.5%

The statistical analysis has limitations in that results are produced based on taxa presence or absence. No consideration is given to dominant taxa or landforms. Therefore statistical output must be complemented by field based observation when determining FCT assignment. Based on the presence of key species, landforms, field observations and statistical outputs, VT09 is considered synonymous with FCT26a.

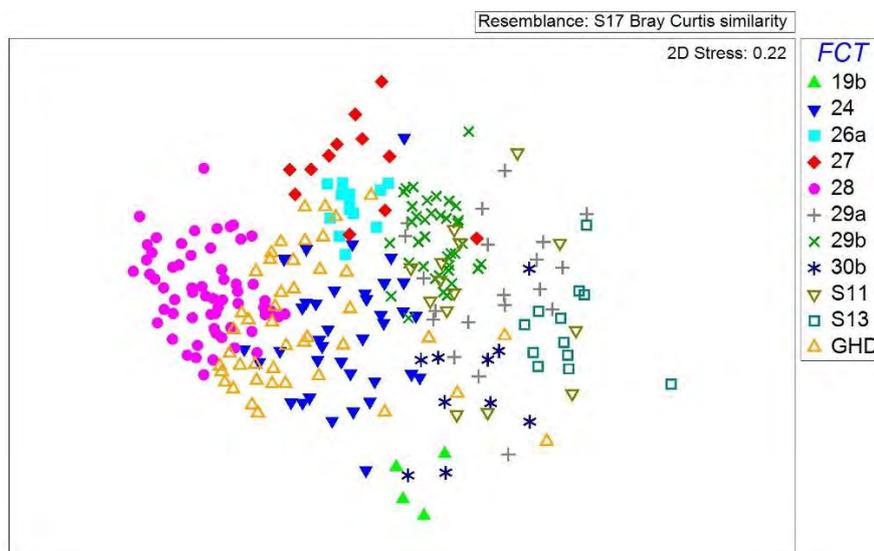


Plate 4-2 MDS showing GHD quadrats compared to the SWA dataset

4.1.4 Conservation significant ecological communities

Based on the results of the desktop searches, dominant species, landform features, field observations, and coupled with the statistical analyses, five conservation significant ecological communities were identified within the survey area and extended survey area. The conservation significant ecological communities are:

- *Banksia* Woodlands of the Swan Coastal Plain TEC (FCT28 is a component of this TEC) listed under the EPBC Act
- *Banksia* dominated woodlands of the Swan Coastal Plain IBRA region P3 PEC listed by DBCA
- *Melaleuca huegelii* - *Melaleuca systena* shrublands on limestone ridges (FCT26a) TEC under the BC Act
- Northern Spearwood shrublands and woodlands (FCT24) P3 PEC listed by DBCA
- Tuart (*Eucalyptus gomphocephala*) woodlands of the Swan Coastal Plain P3 PEC listed by DBCA.

Representative photographs of the TECs and PECs recorded within the survey area are provided in Appendix D.

Banksia Woodlands of the Swan Coastal Plain (TEC)

The *Banksia* Woodlands of the Swan Coastal Plain was listed in September 2016 as an Endangered TEC under the EPBC Act. The Commonwealth TEC encompasses a number of FCTs, some of which are also listed as State TECs/PECs. Spearwood *Banksia attenuata* or *Banksia attenuata* – *Eucalyptus* woodlands (FCT28), which was identified within the survey area and extended survey area is not listed under the BC Act as a TEC or by DBCA as a PEC. However FCT 28 is considered a component of the Commonwealth TEC due to key structural features as detailed by the Threatened Species Scientific Community (TSSC) (2016). The TSSC (2016) describes the key structural features of the community as:

- A prominent tree layer of *Banksia*, with scattered eucalypts and other tree species often present among, or emerging above, the canopy
- The understorey is a species rich mix of sclerophyllous shrubs, graminoides and forbs
- High endemism and considerable localised variation in species composition across its range.

The TSSC (2016) provides guidance for determining whether the TEC is present. These criteria are listed in Appendix B. During the field survey two vegetation types were assessed as meeting the key diagnostic characteristics for the *Banksia* Woodlands of the SCP TEC:

- VT01 - *Banksia* low woodland
- VT02 – Tuart/*Banksia* open woodland.

A breakdown of the mapped *Banksia* Woodlands of the SCP TEC patches (by vegetation type, condition and extent) is detailed in Table 4-3 with the TEC extent mapped in Figure 7, Appendix A. There is 85.97 ha of *Banksia* Woodland SCP TEC in the survey area and 263.65 ha within the extended survey area.

Table 4-3 Extent of Banksia Woodlands of the SCP TEC within the survey areas

Patch ID and Patch extent (ha)	Vegetation location and extent (ha)	Vegetation condition and extent			Comments
		Condition	VT01 (ha)	VT02 (ha)	
Patch 1 Total area 12.04	Survey area Total 4.86	VG G D	2.85 1.01 1.01		Area mapped as TEC is in Very Good condition and occurs within the survey area and extended survey area, dissecting this patch is a dirt road and a couple of dirt bike tracks. It is noted by TSSC (2016) that a patch may include small scale variation in structure and condition and/or gaps such as tracks and disturbances (<30 m wide from the edge of the tree canopy), as long as overall functionality of the community is not significantly altered.
	Extended survey area Total 7.18	VG G	6.41 0.77		
Patch 2 Total area 2.90	Survey area Total 2.03	VG D	1.01 1.02		Area mapped as TEC is predominately in Very Good condition. A dirt road dissects the centre of this patch.
	Extended survey area Total 0.87	VG D	0.86 0.01		
Patch 3 Total area 5.90	Survey area Total 5.90	VG	5.90		Patch 3 is solely within the survey area and is in Very Good condition with minor dirt tracks traversing the patch.
Patch 4 Total area 285.40	Survey area VT01 60.07 VT02 1.22 Total 61.29	Ex Ex-VG VG VG-G G G-D D DCD	4.18 13.80 19.94 2.07 10.43 6.68 2.44 0.53	1.01 0.21	Patch 4 is the largest patch within the survey/ extended survey area and is made up of two vegetation types VT01 and VT02. This patch has a number of minor dirt tracks traversing the patch as well as scattered patches of other vegetation types within it. Apart from these small scale variations it is predominately in Good or better condition.

Patch ID and Patch extent (ha)	Vegetation location and extent (ha)	Vegetation condition and extent			Comments
		Condition	VT01 (ha)	VT02 (ha)	
	Extended survey area Total 224.11	E E-VG VG VG-G G G-D D	46.03 95.42 69.92 5.27 5.14 2.32 0.01		
Patch 5 Total area 14.14	Extended survey area VT01 10.03 VT02 4.11 Total 14.14	VG-G G-D	10.03	0.77 3.34	Patch 5 occurs within the extended survey area (Neerabup National Park) and is made up of VT01 and VT02. It has a couple of minor dirt tracks dissecting it but is overall in Very Good to Good condition
Patch 6 Total area 0.07	Survey area Total 0.07	G	0.07		Within the survey area Patch 6 is below the minimum patch size threshold for Good condition Banksia Woodland (>2 ha). However TSSC (2016) states that consideration should be given to the surrounding environment when identifying a patch. Patch 6 makes up a very small component of Banksia Woodland within Neerabup Nation Park south of Hester Avenue.
Patch 7 Total area 1.71	Extended survey area Total 1.71	VG-G	1.71		An isolated patch with no tracks or variations, located at the south eastern extent of the extended survey area.
Patch 8 Total area 1.37	Survey area Total 1.37	VG-G G G-D	0.99 0.10 0.28		Patch 8 was dissected by a fire break and was located on the eastern side of Wanneroo Road. This patch is part of a larger <i>Banksia</i> woodland remnant that extends beyond the survey area. The overall condition of this larger remnant was considered Good.
Patch 9	Survey area Total 2.41	VG VG-G	1.14 1.27		Located within the survey area and extended survey area Patch 9 occurred on the eastern side of Wanneroo Road, it was dissected by a fire break from north to south

Patch ID and Patch extent (ha)	Vegetation location and extent (ha)	Vegetation condition and extent			Comments
		Condition	VT01 (ha)	VT02 (ha)	
Total area 10.47	Extended survey area Total 8.33	VG	8.33		
Patch 10 Total area 1.29	Extended survey area Total 1.29	E-VG	1.29		This patch was isolated within the extended survey area. It was surrounded on all sides by VT08 – mixed low heathland
Patch 11 Total area 4.43	Survey area Total 4.32 Extended survey area Total 0.10	G G	1.38	2.94 0.10	Consisting of VT01 and VT02 this patch occurred at the northern extent of Wanneroo Road, separated by a fire break
Patch 12 Total area 3.81	Survey area Total 1.23 Extended survey area Total 2.58	VG-G G G		0.98 0.25 2.58	Patch 12 occurred along the eastern side of Wanneroo Road within the boundary of Nowergup Lake. A small fire break dissected the patch
Patch 13 Total area 5.84	Survey area Total 2.48 Extended survey area Total 3.36	VG-G D VG-G	2.39 0.09 3.36		Patch 13 occurred at the southern extent of the survey area and extended survey area. A number of minor dirt tracks dissected this patch at various places.

Banksia dominated woodlands of the SCP IBRA region (PEC)

The field assessment also confirmed the presence of the *Banksia* dominated woodlands of the SCP IBRA region PEC, listed as Priority 3 by DBCA. Similar to the TEC, this PEC was associated with VT01 and VT02. This PEC differs from the TEC in that it has no minimum condition or patch size thresholds. There is 102.13 ha of the PEC present within the survey area and 265.90 ha present within the extended survey area. These totals include the *Banksia* Woodlands of the SCP TEC and should not be double counted. A breakdown of the PEC extent by condition is detailed in Table 4-4 with the PEC distribution mapped in Figure 7, Appendix A.

Table 4-4 Extent of the *Banksia* dominated woodlands of the SCP IBRA region PEC within the survey areas

Location and Condition	Vegetation Types		Total
	VT01	VT02	
Survey area			
Excellent	4.18	-	4.18
Excellent – Very Good	13.80	-	13.80
Very Good	29.70	-	29.70
Very Good - Good	6.73	0.98	7.71
Good	18.62	4.19	22.81
Good - Degraded	11.27	0.21	11.48
Degraded	11.53	-	11.53
Degraded – Completely Degraded	0.92	-	0.92
Survey area total	96.75	5.38	102.13
Extended survey area			
Excellent	46.03	-	46.03
Excellent – Very Good	96.71	-	96.71
Very Good	85.51	-	85.51
Very Good - Good	20.37	0.77	21.14
Good	6.55	2.67	9.22
Good - Degraded	2.91	3.34	6.25
Degraded	0.56	-	0.56
Degraded – Completely Degraded	0.42	-	0.42
Completely Degraded	0.06	-	0.06
Extended survey area total	259.12	6.78	265.90

Melaleuca huegelii - Melaleuca systema shrublands on limestone ridges (TEC)

The *Melaleuca huegelii-Melaleuca systema* shrublands of limestone ridges TEC occurs on skeletal soils on ridge slopes and ridge tops with limestone outcropping. The community is described as comprising of species rich thickets, heaths or scrubs dominated by *Melaleuca huegelii*, *M. systema*, *Banksia sessilis* over *Grevillea preissii*, *Acacia lasiocarpa* and *Spyridium globulosum* (community 26a as described by Gibson *et al.* 1994). The community is highly restricted and known from massive limestone ridges around Yanchep north of Perth, and south of Perth near Lake Clifton.

A multiple site analysis and SSI analysis showed some similarity between GHD VT09 and FCT26a - *Melaleuca huegelii-Melaleuca systema* shrublands of limestone ridges TEC. Field observations and landform features confirmed the similarities through the following key characteristics:

- Occurs on the SCP on the Cottesloe complex of the Spearwood system
- Recorded on limestone ridges and outcrops

- Vegetation type contained key species; *Melaleuca huegelii*, *M. systema*, *Banksia sessilis*, *Grevillea preissii*, *Acacia lasiocarpa* and *Spyridium globulosum*.

There is 3.87 ha of the *Melaleuca huegelii*-*Melaleuca systema* shrublands of limestone ridges TEC within the survey area and 4.83 ha within the extended survey area. The condition of this vegetation ranged from Excellent-Very Good to Good (Table 4-5). The location of the *Melaleuca huegelii*-*Melaleuca systema* shrublands of limestone ridges TEC within the survey areas is mapped in Figure 7, Appendix A.

Table 4-5 Extent of the *Melaleuca huegelii*-*Melaleuca systema* shrublands of limestone ridges TEC within the survey areas

Condition	Extent (ha)
Survey area	
Excellent – Very Good	0.44
Very Good	2.13
Very Good – Good	0.02
Good	1.28
Survey area total	3.87
Extended survey area	
Excellent – Very Good	1.17
Very Good	3.26
Very Good – Good	0.34
Good	0.06
Extended survey area total	4.83

Northern Spearwood shrublands and woodlands (PEC)

The Northern Spearwood shrublands and woodlands (FCT24) PEC occurs as heaths or heaths with scattered *Eucalyptus gomphocephala* occurring on deeper soils north from Woodman Point. *Banksias* found in this community include *Banksia attenuata* and *B. menziesii*. The heathlands in this group typically include *Dryandra sessilis* (now *Banksia sessilis*), *Calothamnus quadrifidus* and *Schoenus grandiflorus*, with other common species including *Hardenbergia comptoniana*, *Melaleuca acerosa* (now *Melaleuca systema*) and *Xanthorrhoea preissii*.

The GHD vegetation types that were statistically representative of the Northern Spearwood shrublands and woodlands PEC were VT07 and VT08. Field observations confirmed the similarities. The key characteristics of Northern Spearwood shrublands and woodlands PEC met by VT07 and VT08, were:

- Occurs on the western SCP on the Cottesloe units of the Spearwood system
- The vegetation types includes occurrences of *Banksia attenuata* and *B. menziesii*
- The heath community may consist of *Banksia sessilis*, *Calothamnus quadrifidus*, *Melaleuca systema*, *Xanthorrhoea preissii*, *Lepidosperma squamatum*, *Hardenbergia comptoniana*, *Phyllanthus calycinus*, *Conostylis aculeata*, *Dianella revoluta*, *Lomandra maritima*, *Schoenus grandiflorus*, *Desmocladius flexuosa* and *Austrostipa flavescens*.

Table 4-6 shows the condition and extent of the Northern Spearwood shrublands and woodlands PEC within the survey area and extended survey area through the GHD representative vegetation types (VT07 and VT08). Figure 7, Appendix A illustrates the location of the Northern Spearwood shrublands and woodlands PEC within the survey areas.

Table 4-6 Extent of the Northern Spearwood shrublands and woodlands PEC within the survey areas

Location and Condition	Vegetation Types		Total
	VT07	VT08	
Survey area			
Excellent – Very Good	3.37	2.06	5.43
Very Good	1.46	22.69	24.15
Very Good - Good	3.99	0.79	4.78
Good	2.06	1.60	3.66
Good - Degraded	2.02	-	2.02
Degraded	2.84	0.69	3.53
Degraded – Completely Degraded	0.44	-	0.44
Completely Degraded	-	0.06	0.06
Survey area total	16.19	27.89	44.08
Extended survey area			
Excellent	-	0.85	0.85
Excellent – Very Good	15.32	39.31	54.63
Very Good	1.73	34.99	36.72
Very Good - Good	7.32	7.00	14.32
Good	1.61	3.51	5.12
Good - Degraded	5.08	-	5.08
Degraded	1.07	-	1.07
Degraded – Completely Degraded	0.38	-	0.38
Extended survey area total	32.51	85.66	118.17

Tuart (*Eucalyptus gomphocephala*) woodlands of the Swan Coastal Plain (PEC)

Mostly confined to Quindalup Dunes and Spearwood Dunes from Jurien Bay to the Sabina River, with outliers along some rivers. Tuart is the key dominant canopy species however; Tuart communities comprise a variety of flora and fauna assemblages. Flora commonly occurring with Tuart include: *Agonis flexuosa*, *Banksia attenuata*, *Banksia grandis*, *Allocasuarina fraseriana*, *Xylomelum occidentale*, *Macrozamia riedlei*, *Xanthorrhoea preissii*, *Spyridium globulosum*, *Templetonia retusa* and *Diplolaena dampieri*.

During the field survey one vegetation type (VT04) was assessed as meeting the key diagnostic characteristics for the Tuart woodlands of the Swan Coastal Plain PEC, as outlined by DBCA (2019), specifically:

- The survey area occurs in the SCP IBRA bioregion
- Mostly confined to Quindalup Dunes and Spearwood Dunes from Jurien bay to the Sabina River
- Tuart is the key dominant canopy species however Tuart communities comprise a variety of flora and fauna assemblages
- Flora commonly occurring with Tuart include Peppermint (*Agonis flexuosa*), *Banksia attenuata*, *Banksia grandis*, *Allocasuarina fraseriana*, *Xylomelum occidentale*, *Macrozamia riedlei*, *Xanthorrhoea preissii*, *Spyridium globulosum*, *Templetonia retusa* and *Diplolaena dampieri*.

GHD vegetation type VT04 aligned with the Tuart (*Eucalyptus gomphocephala*) woodlands of the Swan Coastal Plain PEC. There was 11.88 ha within the survey area and 7.04 ha in the extended survey area. Table 4-7 presents the extent and condition of the Tuart (*Eucalyptus gomphocephala*)

woodlands of the Swan Coastal Plain PEC within the survey areas, with the distribution shown in Figure 7, Appendix A.

Table 4-7 Extent of the Tuart Woodlands of the Swan Coastal Plain PEC within the survey areas

Vegetation condition	Extent (ha) within the survey area
Survey area	
Very Good	0.55
Very Good – Good	0.45
Good	4.59
Good - Degraded	1.96
Degraded	0.97
Degraded – Completely Degraded	3.35
Survey area total	11.87
Extended survey area	
Good	0.28
Degraded	0.19
Degraded – Completely Degraded	6.57
Extended survey area total	7.04

4.1.5 Other significant vegetation

Vegetation that grows in association with wetlands or lakes is considered other significant vegetation (EPA 2016a). Although no vegetation that grows in association with wetlands or lakes was identified within the survey area, there was within the extended survey area.

VT14 and VT13 represented the Conservation Category Wetland (CCW) Nowergup Lake. This vegetation has a restricted distribution and has been historically impacted by extensive clearing throughout the local and broad areas. The vegetation of Nowergup Lake was in Degraded condition with isolated clumps of *Eucalyptus rudis* and *Melaleuca raphiophylla* surrounding the edge of the lake with a rushland of *Typha orientalis* within the shallow edges. The groundcover was dominated by a grassland/ herbland of **Bromus diandrus* **Ehrharta longiflora* and **Pelargonium capitatum*. There is approximately 26.90 ha of wetland/ lake vegetation within the extended survey area that grows in association with CCW Nowergup Lake.

4.1.6 Flora diversity

Two hundred and ninety three flora taxa (including subspecies and varieties) representing 68 families and 177 genera were recorded from the survey area during the field survey. This total comprised 213 native taxa and 80 introduced flora taxa.

Dominant families recorded from the survey area included:

- Fabaceae (37 taxa)
- Poaceae (24 taxa)
- Myrtaceae (21 taxa)
- Asteraceae and Proteaceae (19 taxa each).

A flora taxa list by quadrat and vegetation type is provided in Appendix D.

A species accumulation curve was generated using PRIMER to assess adequacy of sampling effort within the survey area (Plate 4-3). The species accumulation curve for the survey area, based on flora recorded within quadrats, is approaching an asymptote, which suggests that the

current survey effort is sufficient. The bootstrap estimate of species richness generated from this data indicates that 252 species could be expected from the survey area based on the diversity recorded within quadrats. The total species recorded within the quadrats was 222 however the total for the survey area including relevés and opportunistic species was 293 flora taxa. The survey area is considered representative of the floristic diversity in the area.

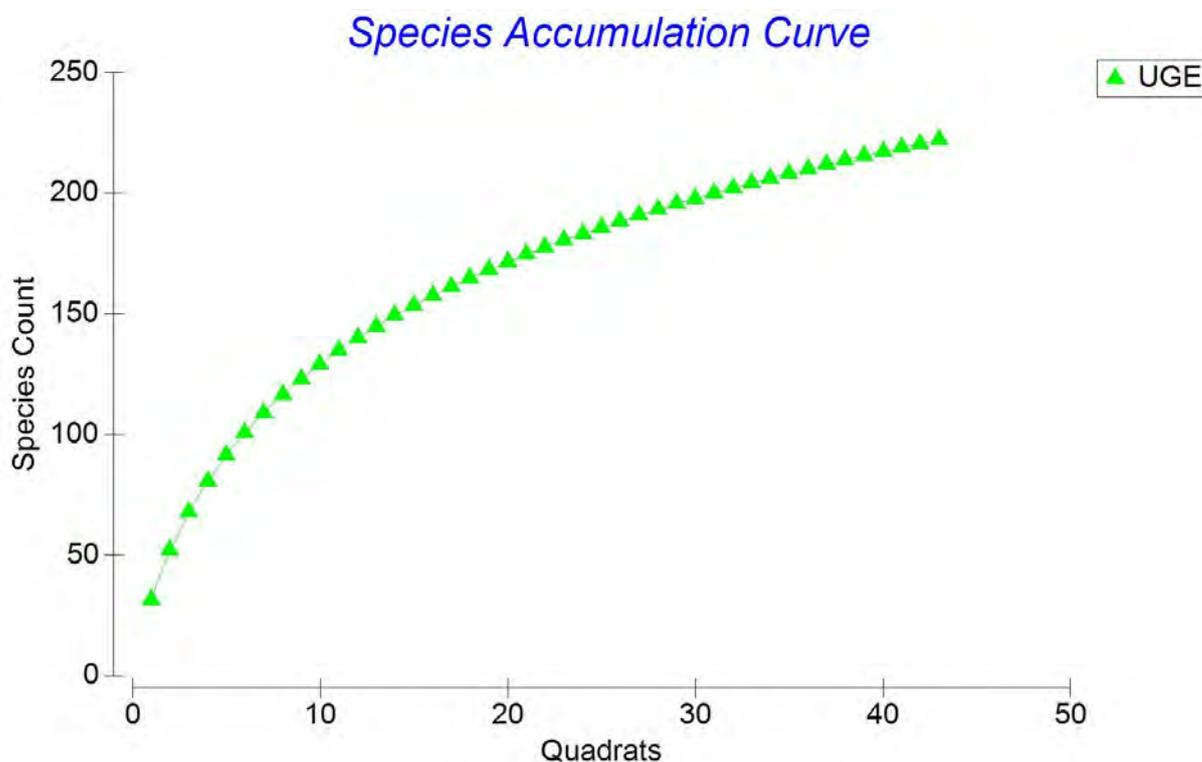


Plate 4-3 Species accumulation curve using quadrat data

4.1.7 Introduced flora

Of the 80 introduced taxa recorded within the survey area, eight are listed as Declared Pests under the *Biosecurity and Management Act 2007*. Four of these taxa are also listed as Weeds of National Significance (WoNS):

- **Moraea flaccida* (One-leaf Cape Tulip)– Declared Pest
- **Gomphocarpus fruticosus* (Narrowleaf Cottonbush) – Declared Pest
- **Echium plantagineum* (Paterson's Curse) – Declared Pest
- **Solanum linnaeanum* (Apple of Sodom)– Declared Pest
- **Opuntia stricta* (Common Prickly Pear)- Declared Pest and WoNS
- **Lantana camara* (Common Lantana)- Declared Pest and WoNS
- **Asparagus asparagoides* (Bridal Creeper) – Declared Pest and WoNS
- **Zantedeschia aethiopica* (Arum lily) – Declared Pest and WoNS

The remaining introduced taxa are considered environmental weeds and all have been previously recorded on the Swan Coastal plain. The locations of the Declared Pests and WoNS recorded within the survey area are shown in Figure 6, Appendix A and provided in Appendix D in tabular format.

4.1.8 Conservation significant flora

No EPBC Act or BC Act listed flora were recorded within the survey area. Six DBCA Priority listed flora species were identified within the survey area during the field survey (Herbarium Accession # 7839):

- *Melaleuca* sp. Wanneroo (G.J. Keighery 16705) listed Endangered (En) under the BC Act
- *Baeckea* sp. Limestone (N. Gibson & M.N. Lyons 1425) DBCA listed P1
- *Acacia benthamii* DBCA listed P2
- *Leucopogon* sp. Yanchep (M. Hislop 1986) DBCA listed P3
- *Hibbertia spicata* subsp. *leptotheca* DBCA listed P3
- *Pimelea calcicola* DBCA listed P3
- *Stylidium maritimum* DBCA listed P3.

Although no additional Priority listed flora taxa were identified in the extended survey area, one BC Act listed taxon, *Melaleuca* sp. Wanneroo (G.J. Keighery 16705) (Endangered) was recorded in an isolated patch.

Descriptions of the conservation significant flora recorded during the field survey are below. Table 4-8 summarises the location and count of the significant flora recorded during the field assessment.

Table 4-8 Conservation significant flora location and count

Taxa	Count	
	Survey area	Extended survey area
<i>Melaleuca</i> sp. Wanneroo (G.J. Keighery 16705) (En)	-	3
<i>Baeckea</i> sp. Limestone (N. Gibson & M.N. Lyons 1425) (P1)	354	83
<i>Acacia benthamii</i> (P2)	15	2
<i>Leucopogon</i> sp. Yanchep (M. Hislop 1986) (P3)	425	1341
<i>Hibbertia spicata</i> subsp. <i>leptotheca</i> (P3)	73	141
<i>Pimelea calcicola</i> (P3)	125	67
<i>Stylidium maritimum</i> (P3)	944	291

***Melaleuca* sp. Wanneroo (G.J. Keighery 16705) listed as Endangered under the BC Act**

Melaleuca sp. Wanneroo (G.J. Keighery 16705) (En) is described as an erect shrub, 1 - 2.5 m high x 2 m wide. Flowers are pale yellow and flower in November. This species is found on well drained grey sand with 30-70% limestone outcropping (WA Herbarium 1998–). Three plants were recorded within the extended survey area mapped as VT08. The occurrence of this taxon was restricted to an isolated patch of tall (3 m) heathland *Melaleuca systema* with *Banksia sessilis* on exposed limestone (60%). Other taxa represented by VT08 were recorded in this area but were not dominant. The survey area and extended survey area were extensively surveyed for similar VT08 variations however no further occurrences were recorded, it is unlikely that this taxon occurs elsewhere within the survey area or extended survey area due to its restricted preferred habitat. Plate 4-4 shows *Melaleuca* sp. Wanneroo (G.J. Keighery 16705) dried specimen, in situ and habit.



Dried specimen



In situ



Habit

Plate 4-4 *Melaleuca* sp. Wanneroo (G.J. Keighery 16705)

***Baeckea* sp. Limestone (N. Gibson & M.N. Lyons 1425) DBCA listed Priority 1**

Baeckea sp. Limestone (N. Gibson & M.N. Lyons 1425) (P1) is a compact shrub 1.2 (1.6) high x 1 m wide. Flowers are pale pink and flower in September to November. It is found on grey sand over limestone (WA Herbarium 1998–).

During the field survey 437 individuals were recorded: 354 were recorded within the survey area and 83 were recorded within the extended survey area. The taxon was recorded within VT08 and VT09. Plate 4-5 shows *Baeckea* sp. Limestone (N. Gibson & M.N. Lyons 1425) dried specimen, in situ and habit.



Dried specimen



Flower



Habit

Plate 4-5 *Baeckea* sp. Limestone (N. Gibson & M.N. Lyons 1425) (P1)

***Acacia benthamii* DBCA listed Priority 2**

Acacia benthamii (P2) is described as a shrub, approximately 1 m high. The flowers are yellow, from August to September. Typically found in sand on limestone breakaways (WA Herbarium 1998–).

Seventeen individuals were recorded during the field survey: 15 were recorded within the survey area and two were recorded within the extended survey area. The plants were individually protected by a fence made of chicken wire. The individuals were recorded in VT15 -Revegetation. Plate 4-6 shows *Acacia benthamii* dried specimen and habit.



Dried specimen



Habit

Plate 4-6 *Acacia benthamii* (P2)

***Leucopogon* sp. Yanchep (M. Hislop 1986) DBCA listed Priority 3**

Leucopogon sp. Yanchep (P3) is an erect shrub, 0.15-1 m high, to 0.6 m wide. Flowers are white/pink and flower between April to June or September. It is found on light grey-yellow sand, brown loam, limestone, laterite, granite, coastal plain, breakaways, valley slopes and low hills (WA Herbarium 1998–).

During the field survey 1766 individuals were recorded: 425 were recorded within the survey area and 1341 were recorded within the extended survey area. The taxon was recorded within VT08. Plate 4-7 shows *Leucopogon* sp. Yanchep (M. Hislop 1986) dried specimen and habit.



Dried specimen



Habit

Plate 4-7 *Leucopogon* sp. Yanchep (M. Hislop 1986) (P3)

***Hibbertia spicata* subsp. *leptotheca* DBCA listed Priority 3**

Hibbertia spicata subsp. *leptotheca* (P3) is described as an erect or spreading shrub, approximately 0.2-0.5 m high with yellow flowers in July to October. It grows near coastal limestone ridges, outcrops and cliffs (WA Herbarium 1998–).

During the field survey 214 individuals were recorded: 73 were recorded within the survey area and 141 were recorded within the extended survey area. The taxon was recorded within VT08 and VT09. Plate 4-8 shows *Hibbertia spicata* subsp. *leptotheca* dried specimen and in situ



Dried specimen

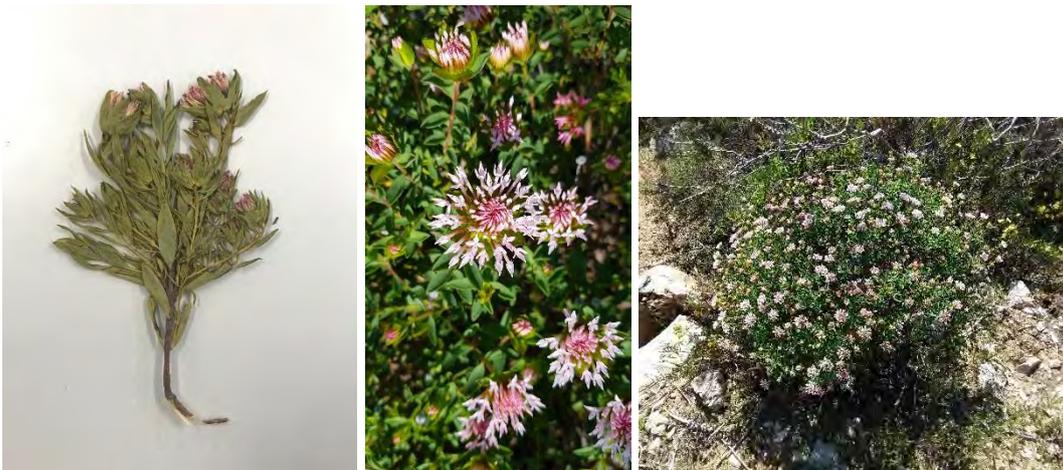
In situ

Plate 4-8 *Hibbertia spicata* subsp. *leptotheca* (P3)

***Pimelea calcicola* DBCA listed Priority 3**

Pimelea calcicola (P3) is described as an erect to spreading shrub, 0.2-1 m high. It has pink flowers from September to November and grows on sandy soils along coastal limestone ridges (WA Herbarium 1998–).

During the field survey 192 individuals were recorded: 125 were recorded within the survey area and 67 were recorded within the extended survey area. The taxon was recorded within VT08 and VT09. Plate 4-9 shows *Pimelea calcicola* dried specimen, in situ and habit.



Dried specimen

Flower

Habit

Plate 4-9 *Pimelea calcicola* (P3)

***Stylidium maritimum* DBCA listed Priority 3**

Stylidium maritimum (P3) is described as a caespitose perennial, herb, 0.3-0.7 m high, with white/purple flowers in September to November. It grows in sandy soils over limestone, dune slopes and flats in coastal heath, shrubland and open Banksia woodland (WA Herbarium 1998–).

During the field survey 1235 individuals were recorded: 944 were recorded within the survey area and 291 were recorded within the extended survey area. The taxon was recorded within VT08 and VT09. Plate 4-10 shows *Stylidium maritimum* dried specimen, in situ and habit.



Dried specimen

Flower

Habit

Plate 4-10 *Stylidium maritimum* (P3)

Likelihood of Occurrence assessment

A likelihood of occurrence assessment was conducted post-field survey for all conservation significant flora taxa identified in the desktop assessment (Appendix D). This assessment took into account previous records, habitat requirements, efficacy of the survey, intensity of the survey, flowering times and the cryptic nature of species. The assessment considered the survey area and extended survey area separately.

The likelihood of occurrence assessment for the survey area concluded that six taxa are known to occur, one taxa is likely to occur and five taxa may possibly occur (Table 4-9). The remaining taxa are unlikely or highly unlikely to occur within the survey area.

By comparison, the extended survey area likelihood of occurrence assessment concluded seven taxa are known to occur, one taxa is likely to occur and six taxa may possibly occur (Table 4-9). The additional taxa considered possible to occur in the extended survey area is *Eucalyptus argutifolia* (Vulnerable).

The taxa considered likely to occur in both survey areas, *Jacksonia sericea* (P4), has previously been recorded within the survey area, however was not identified during the current survey. Potential specimens of *J. sericea* identified within the survey area as well as specimens from previously recorded populations (GHD 2014a) were re-collected. All these specimens were informally identified by Michael Hislop (Identification Botanist, WA Herbarium) as *Jacksonia calcicola*. Michael Hislop commented that *Jacksonia sericea* and *J. calcicola* are closely related species that are known to intergrade in the northern Perth suburbs (M. Hislop pers comm. 9 Nov. 2018). *Jacksonia calcicola* was a common and dominant component of the understorey throughout the survey area and extended survey area, particularly in association with the *Banksia* woodlands and mixed heathlands. Given the complexity of distinguishing the two species it is considered *Jacksonia sericea* is likely to occur within the survey area and extended survey area however its occurrence may be isolated.

Table 4-9 Taxa likely to or possible to occur within the survey areas

Taxa	Known habitat (WA Herbarium 1998-)	Likelihood to occur and vegetation types that support known habitat	
		Survey area	Extended survey area
<i>Jacksonia sericea</i> (P4)	Calcareous and sandy soils.	Likely VT 01, 07, 08, 09 and disturbed areas	Likely VT 01, 07, 08, 09 and disturbed areas
<i>Conostylis bracteata</i> (P3)	Sand, limestone on consolidated sand dunes.	Possible VT 07, 08, 09, 10,	Possible VT 07, 08, 09, 10.
<i>Conostylis pauciflora</i> subsp. <i>euryrhipis</i> (P4)	White, grey or yellow sand on consolidated dunes.	Possible VT 07, 08, 09, 10,	Possible VT 07, 08, 09, 10,
<i>Eucalyptus argutifolia</i> (VU under EPBC Act and BC Act)	Shallow soils over limestone. Slopes or gullies of limestone ridges, outcrops.	Unlikely	Possible VT 07, 08, 09
<i>Fabronia hampeana</i> (P2)	Moss growing on the trunk of <i>Macrozamia</i>	Possible VT01, 02, 03, 04, 05, 06	Possible VT01, 02, 03, 04, 05, 06
<i>Leucopogon maritimus</i> (P1)	Pale yellow to white-grey sand, upper slopes of coastal dunes, limestone.	Possible VT 07, 08, 09, 10	Possible VT 07, 08, 09, 10
<i>Sarcozona bicarinata</i> (P3)	White sand.	Possible VT 10	Possible VT 10

4.2 Fauna

4.2.1 Fauna habitat within the survey area

Nine broad fauna habitat types were identified in the survey area and extended survey area based on the predominant landforms, soil and vegetation structure in the area. These following habitat types closely correspond to the vegetation types outlined in Table 4-1:

- Mixed heathland on limestone outcrops or heavy loams
- Banksia woodland on grey/brown sand
- Tuart (*Eucalyptus gomphocephala*) woodland in deep dark brown sand
- Jarrah (*E. marginata*) woodland on grey/brown sand
- Acacia shrublands on dunes and deep sands
- Parabolic dunes
- Pine Plantation (survey area only)
- Natural Regrowth
- Scattered natives over weeds, Cleared/highly disturbed

The fauna habitat of the survey area is described further in Table 4-10 and mapped in Figure 8, Appendix A.

The native vegetation within the survey consists predominantly of a combination of mixed eucalypt woodlands and Banksia woodlands. These habitat types consist of a dominant overstorey of

Eucalyptus gomphocephala (tuart), *E. marginata* (jarrah), *Corymbia calophylla* (marri), *Banksia attenuata*, *B. menziesii* and *B. sessilis* and were generally associated with grey sandy soils on plains, low undulating dune systems or limestone out cropping. The eucalypt and *Banksia* woodlands ranged from degraded to excellent condition and provided particularly high habitat value for fauna species due to the variety of microhabitats and various resource niches available (i.e. fallen logs, hollows, leaf litter, sandy soil and foraging plant species).

Portions of the survey area demonstrated large amounts of dumped rubbish including boats, cars, building materials, house hold rubbish and vegetation. The particularly affected areas were those just off Hester Ave and Romeo Road including the Romeo Road extension. In most cases the dumped rubbish kills/impacts on vegetation survival reducing habitat available for some species. Other species were recorded to utilise the rubbish such as the Marble Gecko, Mulga Snake and Bobtail that were recorded underneath sheet iron and super six fencing. Pollutants from the rubbish dumping was also evident including oils, car parts, paint and other liquid contaminants. Most fencing surrounding the private lands or remnant areas had been cut or flattened.

Some areas have been highly degraded by historical clearing (fire breaks, tracks, old farms) and provide very little to no habitat value for most fauna species as these areas are generally devoid of vegetation. Roadside vegetation may provide some shelter and opportunistic food for some bird species.

4.2.2 Fauna habitat within the extended survey area

Eight of the nine fauna habitat types identified in the survey area also occurred in the extended survey area. Pine plantation was not represented, whereas Open water with riparian vegetation and weeds is an additional fauna habitat present in the extended survey area, in association with Lake Nowergup. The fauna habitat of the survey area and extended survey area is described further in Table 4-10 and mapped in Figure 8, Appendix A.

Table 4-10 Fauna habitats in the survey areas

Broad Fauna Habitat Types	Location (survey area/extended survey area) and extent (ha)	Representative photograph
<p>Banksia woodland</p> <p>Corresponding vegetation types: VT01, VT05</p> <p>Woodlands of <i>Banksia attenuata</i>/<i>B. menziesii</i> (with occasional <i>Eucalyptus</i>/<i>Corymbia</i> species, <i>B. grandis</i> and <i>Allocasuarina fraseriana</i>) over shrubland of <i>Hibbertia hypericoides</i>, <i>Xanthorrhoea preissii</i> and <i>Acacia pulchella</i> over dense understorey of <i>Mesomelaena pseudostygia</i>, weedy grasses and herbs and <i>Desmocladus flexuosus</i> on grey to brown sand.</p> <p>This habitat type dominates the survey area and extended survey areas and contains good structural diversity and a variety of micro-habitat types including patches of thick leaf litter, fallen logs and branches. Patches showed evidence of historical fire but was mostly long unburnt. Areas where public or trade workers can access often had dumped rubbish and worn tracks. Most tracks were on existing features however some areas showed driving over vegetation. Overall the vegetation is in excellent condition. There are no water ways in the habitat type.</p> <p>Conservation Significant Fauna</p> <p>Four conservation significant species were recorded utilising this habitat type including Forest Red-tailed Black Cockatoo, Carnaby's Black Cockatoo, Southern Brown Bandicoot and Western Brush Wallaby. The Forest Red-tailed Black Cockatoo and Carnaby's Cockatoo were recorded loafing and feeding in the habitat. Feeding was recorded in <i>Banksia attenuata</i> (cones), <i>B. grandis</i> (flowers), scattered Jarrah, Marri and <i>Allocasuarina</i> (nuts). This habitat would be a highly utilised resource (core foraging habitat) for these species. The Southern Brown Bandicoot and Western Brush Wallaby would utilise this habitat daily and be considered core habitat. The Peregrine Falcon would opportunistically utilise this habitat for foraging only. The Black Striped Snake and Jewelled South West Ctenotus are likely to utilise this habitat particularly in areas of deep sands would be considered core habitat.</p> <p>Habitat Significance- High</p>	<p>Survey area – 97.25 ha</p> <p>Extended survey area – 259.11 ha</p>	

Broad Fauna Habitat Types	Location (survey area/extended survey area) and extent (ha)	Representative photograph
<p>Tuart Forest</p> <p>Corresponding vegetation types: VT02, VT04, VT14</p> <p>Forest/woodlands of <i>Eucalyptus gomphocephala</i> over sparse shrubland of <i>Xanthorrhoea preissii</i>, <i>Acacia saligna</i>, <i>Rhagodia baccata</i> and <i>Hakea lissocarpa</i> over sparse understorey of weedy grasses and herbs in deep dark brown sand.</p> <p>This habitat type contains good structural diversity and a mosaic of micro-habitat types which are closely associated with the fire history in the area. Mostly the habitat was long unburnt and good log and ground cover was present. Some logs showed hollows suitable for use by small mammals and reptiles. Free standing Tuarts often had hollows present and large ones would be considered suitable for Black Cockatoo although no breeding was recorded during the survey. Other breeding bird species were recorded and include Tree Martin, Galah, Australian Ringneck and Elegant Parrot. All hollows small and large demonstrated some use by bees, both free standing and on the ground. Litter was generally present on the ground however in areas of dense weed cover was overgrown litter was not visible. There were no waterways in this habitat type however the habitat surrounding Lake Nowergup (outside of the riparian zone) was Tuart Forest.</p> <p>Conservation Significant Fauna</p> <p>Three conservation significant species were recorded utilising this habitat type including Forest Red-tailed Black Cockatoo, Carnaby's Cockatoo and Southern Brown Bandicoot. The Forest Red-tailed Black Cockatoo and Carnaby's Cockatoo were recorded loafing in the habitat. This habitat would have hollows suitable for Black Cockatoo breeding and one suspected breeding tree was recorded within the extended survey, no breeding was recorded in the survey area. Roosting was recorded in this habitat type. The Southern Brown Bandicoot would utilise this habitat daily and be considered core habitat. The Peregrine Falcon would opportunistically utilise this habitat for foraging and may utilise large hollows or branch platforms from breeding.</p> <p>Habitat Significance- High</p>	<p>Survey area – 17.27 ha</p> <p>Extended survey area – 25.44 ha</p>	

Broad Fauna Habitat Types	Location (survey area/extended survey area) and extent (ha)	Representative photograph
<p>Jarrah woodland</p> <p>Corresponding vegetation types: VT03, VT06</p> <p>Woodland of <i>Eucalyptus marginata</i> and <i>Banksia grandis</i> with scattered <i>Corymbia</i>, <i>B. attenuata</i>/<i>B. menziesii</i> over shrubland of <i>Hibbertia hypericoides</i>, <i>Xanthorrhoea preissii</i> and <i>Acacia pulchella</i> over dense understorey of <i>Mesomelaena pseudostygia</i>, weedy grasses and herbs and <i>Desmocladius flexuosus</i> on grey to brown sand.</p> <p>The habitat values of this habitat type varies according to the complex combination of fire (old and more recent – 5 to 10 years), disease (potential dieback), condition (structural and species diversity) of the vegetation and the proximity of the habitat to disturbed area. This habitat has logs present but few had hollows. Free standing Jarrah often had small hollows present but large ones were uncommon and scattered. Where large hollows were present these would be considered suitable for Black Cockatoo although no breeding was recorded during the survey. Other breeding bird species were recorded and include Galah and Elegant Parrot. All hollows small and large demonstrated some use by bees, both free standing and on the ground (in Jarrah stems). Litter and debris was common and would be utilised by ground dwelling species.</p> <p>Conservation Significant Fauna</p> <p>Four conservation significant species were recorded utilising this habitat type including Forest Red-tailed Black Cockatoo, Carnaby’s Black Cockatoo, Southern Brown Bandicoot and Western Brush Wallaby (on the edge). The Forest Red-tailed Black Cockatoo and Carnaby’s Cockatoo were recorded loafing and feeding in the habitat. Feeding was recorded in Jarrah, Marri, <i>B attenuata</i> (cones) and <i>B. grandis</i> (flowers). Where large hollows are present they May be utilised by Black Cockatoo, however no breeding was recorded during the field survey. Roosting was recorded in this habitat type. This habitat would be a highly utilised resource (core foraging habitat) for these species. The Southern Brown Bandicoot and Western Brush Wallaby would utilise this habitat daily and be considered core habitat. The Peregrine Falcon would opportunistically utilise this habitat for foraging and may utilise large hollows or branch platforms from breeding. The Black Striped</p>	<p>Survey area – 15.97 ha</p> <p>Extended survey area – 90.73 ha</p>	

Broad Fauna Habitat Types	Location (survey area/extended survey area) and extent (ha)	Representative photograph
<p>Snake and Jewelled South West Ctenotus are likely to utilise this habitat particularly in areas of deep sands would be considered core habitat.</p> <p>Habitat Significance- High</p>		
<p>Mixed Heathland Corresponding vegetation types: VT07, VT08, VT09 The Mixed Heathlands is a mosaic habitat of low shrubs dominated by <i>Banksia sessilis</i>, <i>Melaleuca systena</i>, <i>M. Huegelii</i>, <i>Spyridium globulosum</i>, <i>Xanthorrhoea preissii</i> and <i>Calothamnus</i> sp. This habitat type occurs across the survey area and is associated with heathlands on limestone outcropping or limestone rocky soils. The majority of the heathland areas appear long unburnt (> 20 years) given the size and density of the habitat. The dense heathland provides good foraging and breeding opportunities for small native ground mammals, birds and reptiles. Small skinks, geckos and snakes were raked from sandy spoil heaps along the track during the survey. It is the only habitat that the Honey Possum was recorded. Fallen timber was not present however clumps of dead shrubs and <i>Xanthorrhoea</i> were scattered in this habitat type and provide good cover for ground dwelling species. Leaf-litter was scattered and densest under shrubs. Litter was absent from those areas where fauna had created runways or rest spots through the heathland.</p> <p>Conservation Significant Fauna Three conservation significant species were recorded utilising this habitat type including Carnaby's Black Cockatoo, Peregrine Falcon and Southern Brown Bandicoot. The Carnaby's Cockatoo were recorded feeding in this habitat particularly on <i>Banksia sessilis</i>. The Peregrine Falcon was recorded flying overhead in this habitat and would likely utilise this habitat for foraging/hunting. The Southern Brown Bandicoot was recorded in this habitat and be considered core habitat. The Western Brush Wallaby would opportunistically utilise this habitat. The</p>	<p>Survey area – 45.95 ha Extended survey area – 123.00 ha</p>	

Broad Fauna Habitat Types	Location (survey area/extended survey area) and extent (ha)	Representative photograph
<p>Black Striped Snake and Jewelled South West Ctenotus are likely to utilise this habitat particularly in areas of sands incursion.</p> <p>Habitat Significance- High</p>		
<p>Acacia shrubland Corresponding vegetation type: VT11 This habitat type is present in the extended survey area in the north western portion. The <i>Acacia</i> shrubland consists of <i>Acacia rostellifera</i>, <i>Melaleuca systema</i> and <i>Spyridium globulosum</i> closed shrubland over <i>Hibbertia hypericoides</i>, <i>Acanthocarpus preissii</i> and a sparse shrubland over an understorey dominated by introduced herbs (<i>*Euphorbia terracina</i>, <i>*Carpobrotus edulis</i>, <i>*Asparagus asparagoides</i>) and grasses (<i>*Vulpia myuros</i>, <i>*Bromus diandrus</i>, <i>*Ehrharta calycina</i>, <i>*Lagurus ovatus</i>).</p> <p>This habitat type was long unburnt and had a very thick layer of litter and wood debris under storey over deep sand. This habitat was also present on low dunes and within the swales. Traversing this habitat was difficult due to the thickness of some areas. Portions of this habitat had been impacted by off road vehicles and motorbikes with numerous tracks and degraded areas. Dumping of rubbish was also evident. Faunal presence was restricted but unique with it being the only location the Mulga Snakes were recorded. This habitat would also be utilised by a number of other coastal species such as skinks, burrowing reptiles, small birds, and mammal species. These areas also provides ideal habitat for the Black-striped Snake and other burrowing snakes.</p> <p>Conservation Significant Fauna No conservation significant species were recorded utilising this habitat type. The Southern Brown Bandicoot and Western Brush Wallaby are likely to utilise it due to it having very dense cover. The Peregrine Falcon would opportunistically utilise this habitat for foraging. The Black Striped Snake is likely to utilise this habitat due to the deep sands would be considered core habitat.</p>	<p>Survey area – 0.07 ha Extended survey area – 13.23 ha</p>	 <p>Parabolic dunes in the back ground</p>

Broad Fauna Habitat Types	Location (survey area/extended survey area) and extent (ha)	Representative photograph
Habitat Significance- Medium		
<p>Parabolic dunes Corresponding vegetation type: VT10 This habitat type is present in the extended survey area in the north western portion. The parabolic dunes comprise scattered low shrubs of <i>Melaleuca systema</i> over a low forbland of <i>Lomandra maritima</i>, <i>Acanthocarpus preissii</i> and <i>Conostylis candicans</i> over a groundcover dominated by <i>Desmocladus flexuosus</i> and introduced grasses and herbs (<i>*Euphorbia terracina</i>, <i>*Avena barbata</i> and <i>*Lagurus ovatus</i>). The dunes are low to approximately 8 meters and comprise deep white sands. Vegetation is sparse and low an artefact of a wind swept system, limiting the amount of ground cover and litter. Additionally the area has been impacted by off road vehicles and motorbikes with numerous tracks and degraded areas throughout the site. Dumping of rubbish was also evident. Faunal presence was restricted but unique with it being the only location <i>Lerista lineopunctata</i> and White-backed Swallows were recorded. This habitat would also be utilised by a number of other coastal species such as skinks, burrowing reptiles, small birds, and mammal species. These areas also provides ideal habitat for the Black-striped Snake and other burrowing snakes.</p> <p>Conservation Significant Fauna No conservation significant species were recorded utilising this habitat type. The Southern Brown Bandicoot and Western Brush Wallaby may utilise portions of it however use would be opportunistic and limited. The Peregrine Falcon would opportunistically utilise this habitat for foraging. The Black Striped Snake is likely to utilise this habitat due to the deep sands would be considered core habitat.</p> <p>Habitat Significance- Medium</p>	<p>Survey area – 0.49 ha Extended survey area – 5.47 ha</p>	

Broad Fauna Habitat Types	Location (survey area/extended survey area) and extent (ha)	Representative photograph
<p>Open water with riparian vegetation and weeds Corresponding vegetation types: VT13, VT17 This habitat type occurs across a small portion of the extended survey area and comprises an ephemeral lake (Lake Nowergup) that supports an exterior reed bed of <i>Typha</i> and scattered <i>Melaleuca</i>. The ground cover/understory is an assortment of introduced weeds which is densely matted. Scattered logs and branches were present but limited. This habitat appeared long unburnt (> 20 years) based on limited burn scaring. The lake appears seasonally inundated and provides the only open water body habitat within the survey or extended survey area. Numerous water birds were in this environment, including frogs (two species calling). The water bodies would also be utilised by most fauna species as a water source.</p> <p>Conservation Significant Fauna No conservation significant species were observed utilising this habitat. However the water body is likely to be used opportunistically by Black Cockatoo and other mobile species such as the Peregrine Falcon, Western Brush Wallaby and Southern Brown Bandicoot.</p> <p>Habitat Significance- High</p>	<p>Extended survey area – 20.36 ha</p>	

Broad Fauna Habitat Types	Location (survey area/extended survey area) and extent (ha)	Representative photograph
<p>Natural Regrowth Corresponding vegetation type: VT15 Areas comprise portions of the previous works associated with the construction of the rail corridor. The habitat comprises remnant natives, plantings and modified natural regrowth of <i>Banksia attenuata</i>, <i>Acacia</i>, Jarrah (small) and mixed shrubs. Natural regrowth was scattered and with an understorey dominated by introduced grasses and herbs. Logs and woody debris were scattered and litter was associated to <i>Banksia</i> and shrubs with areas of bare ground present in between vegetation.</p> <p>Conservation Significant Fauna No conservation significant species were observed utilising this habitat. However the habitat is likely to be used opportunistically by Black Cockatoo (foraging) and other mobile species such as the Peregrine Falcon, Western Brush Wallaby and in denser areas the Southern Brown Bandicoot. The Black Striped Snake is likely to utilise this habitat due to the deep sands but restricted to dense litter areas.</p> <p>Habitat Significance- Medium</p>	<p>Survey area – 13.58 ha Extended survey area – 3.53 ha</p>	

Broad Fauna Habitat Types	Location (survey area/extended survey area) and extent (ha)	Representative photograph
<p>Pine plantation Corresponding vegetation type: VT16 A small pine plantation was present near to Wanneroo Road in the survey area. The plantation is managed and likely utilised as a harvested tree. The plantation may opportunistically be utilised by fauna species but would be an ongoing food supply for the Carnaby's Black Cockatoo.</p> <p>Conservation Significant Fauna No conservation significant species were recorded utilising this habitat type. The Peregrine Falcon would opportunistically utilise this habitat for foraging.</p> <p>Habitat Significance- Low but is a core feeding species for Carnaby's Black Cockatoo</p>	<p>Survey area – 0.43 ha</p>	
<p>Scattered natives over weeds, Cleared/highly disturbed Corresponding vegetation types: VT12, VT18 This habitat type occurs in the cleared areas (old farm) in the north west portion of the extended survey area plus areas along Wanneroo Road, Romero Road and publicly disturbed areas within the survey area. The soils are mostly sand with small areas of limestone incursion. Some impacted areas within the limestone incursion appeared to be due to the removal of <i>Xanthorrhoea preissii</i>. Dumped rubbish was also present in areas. This habitat is mostly disturbed however the isolated scattered shrubs and trees may provide habitat and linkage for birds and mobile mammals traversing the environment. Due to the nature of the habitat present both native and introduced grazers were recorded. Limited fallen branches, logs or hollows were present in this habitat type and were present only under the scattered trees.</p> <p>Conservation Significant Fauna</p>	<p>Survey area – 206.96 ha Extended survey area – 105.62 ha</p>	

Broad Fauna Habitat Types	Location (survey area/extended survey area) and extent (ha)	Representative photograph
<p>No conservation significant species were recorded utilising this habitat type. The Peregrine Falcon and Black Cockatoo would opportunistically utilise this habitat for foraging.</p> <p>Habitat Significance- Low but is a core feeding species for Carnaby's Cockatoo and Forest Red-tailed Black Cockatoo</p>		

4.2.3 Habitat corridors and linkages

Habitat within the survey and extended survey area currently form part of the Neerabup National Park, Neerabup Nature Reserve and associated Bush Forever sites. These bushland areas form part of a vegetated corridor that runs north to south partially bound by railways, the existing Mitchell Freeway and portions of Wanneroo Road. The vegetation within the PTA rail boundary is currently fenced off with 2.5 m high chain mesh fencing which presents a barrier to movement of ground dwelling fauna between remnant vegetation to the east and west of the existing railway. The majority of the survey area and extended survey area west of the railway has been cleared or is currently being cleared for urban development, with only small patches of remnant vegetation remaining.

The areas of remnant vegetation in and immediately surrounding the survey and extended survey areas form part of a regionally significant contiguous bushland/wetland linkage (GoWA 2000). A large proportion of this vegetation is currently protected as national park, reserves and a series of Bush Forever sites (Government of Western Australia 2000). The vegetation within Neerabup National Park (Bush Forever site 383) is linked to vegetation to the north, south (Bush Forever site 299, across the road), east and west (Site 323, through bushland to Site 397); and is part of Greenways 35, 2, 5 (Tingay, Alan and Associates 1998). Neerabup National Park provides a north/south narrow corridor to allow movement of animals along the coastal plain and associated wetlands.

4.2.4 Habitat Scatter Plot

The similarity between sites based on the GHD trapping data was examined using PRIMER. The cluster analysis (Plate 4-11) and resulting dendrogram (Plate 4-12) showed that according to the species recorded the habitat surveyed, some demonstrate uniqueness in the species recorded and with habitats isolated or clustered. This is particularly the case for the woodlands where Sites 2, 8, 5 (both Tuart and Jarrah woodlands) are clustered with mixed heathland (Sites 3 and 6) together. The remaining sites, *Banksia* shrublands demonstrate overlap and similarities to all sites. Particularly site 1 which clumps with woodlands within the dendrogram. These results are not surprising due to the relatively small survey area and the amount of overlap and variation throughout the survey area.

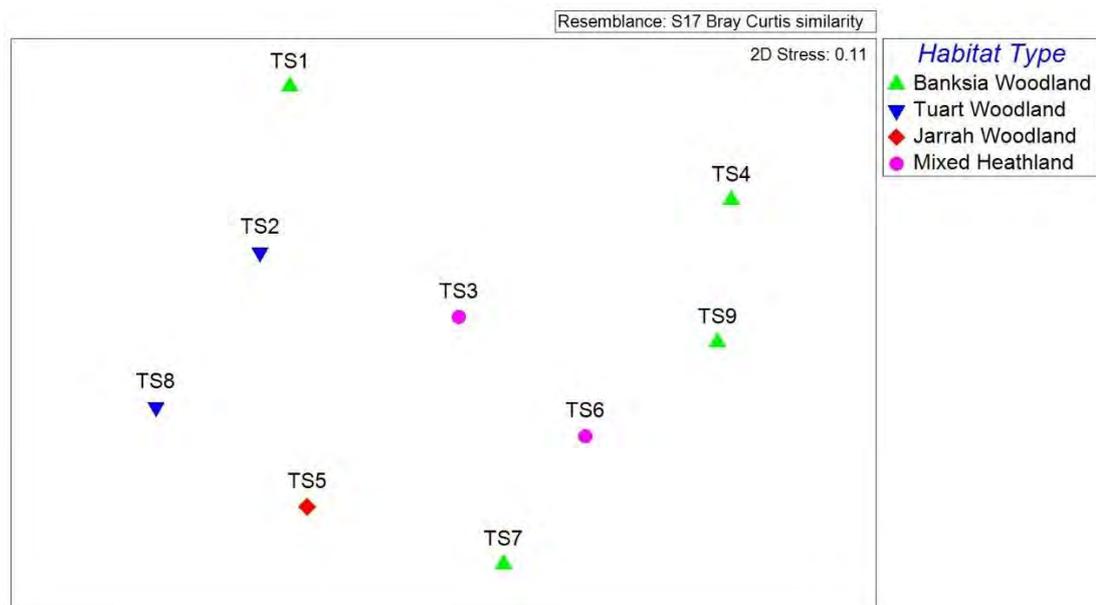


Plate 4-11 Cluster Analysis Habitats based on trapping data

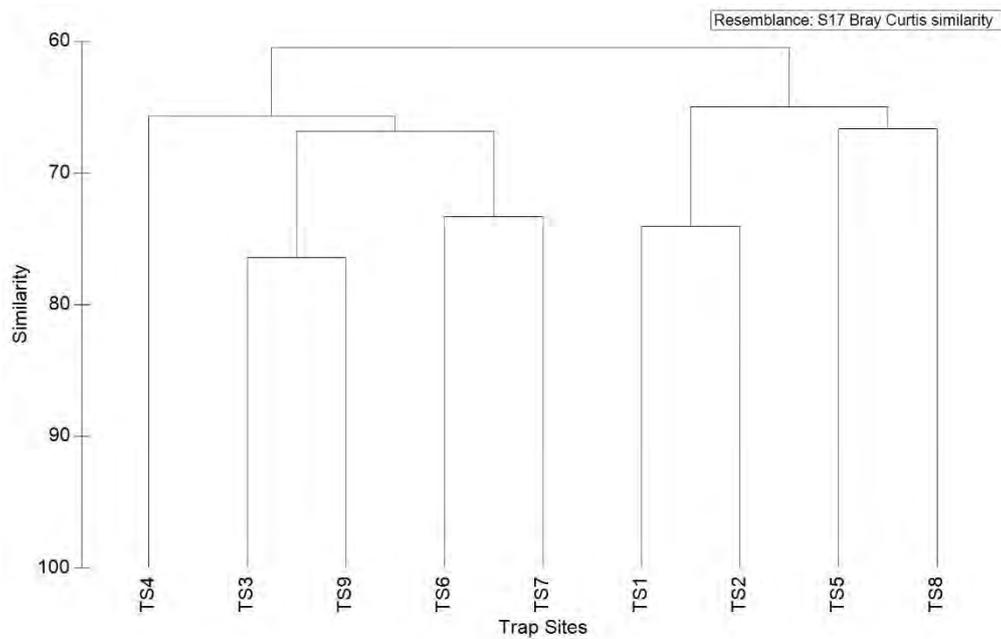


Plate 4-12 Dendrogram of Habitats based on trapping data

4.2.5 Fauna assemblages and abundance

The October/November (Level 2) 2018 fauna surveys recorded species within both the survey area and extended survey area. Within the survey area 124 vertebrate fauna species were recorded, including 17 mammals, 74 birds, 32 reptiles and one frog. Within the extended survey area 96 species were recorded and included 15 mammals, 57 birds, 22 reptiles and 2 frogs. Many of the species recorded in the survey and extended survey areas were the same, therefore when combined the trapping program recorded 140 vertebrate fauna species utilising the survey area, including 17 mammals, 85 birds, 35 reptiles and three amphibians. Of these 12 introduced species were identified and were all mammals and birds.

The compiled species list can be found in Appendix E. A breakdown of the fauna assemblages is provided below.

Although many of the species recorded in the survey and extended survey areas were the same, the extended survey area had a large wetland (Lake Nowgerup) present and therefore demonstrated additional species. These species will not be present within the survey area therefore the below breakdown of the fauna assemblages is for the survey area only.

Mammals

The surveys recorded 17 mammal species within the survey area, including six introduced and 11 native mammals. The composition of native species includes five bats, two macropod, Honey Possum, Possum, Bandicoot, Echidna and six introduced mammals. The most specious family was the microchiropteran Vespertilion bats (3 species), macropods (two species), Molossid bats (two species), Canids (two species), Murids (two species) with felid, Phalangerid, Leporid, Peramelid, Tarsipedid and Tachyglossid each having a single species.

One hundred and eleven individual mammals (excluding camera and bats data) were recorded over the trapping program between 9 species, with the most abundant being the Western Grey Kangaroo and Southern Brown Bandicoot. Thirty seven Western Grey Kangaroo sightings were recorded (33% of total native mammal recordings) with 30 Southern brown Bandicoot (27% of total native mammal recordings).

Bats were only recorded via echolocation, therefore only presence or absence information could be collected. Some species overlap in call identification and therefore may represent multiple species (such as in the *Nyctophilus* group). In any case, in this region there are no species of conservation significance. A breakdown of mammal families recorded during the surveys is provided in Table 4-11.

Table 4-11 Mammal families recorded during the field surveys

Mammal Family	No. of species
Canidae (Dog)	2
Felidae (Cat)	1
Leporidae (Rabbit)	1
Molossidae (Freetail Bats)	2
Muridae (Rodents)	2
Macropodidae (Kangaroos)	2
Peramelidae (Bandicoots)	1
Phalangeridae (Honey Possum)	1
Tachyglossidae (Echidna)	1
Tarsipedidae (Honey Possum)	1
Vespertilionidae (Bats)	3
Total	17

Birds

The bird surveys identified 74 bird species from 31 families. Of the 74 species five are introduced. The most specious families were the Meliphagidae (eight species), Acanthizidae (six species) and Accipitridae (six species). One thousand four hundred and thirty eight individual bird sightings were recorded over the trapping program. The most abundant species were the Brown Honeyeater with 164 records (11% of total bird recordings), New Holland Honeyeater with 149 records (10% of total bird recordings), Carnaby's Cockatoo with 82 records (6% of total bird records) and Galah with 69 records (5% of total bird recordings). A breakdown of bird families recorded during the survey is provided in Table 4-12.

Table 4-12 Bird families recorded during field surveys

Bird Family	No. of species
Accanthizidae (Weebill/Gerygone)	6
Accipitridae (Diurnal birds of prey)	6
Artamidae (Magpie group)	3
Cacatuidae (Cockatoo group)	5
Campephagidae (Cuckoo-shrikes)	2
Casuariidae (Emu)	1
Columbidae (Doves)	5
Corvidae (Crows)	1
Cuculidae (Cuckoos)	3
Falconidae (Falcons)	4
Halcyonidae (Kingfishers)	1
Hirundinidae (Swallows)	2
Maluridae (Wrens)	2
Meliphagidae (Honeyeaters)	8
Meropidae (Bee eater)	1
Monarchidae (Lark)	1
Motacillidae (Pipit)	1

Bird Family	No. of species
Nectariniidae (Mistletoebird)	1
Neosittidae (Sittella)	1
Pachycephalidae (Whistlers)	3
Pardalotidae (Pardalote)	1
Petroicidae (Robin)	2
Phasianidae (Quail)	1
Podargidae (Frogmouth)	1
Psittacidae (Parrots)	5
Rhipiduridae (Fantail)	2
Strigidae (Boobook)	1
Threskiornithidae (Ibis)	1
Tytonidae (Owl)	1
Timaliidae (Silvereye)	1
Turnicidae (Button Quail)	1
Total	74

Reptiles

A total of 32 reptile species were recorded during the field surveys from eight families. The most specious families were Scincidae (14 species), Elapidae (7 species) and Pygopodidae (5 species). Six hundred and seven reptile captures were recorded in the survey area over the trapping program. The most abundant species were Two-toed Earless Skink with 117 records (19% of total reptile recordings), West Coast Ctenotus with 91 records (15% of total reptile recordings) and Bobtail with 69 records (11% of total reptile recordings). A breakdown of reptile families recorded during the survey is provided in Table 4-13.

Table 4-13 Reptile families recorded during the field surveys

Reptile Family	No. of species
Agamidae (Dragons)	1
Diplodactylidae (Geckos)	1
Elapidae (Snakes)	7
Gekkonidae (Geckos)	1
Pygopodidae (Legless Lizards)	5
Scincidae (Skinks)	14
Typhlopidae (Blind Snakes)	1
Varanidae (Monitors)	2
Total	32

Amphibians

One amphibian species was recorded in the survey area. The species recorded was the Pobblebonk (*Lymnodynastes dorsalis*) a member of Myobatrachidae family. Two individuals were recorded during the survey.

4.2.6 Species Accumulation

As an indication of fauna trapping effectiveness, an accumulation curve was run for the data collected during the field survey within 8 models in Primer V6. The best fit model was UGE (Plate 4-13). The UGE curve reaches a curve asymptote (very few new species were recorded) after trap night 10. The curve asymptote (model levelling) is demonstrated by the end of the survey indicating that of the species active at the time of the survey a majority of them were sampled prior to the end of the trapping program. This is also comparable to the raw data of

which the known species in the region (of reptile, small mammal and frogs) approximately 52 could utilise the habitats present in the survey area (based on *NatureMap* records). This study recorded 35 species similar in numbers to the dendrogram.

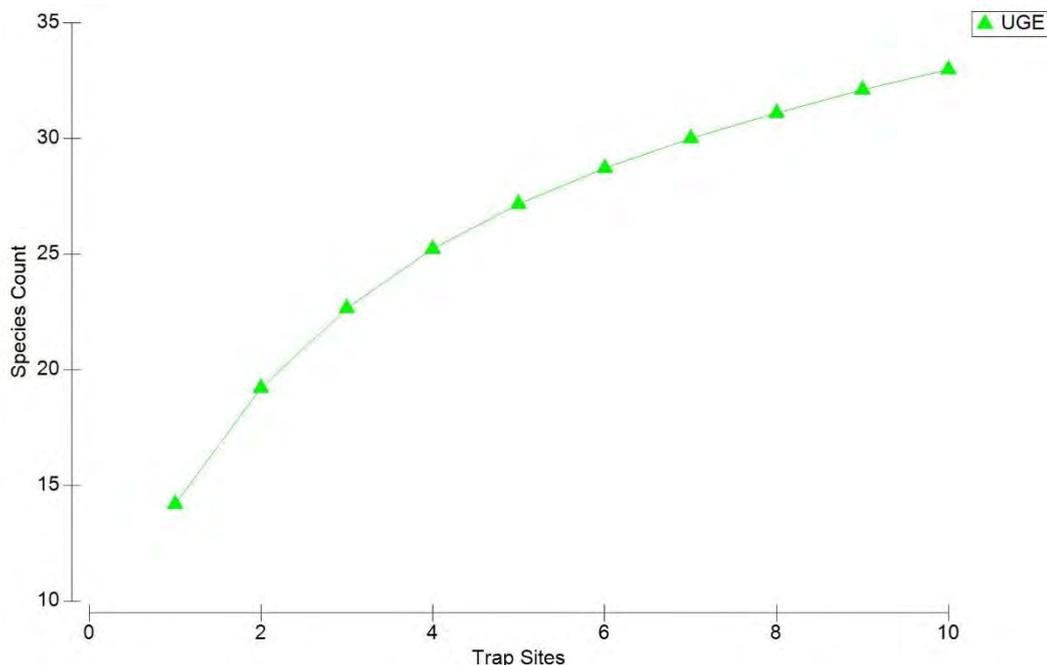


Plate 4-13 Species accumulation for the trapping program

4.2.7 Comparisons to other surveys in the area

The results in this assessment gave a higher species count than those undertaken in the Neerabup National Park and surrounds previously. This is likely due to the large survey area, diversity of habitats and effort undertaken during the survey period. Table 4-14 shows the numbers of birds, reptiles, mammals and amphibian per survey. The complete species list per survey is captured in Appendix E.

Table 4-14 Comparison of numbers of species per previous surveys

Projects	Level of Assessment	Birds	Reptiles	Mammals	Amphibia	Totals
This survey	Level 2	85	35	17	3	140
CALM 1993	Level 2	43	15	8	2	68
DPaW 2013	Level 2	20	18	10	0	48
GHD 2014b	Level 2	59	25	13	1	98
MRIA 2018	Level 2	52	21	9	1	83
GHD 2014a	Level 1	48	7	7	0	62
Maryan pers comm. 1996-2004	Level 1	0	34	0	3	37

4.2.8 Locally significant fauna

Locally significant fauna are also those which are not formally listed under State or Commonwealth legislation or listed as Priority fauna by the DBCA but are considered to have a

restricted distribution on the Swan Coastal Plain or have dramatically declined in numbers since European settlement (GoWA 2000).

Twenty six bird species recorded during the survey are considered to be significant birds of the Swan Coastal Plain portion of the Perth Metropolitan Region (GoWA 2000). This includes:

- Twelve birds listed as category 3: Inland Thornbill, Yellow-rumped Thornbill, Western Thornbill, Weebill, White-browed Scrubwren, Painted Button Quail, Common Bronzewing, Splendid Fairy-wren, Varied Sittella, Grey Shrike-thrush, Golden Whistler, and Scarlet Robin
- Fourteen birds listed under category 4: Collared Sparrowhawk, Brown Goshawk, Wedge-tailed Eagle, Whistling Kite, Little Eagle, Brown Falcon, Peregrine Falcon, Carnaby's Black Cockatoo, Forest Red-tailed Black Cockatoo, Emu, New Holland Honeyeater, White-cheeked Honeyeater, Little Wattlebird and Black-faced Woodswallow.

These species are either habitat specialists with a reduced distribution on the Swan Coastal Plain or are wide-ranging species with reduced populations on the Swan Coastal Plain.

The Mulga Snake, Reticulated Whip Snake, Western Slender Blue-tongue, Western Blue-tongue, Javelin Legless Lizard, Gould's Hooded Snake, all the Bat species, Honey Possum, Common Brushtail Possum and Echidna would also be considered to be locally significant fauna, even though they have large distributions they have declined or have limited distribution on the Swan Coastal Plain. Additionally the Mulga Snake, Western Blue-tongue and Javelin Legless Lizard are species that are on the southern edge of a more north distribution.

4.2.9 Introduced species

Mammals and birds comprised the only groups in which introduced fauna were recorded. In total 11 species were observed and included:

- Dog (*Canis domesticus*)
- Red Fox (*Vulpes vulpes*)
- Cat (*Felis catus*)
- European Rabbit (*Oryctolagus cuniculus*)
- House Mouse (*Mus musculus*)
- Black Rat (*Rattus rattus*)
- Rainbow Lorikeet (*Trichoglossus haematodus*)
- Laughing Kookaburra (*Dacelo novaeguineae*)
- Spotted Dove (*Streptopelia chinensis*)
- Laughing Dove (*Streptopelia senegalensis*)
- Feral Pigeon (*Columbia livia*).

Of the species recorded the Dog evidence was likely roaming or walked animals by neighbouring properties, while the remaining species are considered feral fauna species to the region.

4.2.10 Conservation significant fauna

Five conservation significant fauna species were recorded within the survey area during the field survey. These included:

- Carnaby's Cockatoo (*Calyptorhynchus latirostris*) – listed as Endangered under the BC Act and Endangered under the EPBC Act
- Forest Red-tailed Black-Cockatoo (*Calyptorhynchus banksii naso*) – listed as Vulnerable under the BC Act and Vulnerable under the EPBC Act
- Peregrine Falcon (*Falco peregrinus*) – listed as Other specially protected fauna under the BC Act
- Southern Brown Bandicoot (*Isodon fusciventer*) – listed as P4 by DBCA
- Western Brush Wallaby (*Notamacropus Irma*) – listed as P4 by DBCA.

Black Cockatoo evidence is presented in Figure 10, Appendix A, with Peregrine Falcon, Southern Brown Bandicoot and Western Brush Wallaby shown in Figure 11, Appendix A.

Likelihood of Occurrence assessment

In addition to the field survey results, an assessment on the likelihood of conservation significant species occurring in the survey area and extended survey area was undertaken. This assessment is based on species' biology, habitat requirements, the quality and availability of suitable habitat as determined during the field survey, and records of the species in the survey area and locality. Species-specific searches of the DBCA *NatureMap* database with a buffer radius of 5 km were also conducted in order to gather information about the broader regional occurrence of species to further inform the likelihood of occurrence assessment. Some species identified in the PMST are not realistically considered to occur in the survey area or are not terrestrial vertebrate species and have been excluded from the assessment (i.e. marine species).

In total 25 species (2 mammals, 2 reptile and 21 birds) were recorded from desktop assessment as potentially occurring in the survey areas. Of these, five were recorded and two are likely to utilise the habitats present in the survey area. Table 4-15 summarises the species of conservation significance that are either known or considered likely to occur in the survey area.

There are six conservation significant species likely to be present in the extended survey area, in addition to the five known and two species considered likely to occur in the survey area. The larger number of species considered likely to occur is associated with the extended survey area incorporating Nowergup Lake, which provides habitat not found in the survey area. Table 4-15 summarises the species of conservation significance that are either known or considered likely to occur in the extended survey area.

The parameters of assessment for this likelihood of occurrence assessment and the full likelihood of occurrence assessment are provided in Appendix E.

Table 4-15 Summary of species known or likely to occur in the survey area

Species name	Status			Likelihood of occurrence	
	EPBC Act	BC Act	DBCA	Survey area	Extended survey area
<i>Calyptorhynchus latirostris</i> Carnaby's Black Cockatoo	EN	EN		Known – The species was recorded during the survey	Known – The species was recorded during the survey
<i>Calyptorhynchus banksii naso</i> Forest Red-tailed Black Cockatoo	VU	VU		Known – The species was recorded during the survey	Known – The species was recorded during the survey
<i>Falco peregrinus</i> Peregrine Falcon		OS		Known – The species was recorded during the survey	Known – The species was recorded during the survey
<i>Isoodon fusciventer</i> Southern Brown Bandicoot			P4	Known – The species was recorded during the survey	Known – The species was recorded during the survey
<i>Notamacropus irma</i> Western Brush Wallaby			P4	Known – The species was recorded during the survey	Known – The species was recorded during the survey
<i>Botaurus poiciloptilus</i> Australasian Bittern	EN	EN		Highly Unlikely - There is no suitable habitat for this species within the survey area.	Likely - There is suitable habitat for this species around Nowergup Lake.
<i>Rostratula australis</i> Australian Painted Snipe	EN, Mi	EN		Highly Unlikely - There is no suitable habitat for this species within the survey area.	Likely - There is suitable habitat for this species at Nowergup Lake.
<i>Neelaps calonotos</i> Black-striped Snake			P3	Likely - Suitable habitat for the Black-striped Snake is present within the survey area and there are a number of records within the study area.	Likely - Suitable habitat for the Black-striped Snake is present within the survey area and there are a number of records of this species within the study area
<i>Ctenotus gemmula</i> Jewelled southwest Ctenotus(Swan Coastal Plain population)			P3	Likely - There is suitable habitat present for this species within the survey area. The closest known record is approximately 13 km south east.	Likely - There is suitable habitat present for this species within the survey area. The closest known record is approximately 13 km south east.
<i>Oxyura australis</i> Blue-billed Duck			P4	Highly Unlikely - There is no suitable habitat for this	Likely - There is suitable habitat for

Species name	Status			Likelihood of occurrence	
	EPBC Act	BC Act	DBCA	Survey area	Extended survey area
				species within the survey area.	this species at Nowergup Lake.
<i>Actitis hypoleucos</i> Common Sandpiper	Mi	IA		Highly Unlikely - There is no suitable habitat for this species within the survey area.	Likely - There is suitable habitat for this species at Nowergup Lake.
<i>Calidris melanotos</i> Pectoral Sandpiper	Mi	IA		Highly Unlikely - There is no suitable habitat for this species within the survey area.	Likely - There is suitable habitat for this species at Nowergup Lake.
<i>Tringa nebularia</i> Common Greenshank	Mi	IA		Highly Unlikely - There is no suitable habitat for this species within the survey area.	Likely - There is suitable habitat for this species at Nowergup Lake.

Key – OS = Other Species Protection, Special Protection under BC Act. En= Endangered, Endangered under BC and EPBC Acts, VU= Vulnerable under BC and EPBC Acts, P3/4= Priority fauna listings under DBCA.

4.2.11 Targeted Black Cockatoo habitat assessment

Two species of Black Cockatoo, Carnaby's Cockatoo and Forest Red-tailed Black Cockatoo were recorded during the survey.

Carnaby's Cockatoo is endemic to the south-west of Western Australia with a wide-spread distribution. Carnaby's Cockatoo nest in hollows of live or dead eucalypts, primarily smooth-barked Salmon Gum and Wandoo (Saunders 1979, 1982) though breeding has been reported in other wheatbelt tree species and some tree species on the Swan Coastal Plain and jarrah forest (Saunders 1979, 1982; Storr 1991; Johnstone and Storr 2004). Success in breeding is dependent on the quality and proximity of feeding habitat within 12 km of nesting sites (Saunders 1977, 1986; Saunders and Ingram 1987). Along with the trees that provide nest hollows, the protection, management and increase of this feeding habitat that supports the breeding of Carnaby's Cockatoo is a critical requirement for the conservation of the species.

The Forest Red-tailed Black Cockatoo is endemic to the south-west humid and sub-humid zones of Western Australia (Mawson and Johnstone 1997). It inhabits the dense Jarrah, Karri (*E. diversicolor*) and Marri forests receiving more than 600 mm of annual average rainfall. The current distribution is north of Perth and east to Mount Helena, Christmas Tree Well, North Banister, Mt Saddleback, Rocky Gully and the upper King River (Johnstone 1997). More recently the species has been utilising and persisting on the northern portions of the Swan Coastal Plain and is now considered a regular sighting (Johnstone et al 2017). Habitats in which the Forest Red-tailed Black Cockatoo occurs at Bungendore Park and Jarrahdale, have an understorey of Bull Banksia (*Banksia grandis*), Snottygobble (*Persoonia longifolia*), Sheoak (*Allocasuarina fraseriana*) and *Banksia* spp., with scattered Blackbutt (*E. patens*) and Wandoo (*E. wandoo*) (Johnstone and Kirkby 1999). The Forest Red-tailed Black Cockatoo roosts in Jarrah-Marri-Blackbutt habitat on road-sides, paddocks or forest blocks. While the Forest Red-tailed Black Cockatoo feeds on the seeds of other species, around 90 per cent of its diet is made up of the seeds from Marri and Jarrah fruits.

Carnaby's Cockatoo and Forest Red-tailed Black Cockatoo were recorded in both the survey and extended survey areas. Foraging, roosting and breeding data was recorded for all areas. Potential breeding trees were recorded in the survey area while tree plots were undertaken throughout the extended area. The results of this assessment are presented and summarised in Table 4-16.

Potential breeding tree assessment within survey area

Five hundred and seventy potential Black Cockatoo breeding trees were identified within the survey area. These consisted of 413 –Tuart; 132 – Jarrah; 22 – Marri; 2 – Flooded Gum; and 1 - *Eucalyptus* sp.

Of the 570 identified potential breeding trees 20 were identified to have medium to/or large hollows present suitable for Black Cockatoo breeding or demonstrating signs of historical use. These trees were all tuarts, had from 1 to 4 hollows present, and are presented as 'monitoring sites' in Figure 10. Table 4-17 details the hollow entrance size, height, depth and angle for the 20 potential breeding trees with medium to/or large hollows present.

No Black Cockatoo were recorded utilising the identified hollows over the assessment period (August, November and January/February 2018/19). The complete list of potential breeding trees identified in the survey area and notes associated with the hollow assessment are included in Appendix E.

Potential breeding tree plots assessment within extended survey area

Twenty nine tree plots were located within the extended survey area to provide an estimate of potential breeding tree densities (Table 4-18). One hundred and fifty one potential breeding trees were recorded, which equates to an average of 5-6 potential breeding trees per 0.25 ha. From the mix of trees recorded, these numbers would approximately constitute 3 Tuart, 2 Jarrah and 1 Marri.

Of the 29 plots, three trees demonstrated evidence of chews with one of these highly likely to be utilised by Black Cockatoo, although this was not able to be confirmed. Small, medium and large hollows were present within approximately 50% of plots.

Table 4-16 Summary of Black Cockatoo findings

Feature	Species	Survey area	Extended Survey area
Sightings	Carnaby's Black Cockatoo	Carnaby's Cockatoo individuals were recorded flying and foraging within the survey area. The largest group recorded consisted of 17 birds. The locations the birds were observed is shown in Figure 10.	Carnaby's Cockatoo individuals were recorded flying and foraging within the extended survey area. The largest group recorded consisted of 12 birds. The locations the birds were observed is shown in Figure 10.
	Forest Red-tailed Black Cockatoo	Forest Red-tailed Black Cockatoo individuals were recorded flying and foraging within the survey area. The largest group recorded consisted of 4 birds. The locations the birds were observed is shown in Figure 10.	Forest Red-tailed Black Cockatoo individuals were recorded flying and foraging within the extended survey area. The largest group recorded consisted of 7 birds. The locations the birds were observed is shown in Figure 10.
Foraging	Carnaby's Cockatoo	Feeding evidence was recorded in the survey area on <i>Banksia sessilis</i> , <i>B. attenuata</i> , <i>B. grandis</i> and Jarrah. Approximately 217.06 ha of suitable foraging habitat is mapped within the survey area. Refer to Figure 10.	Feeding evidence was recorded opportunistically in the extended survey area on <i>Banksia sessilis</i> , <i>B. attenuata</i> and Jarrah. Approximately 515.06 ha of suitable foraging habitat is mapped within the extended survey area. Refer to Figure 10.
	Forest Red-tailed Black Cockatoo	Feeding evidence was recorded in the survey area on <i>Allocasuarina</i> , Marri and Jarrah. Approximately 217.06 ha of suitable foraging habitat is mapped within the survey area. Refer to Figure 10.	Feeding evidence was recorded opportunistically in the extended survey area on <i>Allocasuarina</i> , Marri and Jarrah. Approximately 515.06 ha of suitable foraging habitat is mapped within the extended survey area. Refer to Figure 10.
Breeding	Carnaby's Cockatoo	No actual breeding was recorded	One possible breeding tree was recorded near to Lake Nowergup in tree plot 23. The main hollow is approximately 20 m high with a 30 cm entrance which has extensive chews. Tree is near -31.6312 and 115.7283. This data was restricted to tree plot assessment only a detailed assessment of breeding within the extended survey areas was not undertaken.
	Forest Red-tailed Black Cockatoo	No actual breeding was recorded	One possible breeding tree was recorded near to Lake Nowergup in tree plot 23. The main hollow is approximately 20 m high with a 30 cm entrance which has extensive chews. Tree is near -31.6312 and 115.7283. This data was restricted to tree plot assessment only a detailed assessment of breeding within the extended survey areas was not undertaken.

Feature	Species	Survey area	Extended Survey area
Roosting	Both Species	Five trees were identified over two locations in and bordering the survey area. See Figure 10	No roosting was recorded although assessment was opportunistic only.
Potential Black Cockatoo Breeding Trees	Carnaby's Cockatoo and Forest Red-tailed Black Cockatoo	570 potential Black Cockatoo breeding trees (DBH > 500 mm) were recorded during the survey. These consisted of: 413 -Tuart 132 - Jarrah 22 - Marri 2 - Flooded Gum 1 - <i>Eucalyptus</i> sp.	Black Cockatoo breeding trees were not surveyed in the extended survey area; Black Cockatoo tree plots established. (See 'BC Tree Plots' cells below for discussion on potential Black Cockatoo breeding trees.)
Potential Black Cockatoo Breeding Trees with Suitable Nesting Hollows	Carnaby's Cockatoo and Forest Red-tailed Black Cockatoo	Of the 570 identified potential breeding trees 20 were identified to have medium to/or large hollows present suitable for Black Cockatoo breeding or demonstrating signs of historical use. These trees had from 1 to 4 hollows present and were assessed via visual inspection and/or via a pole cam (if within 12 m from ground) in August, November and January/February 2018/19. No Black Cockatoo were recorded utilising the identified hollows over the assessment period. See Appendix E for data breakdown.	Black Cockatoo breeding trees were not surveyed in the extended survey area; Black Cockatoo tree plots established.
BC Tree Plots	Carnaby's Cockatoo and Forest Red-tailed Black Cockatoo	Tree plots not established in the survey area.	In total 29 plots were recorded with Tuart (75 trees), Jarrah (50 trees) and Marri (26 trees) present consisting of 151 trees in total. From the plot data an average of 5-6 trees were recorded per 0.25 ha. From the ratio above would constitute 3 Tuart, 2 Jarrah and 1 Marri within a 50 x 50 m plot. Of the 29 plots 3 trees demonstrated evidence of chews with one of these highly likely to be utilised by Black Cockatoo, although this was not confirmed. Small, medium and large hollows were present within approximately 50% of plots.

Table 4-17 Potential breeding trees with suitable size hollows within survey area

Tree No.	DBH (mm)	Hollows Present	Hollow Entrance Size (cm)	Hollow Heights (m)	Breeding Evidence	Hollow Depth	Hollow Angle
T73	1410	3 large	all 20 plus	7, 9, 12	no evidence of use	7m >1m, 9m 40cm, 12m 30 cm	2x vertical, 1x 45
T78	920	3 large	16, 20, 24	7, 12, 15	potential old chews	7m is 30 cm deep	slight angle
T87	2500	2 large	2x 16	12 to 15	no evidence of use	12 m 10 cm, 15 m to high	almost vertical
T103	1300	1 large	16	6	no evidence of use	1m	almost vertical
T106	1600	4 large	all 20 plus	4, 6, 8, 12	no evidence of use	4 m approx 1 m, 6m 20 cm, 8 m 1.2m	2x vertical, 2x horizontal
T236	2200	1 large 1 small	20, 5	20, 3	no evidence of use	3 m 30 cm (bees)	vertical
T239	2200	2 large 2 medium	10, 15, 15, 10	6, 8, 8.5, 20	old chews present	6 m 10 cm, 8 m 10 cm, 8.5 m 10 cm	45 and vertical
T242	1800	2 large 1 medium	20, 10, 20	8, 15, 20	Possible internal chews	8 m 90 cm	vertical
T245	2000	3 large	20, 15, 20	25, 30, 10	no evidence of use	not assessed	45
T252	1600	2 large	15, 15	15, 25	old chews present	not assessed	45
T259	1300	2 large 1 medium	20, 20, 10	10, 16, 17	no evidence of use	10 m 20 cm, 2 large look good	vertical
T299	1200	2 large	2x 20	8, 11	old chews present	8 m >1 m, 11 m 1 m	vertical
T308	750	2 large 1 small	5, 30, 20	5, 7, 4	old chews present	5 m and 7 m same hollow. 1 m, 4 m 20cm	vertical and 45
T325	800	1 large	30	7	old chews present	1.2 m	vertical
T327	950	4 large	20, 20, 15, 25	3, 5, 6, 11	old chews present	3 m 10 cm, 5 m 10 cm, 6 m 10 cm, 11m 2m	vertical and 45
T486	1100	3 medium 1 small	5, 3x 10	8, 15, 15, 17	chews present	To high to assess	
T492	1350	3 large 3 small	30, 20, 15, 3x 5	7, 10, 11	1 large extensive chews	All >1 m	vertical
T526	1130	2 large	12, 20	5, 7	no evidence of use	>1m, couldnt see base	vertical, 45

Tree No.	DBH (mm)	Hollows Present	Hollow Entrance Size (cm)	Hollow Heights (m)	Breeding Evidence	Hollow Depth	Hollow Angle
T527	940	1 large	40, 20	7	no evidence of use	1 m	vertical
T549	1030	2 large	30, 16	5, 7	no evidence of use	40 cm, not checked second	45

Table 4-18 Tree Plots undertaken in the extended survey area

Tree Plots (50 x 50 m)	Tuart	Jarrah	Marri	Total trees	Hollows	Evidence of Breeding by Black Cockatoo
Tree Plot 1		7		7	4 large hollows	No evidence
Tree Plot 2		1	2	3	No hollows	-
Tree Plot 3		1	1	2	No hollows	-
Tree Plot 4	5	1		6	No hollows	-
Tree Plot 5	4			4	No hollows	-
Tree Plot 6	5			5	No hollows	-
Tree Plot 7	7			7	2 large hollows	No evidence, bees present
Tree Plot 8	4		4	8	1 large hollow	Galah scaring on hollow no Black Cockatoo evidence
Tree Plot 9	6	1		7	No hollows	-
Tree Plot 10	6			6	1 large hollow	No evidence
Tree Plot 11	4			4	No hollows	-
Tree Plot 12	3			3	No hollows	-
Tree Plot 13		4		4	2 small hollows	Elegant Parrots nesting, no Black Cockatoo evidence
Tree Plot 14	4			4	No hollows	-
Tree Plot 15		1	7	8	No hollows	-
Tree Plot 16	7		1	8	2 large hollows	No evidence
Tree Plot 17		2	4	6	1 large hollow	No evidence, bees present
Tree Plot 18			3	3	1 large hollow	No evidence
Tree Plot 19		1	3	4	No hollows	-
Tree Plot 20		4		4	No hollows	-
Tree Plot 21		8		8	2 large hollows	No evidence
Tree Plot 22		3		3	1 small hollow	No evidence
Tree Plot 23	9			9	1 large hollow	Evidence present on hollow at 20 m high entrance of 30 cm, chews present.
Tree Plot 24	8			8	1 medium hollow	No evidence
Tree Plot 25		8		8	2 large hollows	Galah scaring on 1 hollow no Black Cockatoo evidence
Tree Plot 26	2			2	5 large and 3 medium hollows	Old chews present on 2 hollows (over 2 trees) possible Black Cockatoo, bee in another hollow
Tree Plot 27	1		1	2	No hollows	-
Tree Plot 28		5		5	No hollows	-
Tree Plot 29		3		3	No hollows	-

5. References

Beard, JS 1979, *Vegetation Survey of Western Australia: the Vegetation of the Perth Area Western Australia*, map and explanatory memoir 1:250,000 series, Applecross, Vegmap Publications.

Beard, JS 1990, *Plant Life of Western Australia*, Perth, Kangaroo Press.

Burbidge, AA 2004, *Threatened Animals of Western Australia*. Western Australian Department of Conservation and Land Management.

Bureau of Meteorology (BoM) 2019, *Climate Data Online*, retrieved January 2019, from <http://www.bom.gov.au/climate/data/?ref=ft>

CALM 1993, Fauna studies in Water Supply reserve 34537, Adjacent to Neerabup National Park. Prepared for Water Authority of Western Australia by Conservation and Land Management.

Churchill, S (2008) *Australian Bats*. Second Edition. Allen and Unwin, NSW

Churchward, HM and McArthur, WM 1980, *Landforms and Soils of the Darling System, Western Australia*, in Atlas of Natural Resources, Darling System Western Australia, Department of Conservation and Environment, Western Australia.

Clarke, KR and Gorley, RN 2006, *PRIMER v6: User Manual/Tutorial*, Plymouth, PRIMER-E

Christidis, L and Boles, WE 2008, *Systematics and Taxonomy of Australian Birds*, Melbourne, CSIRO Publishing.

Department of Parks and Wildlife (DPaW) 2013. Trapping results for Neerabup National Park, Central Section in vicinity of Hester Ave, Raw data provided.

Department of Agriculture and Food WA (DAFWA) 2007, *Soil-landscape mapping in South-WA*, Perth, Department of Agriculture and Food.

Department of Biodiversity, Conservation and Attractions (DBCA) 2018, *NatureMap: Mapping Western Australia's biodiversity*, Department of Parks and Wildlife, retrieved August 2018, from <http://NatureMap.dpaw.wa.gov.au/default.aspx>.

Department of Biodiversity, Conservation and Attractions (DBCA) 2019, Priority Ecological Communities for Western Australia version 28, Species and Communities Program, DBCA, 17th January 2019, retrieved January 2019 from https://www.dpaw.wa.gov.au/images/documents/plants-animals/threatened-species/Listings/Priority%20ecological%20communities%20list%20_Jan%202019.pdf

Department of Environment and Conservation (DEC) 2012, *Chuditch (Dasyurus geoffroii) Recovery Plan*. Wildlife Management Program No. 54. Department of Environment and Conservation, Perth, Western Australia.

Department of Environmental Protection (DEP) 1996, System 6 and Part System 1 Update Programme. Unpublished bushland plot and area records and analysis. Perth, WA.

Department of the Environment and Energy (DotEE) 2017b, *Approved Conservation Advice for Aquatic Root Mat Community in Caves of the Swan Coastal Plain*, retrieved November 2018 from <http://www.environment.gov.au/biodiversity/threatened/communities/pubs/12-conservation-advice.pdf>

Department of the Environment and Energy (DotEE) 2018a, *Environmental Protection and Biodiversity Conservation Act 1999 Protected Matters Search Tool Results*, retrieved August 2018, from <http://www.environment.gov.au/epbc/pmst/index.html>.

Department of the Environment and Energy (DotEE) 2018b, *Environment Protection and Biodiversity Act 1999 List of Threatened Species Database*, retrieved August 2018, from <http://www.environment.gov.au/cgi-bin/sprat/public/publicthreatenedlist.pl?wanted=flora>.

Department of the Environment and Energy (DotEE) 2018c, *Interim Biogeographic Regionalisation of Australia*, Version 7, retrieved August 2018, from <http://www.environment.gov.au/land/nrs/science/ibra/australias-bioregions-maps>

Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) 2012, *Environment Protection and Biodiversity Act 1999 referral guidelines for three threatened black cockatoo species: Carnaby's Black Cockatoo (endangered) *Calyptorhynchus latirostris*, Baudin's Black Cockatoo (vulnerable) *Calyptorhynchus baudinii* and Forest Red-tailed Black Cockatoo (vulnerable) *Calyptorhynchus banksia naso**, Australian Government Canberra.

EPA 2016a, Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment, Perth, Environmental Protection Authority.

EPA 2016b, Technical Guidance – Sampling methods for terrestrial vertebrate fauna, Perth, Environmental Protection Authority.

EPA 2016c, Technical Guidance, Terrestrial Fauna Surveys, Perth, Environmental Protection Authority.

Freegard C 2007, *Nomination of a Western Australian subspecies for listing as threatened change of Status or delisting: Woylie*. Report. Department of Environment and Conservation, Kensington, WA.

GHD Pty Ltd (GHD) 2013a, *Mitchell Freeway Extension: Black Cockatoo assessment*, unpublished report prepared for Main Roads Western Australia.

GHD Pty Ltd (GHD) 2013b, *Mitchell Freeway Extension: Black Cockatoo assessment update*, unpublished letter report prepared for Main Roads Western Australia.

GHD Pty Ltd (GHD) 2014a, *Main Roads Western Australia Mitchell Freeway extension flora and fauna assessment*, unpublished report prepared for Main Roads Western Australia.

GHD Pty Ltd (GHD) 2014b, *Neerabup Road Extension: Level 2 fauna survey*, unpublished report prepared for Main Roads Western Australia.

GHD Pty Ltd (GHD) 2018, *Preliminary Environmental Impact Assessment (PEIA) and Gap Analysis for the Mitchell Freeway Extension (Hester Avenue to Romeo Road) and Wanneroo Road Upgrade (Dunstan Road to train Road)*, unpublished report prepared for Main Roads Western Australia

Gibson, N, Keighery, BJ, Keighery, GJ, Burbidge, AH & Lyons, MN 1994, *A Floristic Survey of the Southern Swan Coastal Plain*, unpublished report prepared for the Australian Heritage Commission prepared by the Department of Conservation and Land Management and The Conservation Council of Western Australia (Inc.).

Government of Western Australia (GoWA) 2000, *Bush Forever – Keeping the Bush in the City. Volumes 1 (Policies, Principals and Processes) & 2 (Directory of Bush Forever Sites)*, Perth, Government of Western Australia.

Government of Western Australia (GoWA) 2018a, *Data WA*, retrieved August 2018, from <https://data.wa.gov.au/>.

Government of Western Australia (GoWA) 2018b, *2018 Statewide Vegetation Statistics incorporating the CAR Reserve Analysis (Full report)*, Current as of March 2019, Perth, Australia, Department of Biodiversity, Conservation and Attractions, retrieved June 2019, from <https://data.wa.gov.au/>.

Government of Western Australia (GoWA) 2018c, *2018 South West Vegetation Complex Statistics, Current as of March 2019*, Perth, Australia, Department of Biodiversity, Conservation and Attractions, retrieved January 2019, from <https://data.wa.gov.au/>.

Griffin, E.A. 1994 *Floristic Survey of Northern Sandplains between Perth and Geraldton*. Unpublished Report to the Heritage Council of WA.

Groom, C. 2011, *Plants Used by Carnaby's Black Cockatoo*. Department of Environment and Conservation, Perth.

Hedde, EM, Loneragan. OW and Havel JJ 1980, *Vegetation Complexes of the Darling System, Western Australia*, in Atlas of Natural Resources, Darling System Western Australia, Department of Conservation and Environment.

Hill, AL, Semeniuk, CA, Seneniuk, V and del Marco, A 1996, *Wetlands of the SCP, Volume 2: Wetland Mapping, Classification and Evaluation – Wetland Atlas*, prepared for the Water and Rivers Commission and the Department of Environmental Protection, Perth, WA.

Higgins, PJ and Davies, SJJF (eds.) 1996, *Handbook of Australian, New Zealand & Antarctic birds, Volume 3: Snipe to Pigeons*, South Melbourne, Australia, Oxford University Press.

Johnstone, R.E. 1997, *Current studies on three endemic Western Australian cockatoos*. *Eclectus*. 3:34--35.

Johnstone, R.E. and Kirkby, T. 1999, *Food of the Forest Red-tailed Black Cockatoo *Calyptorhynchus banksii naso* in south-west Western Australia*. *Western Australian Naturalist*. 22:167-177.

Johnstone, R.E., Kirkby, T. and Sarti, K. 2017, *The distribution, status movements and diet of the Forest Red-tailed Black Cockatoo in the south-west with emphasis on the greater Perth regions, Western Australia*. *Western Australian Naturalist*. 30:4:1-193.

Johnstone, R. E., Storr, G. M. 2004, *'Handbook of Western Australian Birds. Volume 1. Nonpasserines (Emu to Dollarbird).'* (Western Australia Museum: Perth.)

Jones D and Goth A 2008, *Mound-builders*, Clayton, Australia, CSIRO Publishing.

Keighery, BJ 1994, *Bushland Plant Survey: a Guide to Plant Community Survey for the Community*, Nedlands, Wildflower Society of WA (Inc.).

Keighery GJ 1996, *Plot records from Tuart dominated communities*. Unpublished database. Department of Conservation and Land Management, Wanneroo, WA

Mattiske E.M. and Havel J.J. 1998, *Vegetation complexes of the South-west Forest Region of Western Australia*. Maps and report prepared as part of the Regional Forest Agreement, Western Australia for the Department of Conservation and Land Management and Environment Australia.

Mawson, P. R., Johnstone, R. E. 1997, *Conservation status of parrots and cockatoos in Western Australia*. *Eclectus* 2, 4-9.

Maryan, B. Pers comm. Raw data for Level 1 Herpetofauna assessments on Pipidiny Road from 1996 to 2004.

McArthur, WM and Bettenay, E 1960, *The development and distribution of soils on the Swan Coastal Plain, Western Australia*. CSIRO Soil Publication No. 16.

- Menkhorst, P and Knight F 2004, *A Field Guide to the Mammals of Australia, second edition*. Oxford University Press, Melbourne.
- Menkhorst PW and Knight F 2010, *A Field Guide to the Mammals of Australia, Third Revised edition*. Oxford University Press. Melbourne, Australia.
- Mitchell, D, Williams, K & Desmond, A 2002, *Swan Coastal Plain 2 (SWA2 — Swan Coastal Plain subregion)*, in Department of Conservation and Land Management (ed), *A Biodiversity Audit of Western Australia's 53 Biogeographical Subregions in 2002*, pp 724
- Morcombe, M 2004, *Field Guide to Australian Birds*, Queensland, Australia, Steve Parish Publishing Archer Field.
- MRIA 2018, *Fauna clearance trapping program for the Wanneroo Road Extension Burns Beach to Neerabup Roads 2017 to 2018*.
- Nevill, S 2013, *Birds of Western Australia*, Perth, Australia, Simon Nevill Publications.
- NVIS Technical Working Group 2017, *Australian Vegetation Attribute Manual: National Vegetation Information System, Version 7.0*, Department of the Environment and Energy, Canberra. Prep by Bolton, M.P., deLacey, C. and Bossard, K.B. (Eds).
- Pearson, D. J. 2013, *Recovery plan for five species of rock wallabies: Black-footed rock wallaby (Petrogale lateralis), Rothschild rock wallaby (Petrogale rothschildi), Short-eared rock wallaby (Petrogale brachyotis), Monjon (Petrogale burbidgei) and Nabarlek (Petrogale concinna) 2012-2022*. Department of Parks and Wildlife, Perth, WA.
- Richards, J.D. 2012, *Western Barred Bandicoot Perameles bougainville, Burrowing Bettong Bettongia lesueur and Banded Hare-Wallaby Lagostrophus fasciatus National Recovery Plan*. Department of Environment and Conservation (Western Australia) and the Australian Government Department of Sustainability, Environment, Water, Population and Communities. Available from: <http://www.environment.gov.au/resource/western-barred-bandicoot-perameles-bougainville-burrowing-bettong-bettongia-lesueur-and>. In effect under the EPBC Act from 19-Sep-2012.
- Saunders, D.A. 1977, *Effect of Agricultural Clearing on the Breeding Success of the White-tailed Black Cockatoo*. *Emu*. 77 (4). pp. 180-184.
- Saunders, D. A. 1979, *Distribution and taxonomy of the White-tailed and Yellow-tailed Black Cockatoo Calyptorhynchus spp.* *Emu* 79, 215-227.
- Saunders, D.A. 1982, *The breeding behaviour of the short-billed form of the White-tailed Black Cockatoo Calyptorhynchus funereus*. *Ibis*. 124:422--455.
- Saunders, D.A. 1986, *Breeding season, nestling success and nestling growth in Carnaby's Black-Cockatoo, Calyptorhynchus funereus latirostris, over 16 years at Coomallo Creek, and a method for assessing the viability of populations in other areas*. *Australian Wildlife Research* 13, pp. 261-273.
- Saunders, D.A. and Ingram, J.A. 1987, *Factors affecting survival of breeding populations of Carnaby's Cockatoo, Calyptorhynchus latirostris in remnants of native vegetation*. IN: Saunders, D.A., Arnold, G.W., Burbidge, A.A. and Hopkins, A.J.M, *Nature Conservation: the Role of Remnants of Native Vegetation*. Surrey Beatty and Sons, Chipping Norton, pp 249-58.
- Shepherd, DP, Beeston, GR, and Hopkins, AJM 2002, *Native Vegetation in Western Australia – Extent, Type and Status*, Resource Management Technical Report 249, Perth, Department of Agriculture, Western Australia.
- Storr, G.M. 1991, *Birds of the South-west Division of Western Australia*. Records of the Western Australian Museum. Suppl. 35.

Storr, GM, Smith, LA and Johnstone, RE 1999, *Lizards of Western Australia*, Volume 1: Skinks, revised edition, Perth, Western Australian Museum.

Storr GM, Smith LA and Johnstone RE 2002, *Snakes of Western Australia*. Western Australian Museum, Perth, WA.

Threatened Species Scientific Committee (TSSC) 2016, *Review of the status of 10 threatened species in South Australia: Proposed schedules under the South Australian National 11 Parks and Wildlife Act 1972*. Department of Environment and Heritage, Adelaide.

Threatened Species Scientific Committee (TSSC) 2005, *Melaleuca huegelii-Melaleuca systema shrublands of limestone ridges (Swan Coastal Plain Community Type 26a-Gibson et al. 1994) Interim Recovery Plan 2004-2009*, Department of Conservation and Land Management (CALM), available from https://www.dpaw.wa.gov.au/images/documents/plants-animals/threatened-species/recovery_plans/Approved_interim_recovery_plans_/communities/limestone_ridges26a_irp193.pdf

Threatened Species Scientific Community (TSSC) 2016, *Environmental Protection and Biodiversity Conservation Act 1999 Approved Conservation Advice (incorporating listing advice) for the Banksia Woodlands of the Swan Coastal Plain Ecological Community*, Department of the Environment and Energy, Canberra. Available at: <http://www.environment.gov.au/biodiversity/threatened/communities/pubs/131-conservation-advice.pdf>.

Tingay, Alan & Associates 1998, *A Strategic Plan for Perth's Greenways – Final Report*, prepared for Environment Australia, Ministry for Planning.

Tyler, MJ and Doughty, P 2009, *Field Guide to frogs of Western Australia*. Fourth Edition. Perth, WA Museum.

Ugland, KI Gray, JS and Ellingsen, KE 2003, *The species-accumulation curve and estimation of species richness*. Journal of Animal Ecology 72, 888-897.

Van Dyke, S & Strahan, R 2008, *The Mammals of Australia*. Third Edition. New Holland Publishing, Sydney, Australia.

Webb A, Kinloch J, Keighery G & Pitt G, 2016, *The extension of vegetation complex mapping to landform boundaries within the Swan Coastal Plain landform and forested region of south-west Western Australia*.

Western Australian Herbarium 1998–, *FloraBase—the Western Australian Flora*, Department of Parks and Wildlife, retrieved August 2018, from <http://florabase.dpaw.wa.gov.au/>.

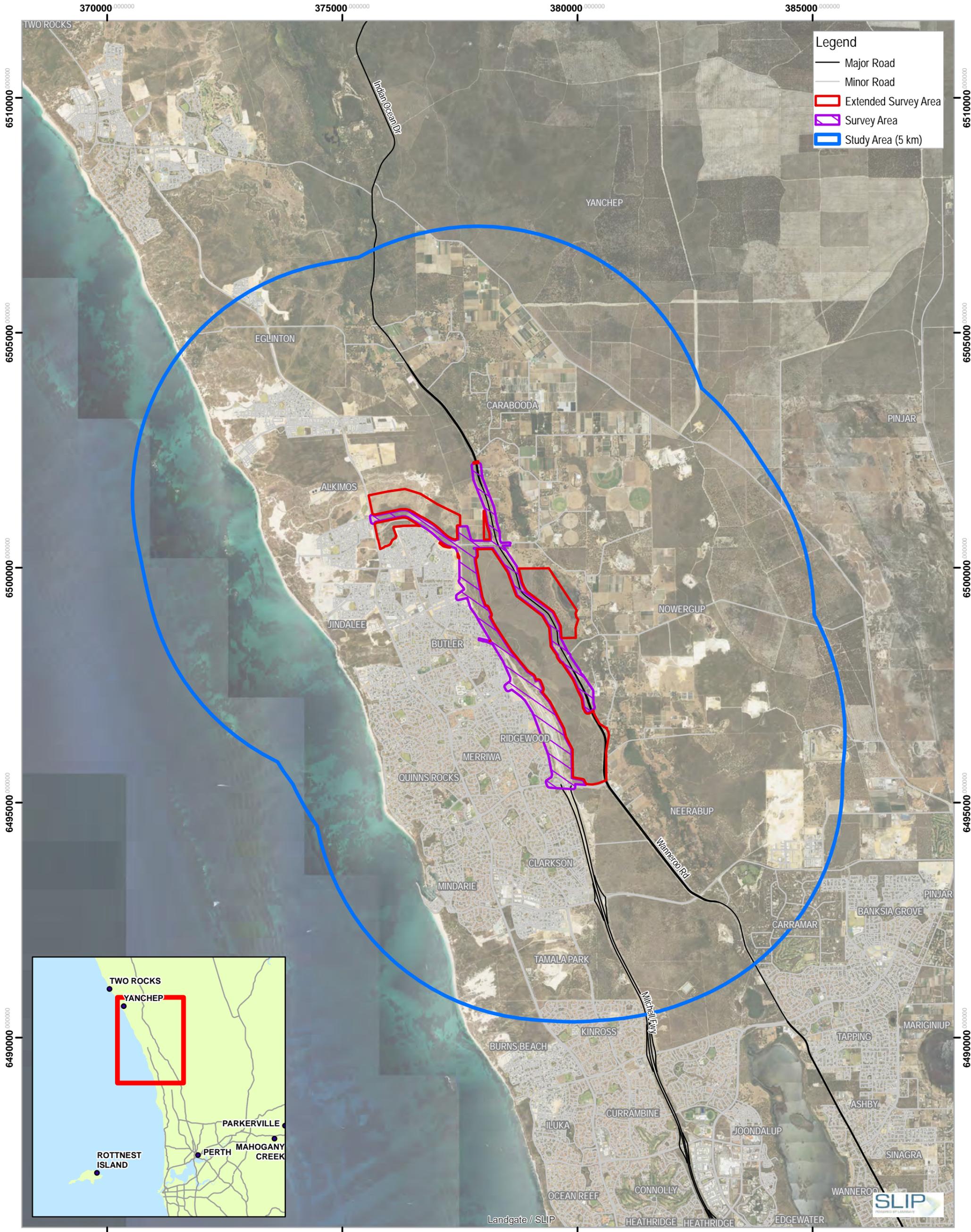
Weston AS, Griffin EA and Trudgen M 1993, *Flora and Vegetation Conservation Values of the Ellenbrook Estate*. Conducted for Bowman Bishaw Gorham 1993.

Wilson S and Swan G 2017, *A Complete Guide to Reptiles of Australia*. 4th Edition New Holland Press Sydney Australia

Appendices

Appendix A – Figures

- Figure 1 Study area and survey area boundaries
- Figure 2 Biological constraints
- Figure 3 Land use constraints
- Figure 4 Hydrology constraints
- Figure 5 Vegetation mapping
- Figure 6 Vegetation condition
- Figure 7 Conservation significant vegetation and flora records
- Figure 8 Fauna habitat types
- Figure 9 Fauna survey methods
- Figure 10 Fauna results, Black Cockatoo
- Figure 11 Other conservation species recorded



Legend

- Major Road
- Minor Road
- ▭ Extended Survey Area
- ▭ Survey Area
- Study Area (5 km)

Paper Size ISO A3

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Kilometres

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Grid: GDA 1994 MGA Zone 50

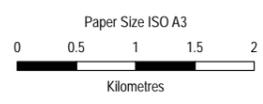
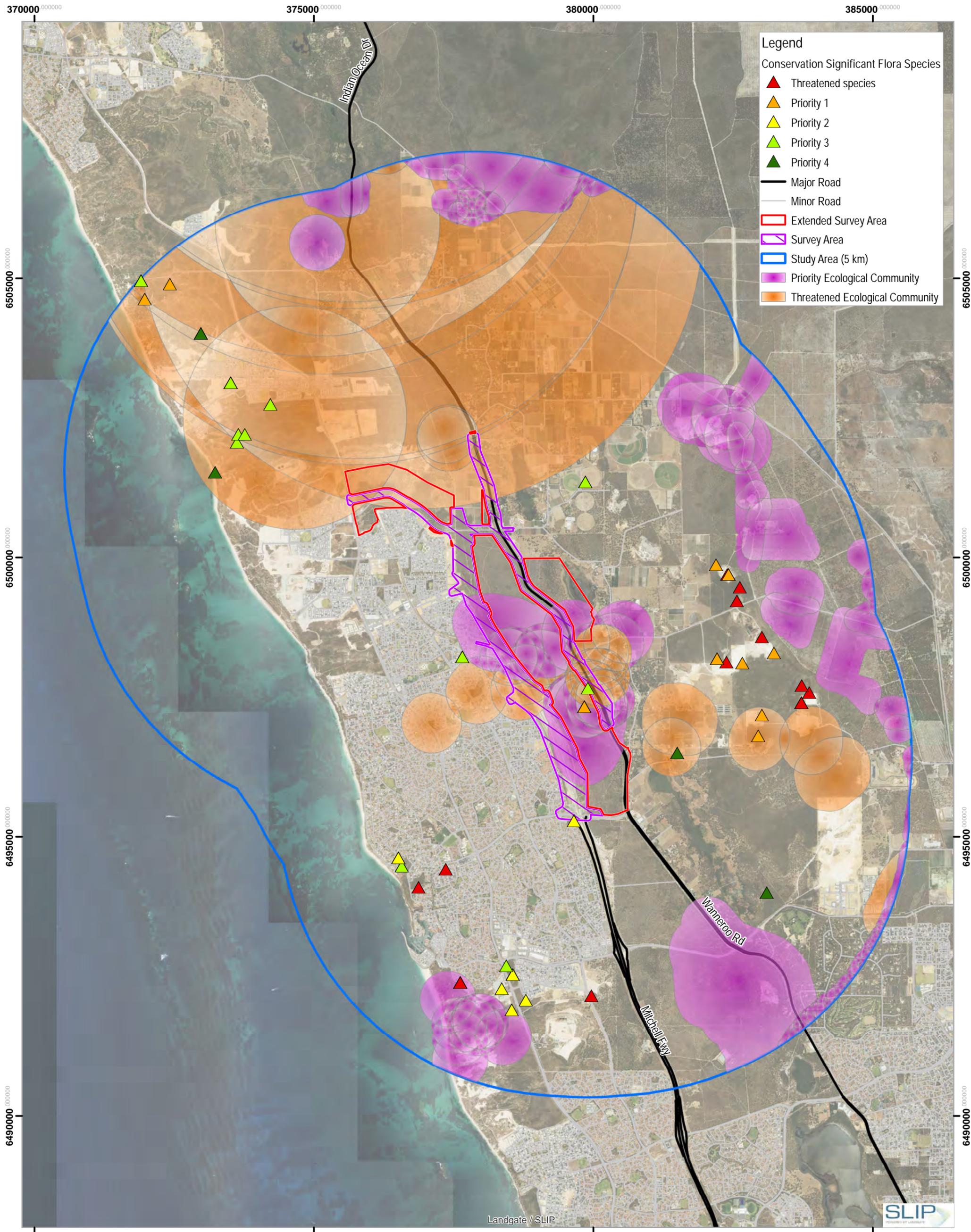


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Mitchell Freeway Extension Hester Avenue
to Romeo Road Biological Surveys

Survey Area Locality

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FIGURE 1

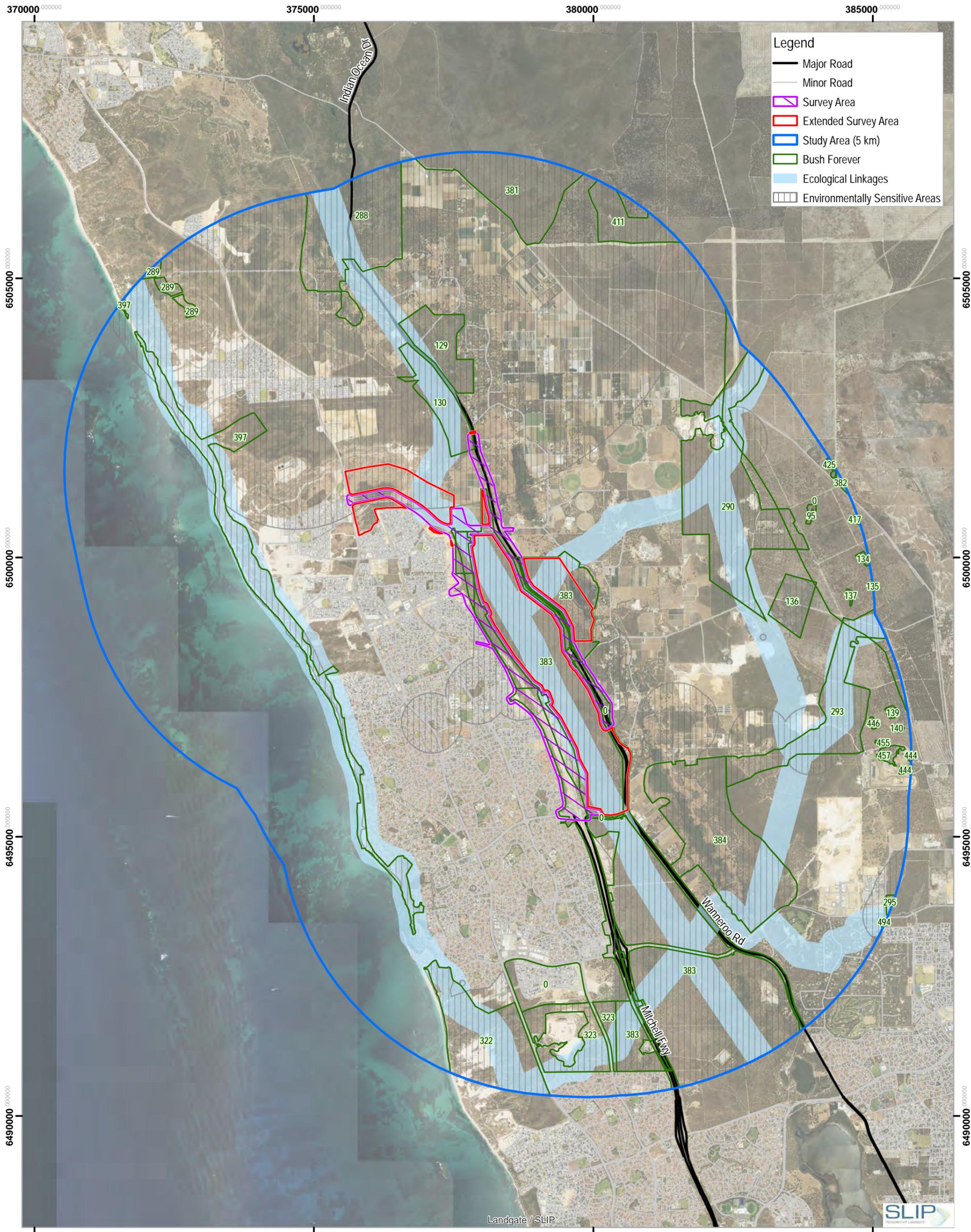


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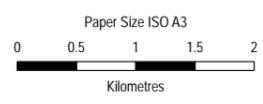
Biological Constraints

FIGURE 2



Legend

- Major Road
- Minor Road
- ▭ Survey Area
- ▭ Extended Survey Area
- Study Area (5 km)
- ▭ Bush Forever
- ▭ Ecological Linkages
- ▭ Environmentally Sensitive Areas



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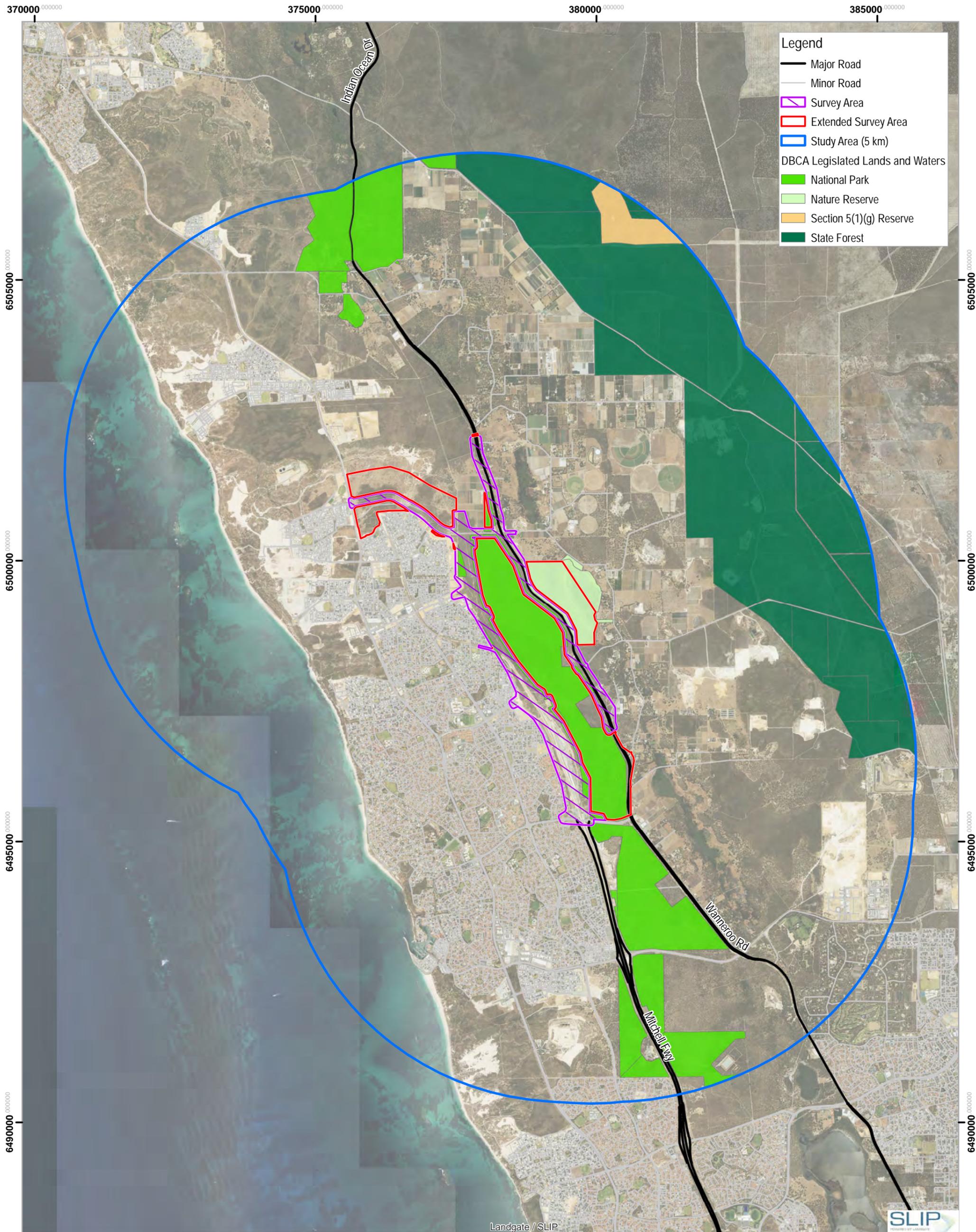
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Landuse Constraints

FIGURE 3a

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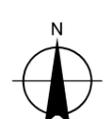
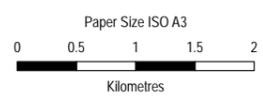


Legend

- Major Road
- Minor Road
- ▭ Survey Area
- ▭ Extended Survey Area
- ▭ Study Area (5 km)

DBCA Legislated Lands and Waters

- ▭ National Park
- ▭ Nature Reserve
- ▭ Section 5(1)(g) Reserve
- ▭ State Forest

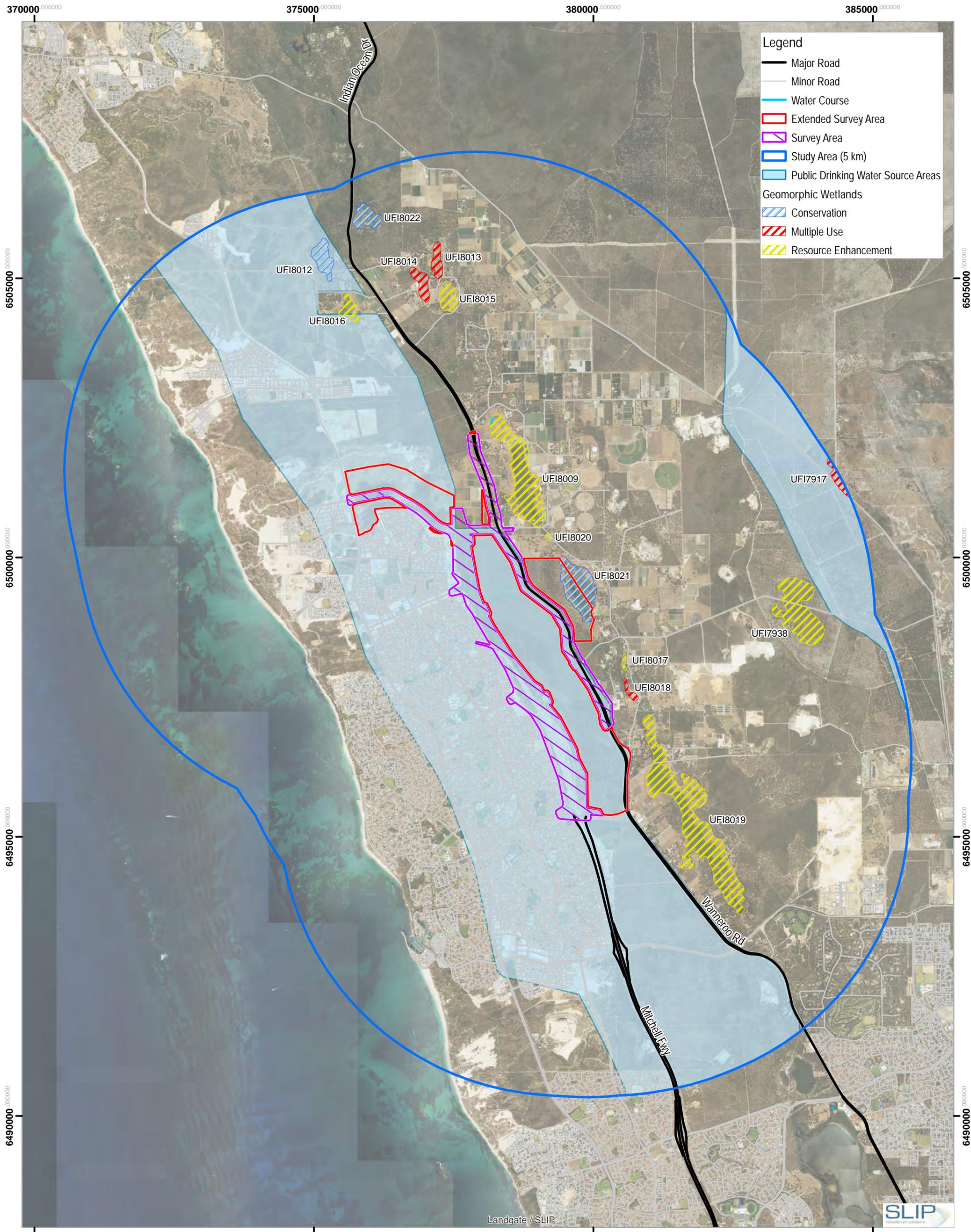


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 to Romeo Road Biological Surveys

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 Date 23/07/2019

Landuse Constraints

FIGURE 3b



Legend

- Major Road
- Minor Road
- Water Course
- Extended Survey Area
- Survey Area
- Study Area (5 km)
- Public Drinking Water Source Areas
- Geomorphic Wetlands
 - Conservation
 - Multiple Use
 - Resource Enhancement

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Indian Ocean Dr

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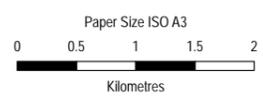
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Wanneroo Rd

Mitchell Fwy

Landgate / SLIP

SLIP



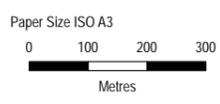
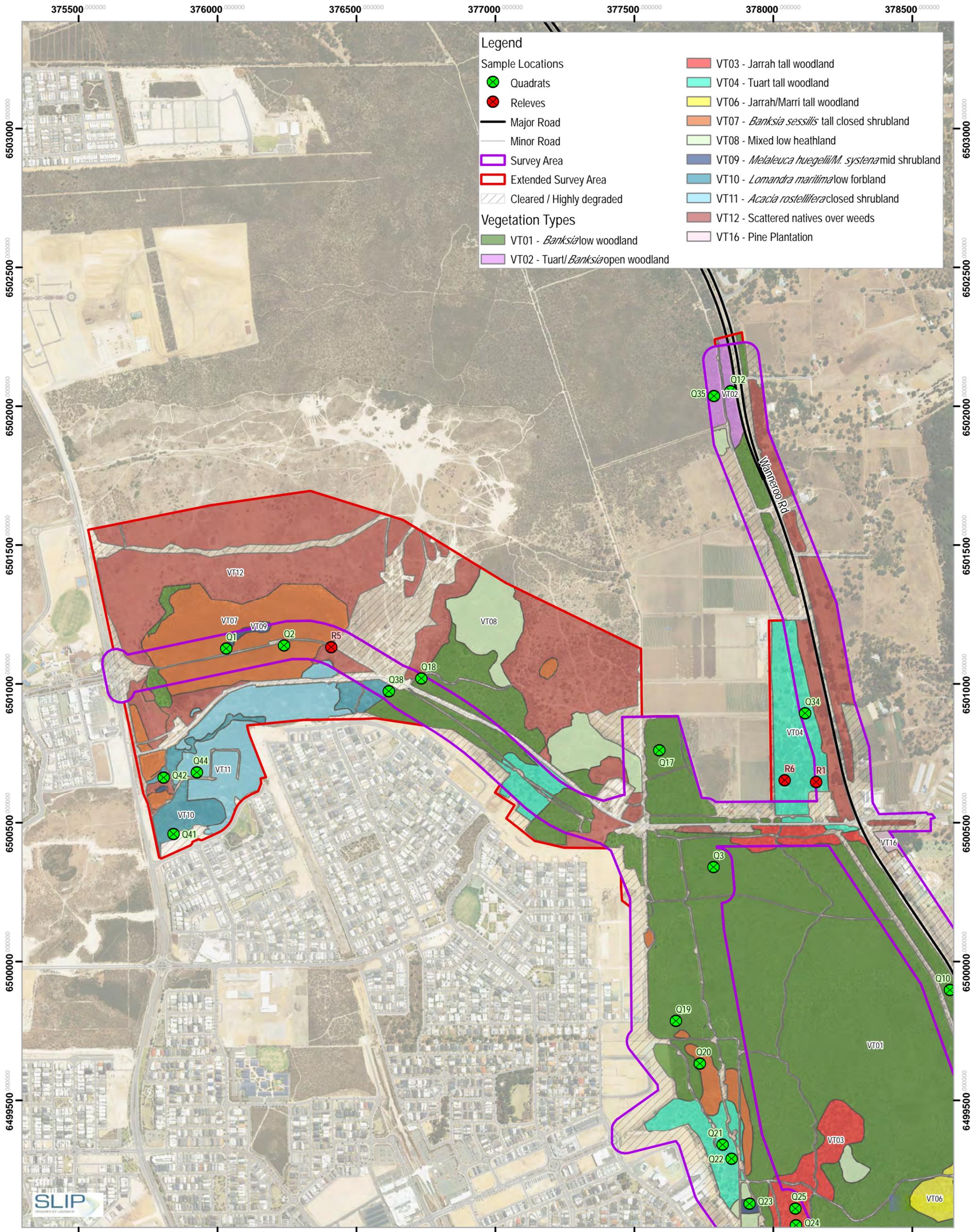
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Hydrology Constraints

FIGURE 4

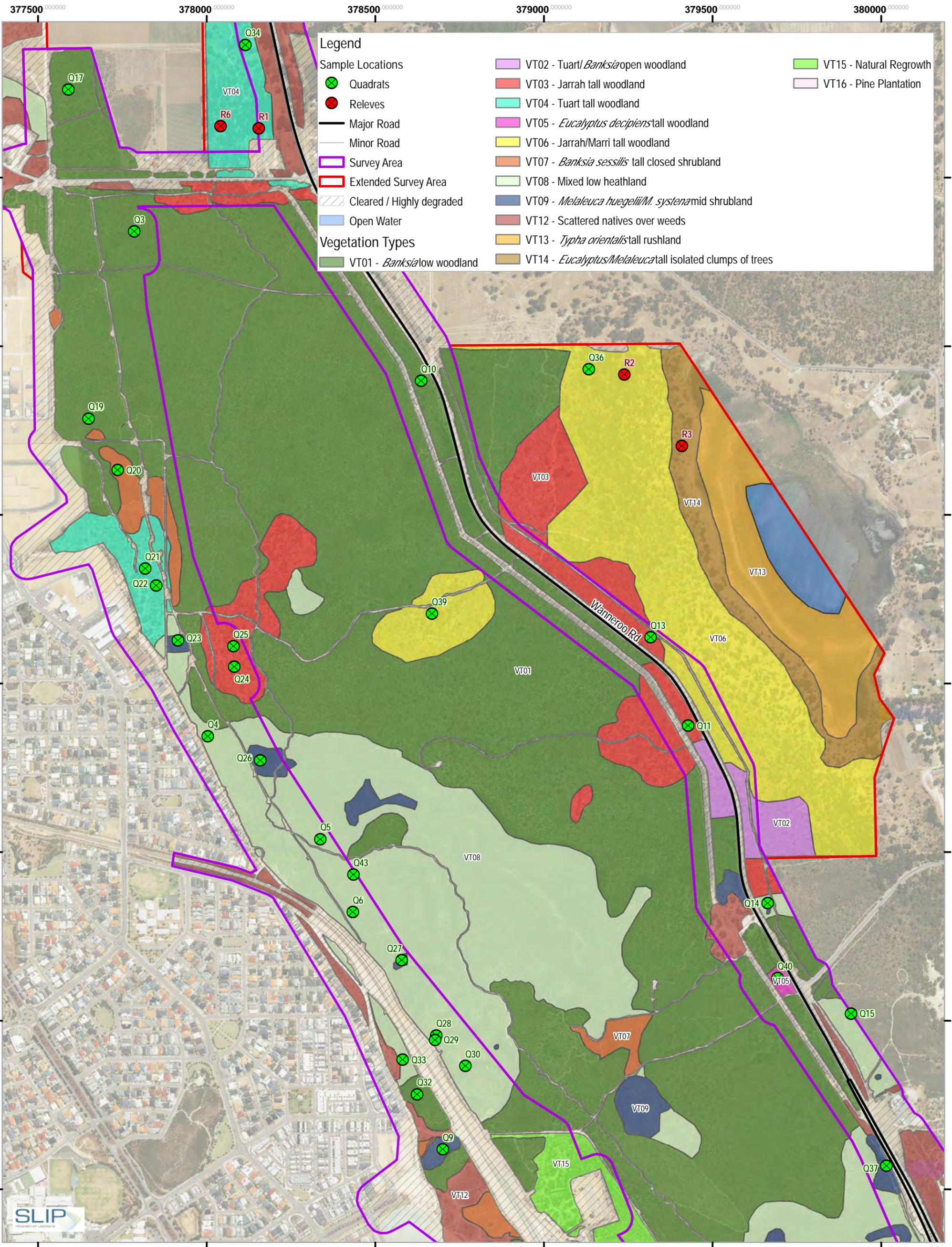
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Date 23/07/2019

**Vegetation Type, Quadrat
and Relve Locations**



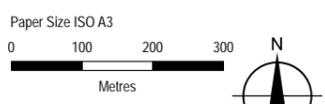
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Sample Locations

- Quadrats (Green circle with 'X')
- Relieves (Red circle with 'X')
- Major Road (Thick black line)
- Minor Road (Thin grey line)
- Survey Area (Purple outline)
- Extended Survey Area (Red outline)
- Cleared / Highly degraded (Hatched pattern)
- Open Water (Blue)

Vegetation Types

- VT01 - *Banksia* low woodland
- VT02 - Tuart/*Banksia* open woodland
- VT03 - Jarrah tall woodland
- VT04 - Tuart tall woodland
- VT05 - *Eucalyptus decipiens* tall woodland
- VT06 - Jarrah/Marri tall woodland
- VT07 - *Banksia sessilis* tall closed shrubland
- VT08 - Mixed low heathland
- VT09 - *Melaleuca huegelii*/*M. systema* mid shrubland
- VT10 - Scattered natives over weeds
- VT11 - *Typha orientalis* tall rushland
- VT12 - *Eucalyptus/Melaleuca* tall isolated clumps of trees
- VT13 - *Typha orientalis* tall rushland
- VT14 - *Eucalyptus/Melaleuca* tall isolated clumps of trees
- VT15 - Natural Regrowth
- VT16 - Pine Plantation



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 Grid: GDA 1994 MGA Zone 50

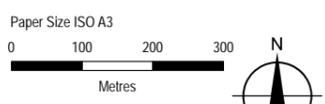
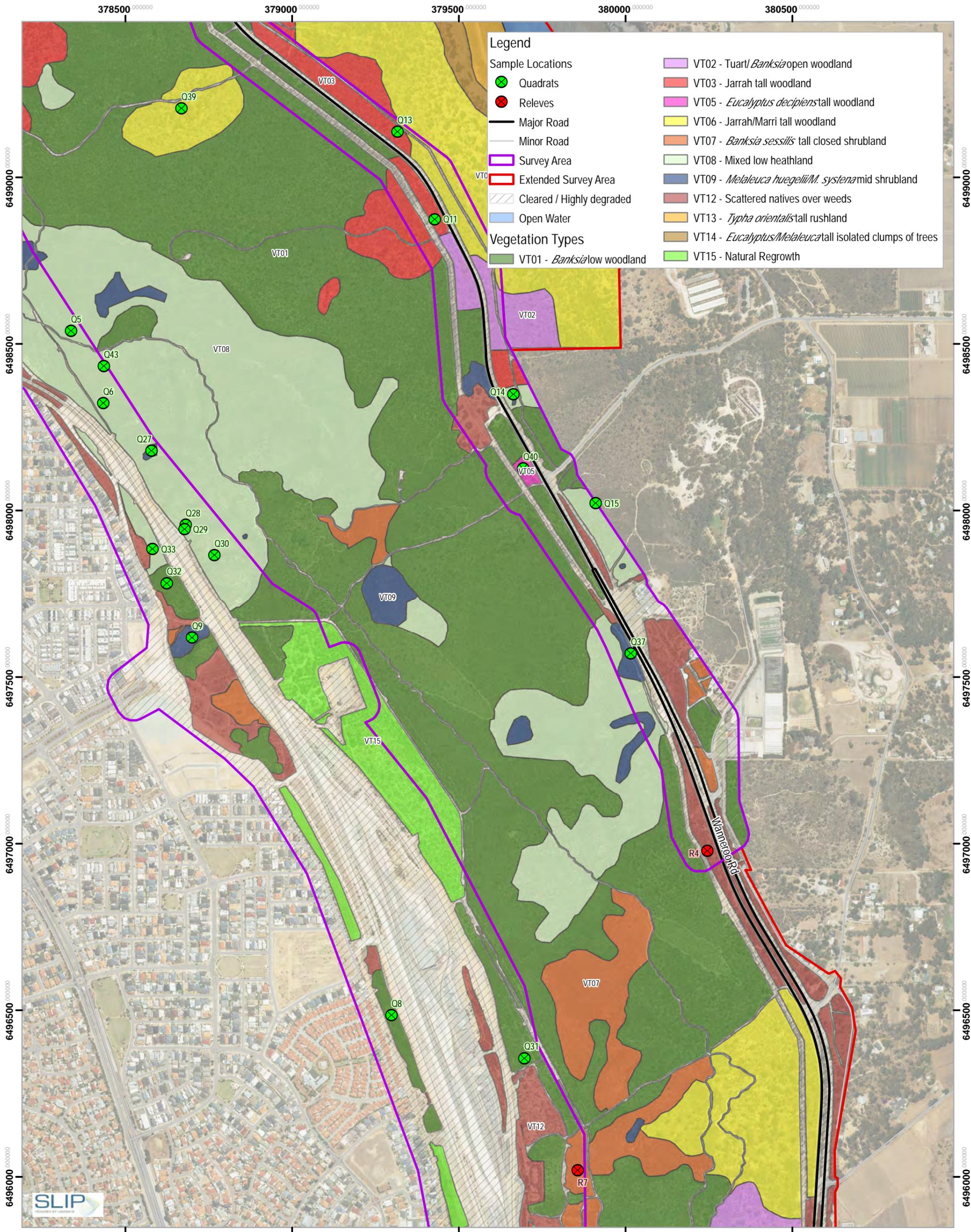


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**Vegetation Type, Quadrat
 and Releve Locations**

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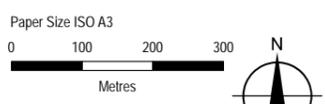
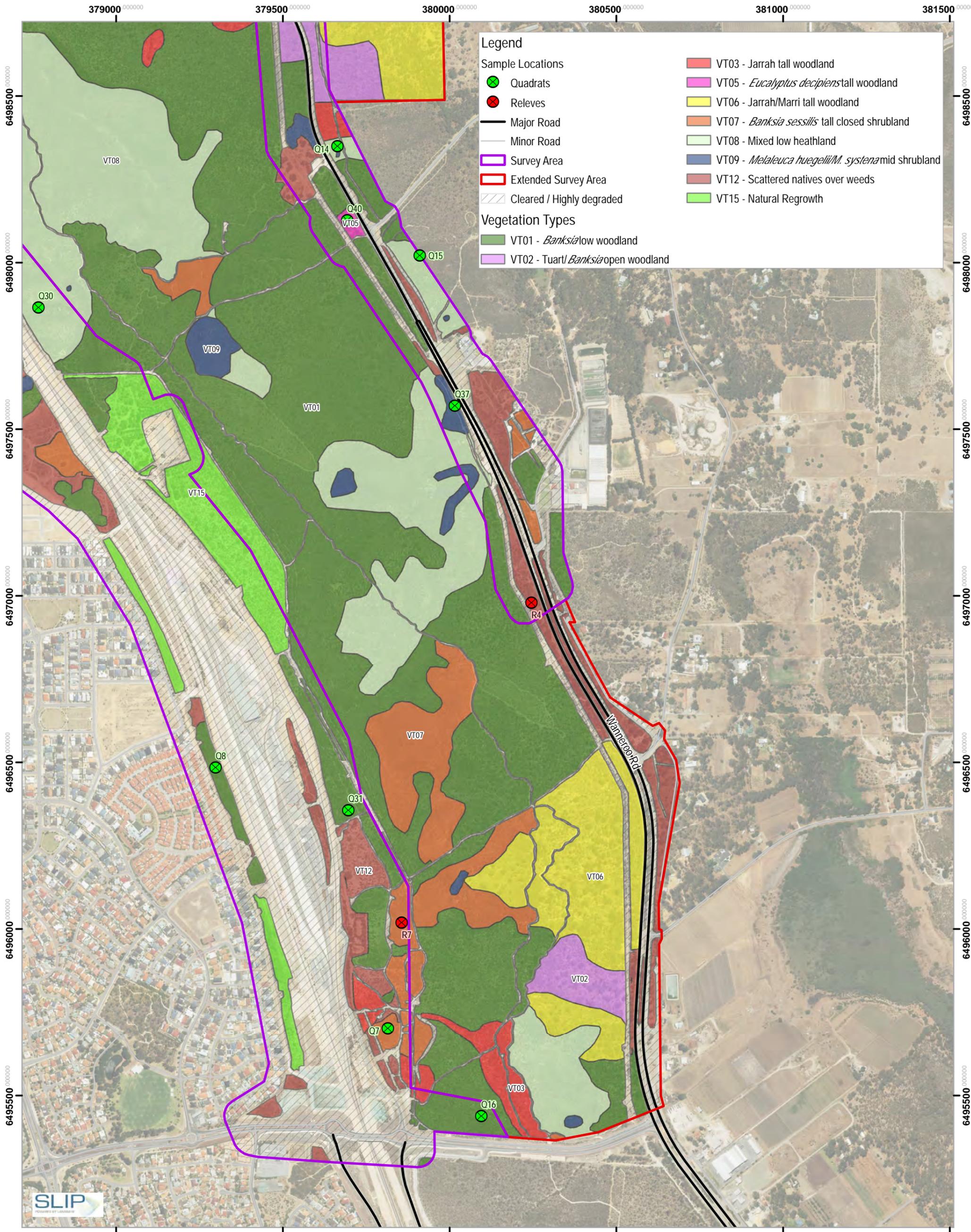
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Main Roads WA
 Mitchell Freeway Extension Hester Avenue
 to Romeo Road Biological Surveys

Vegetation Type, Quadrat
 and Releve Locations

Project No. 61-37375
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 Date 23/07/2019



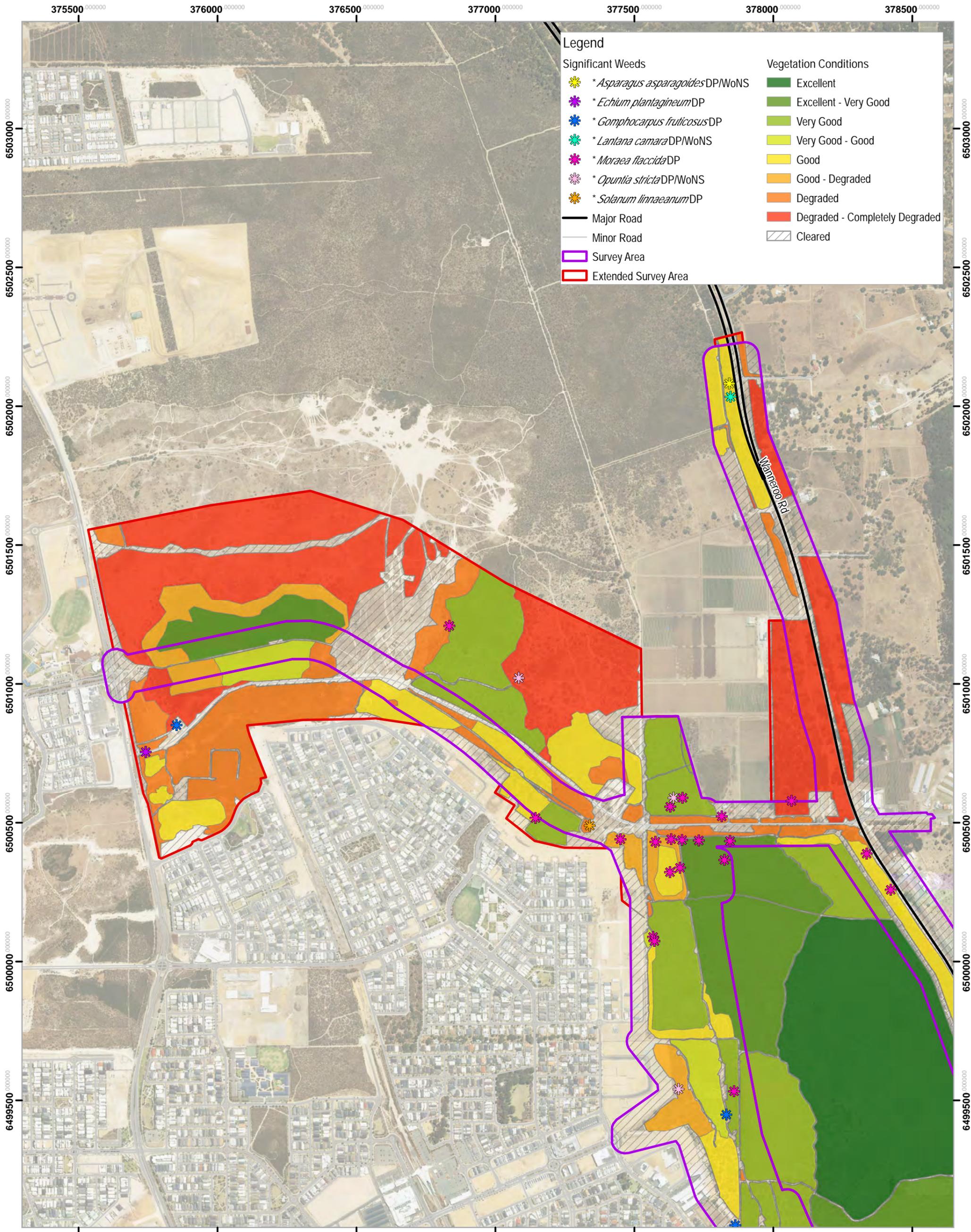
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Main Roads WA
 Mitchell Freeway Extension Hester Avenue
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Vegetation Type, Quadrat
 and Releve Locations

Project No. 61-37375
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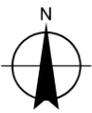


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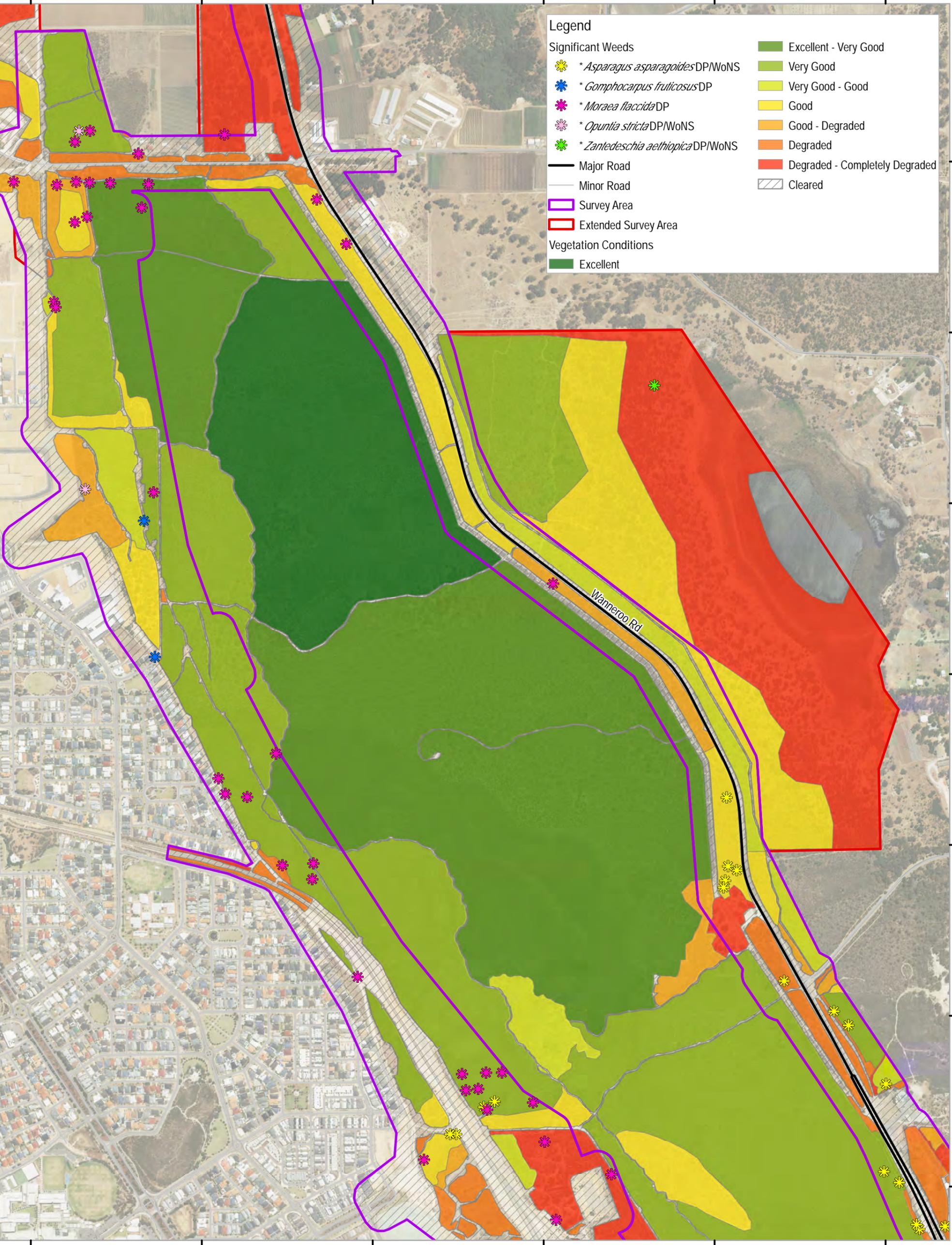
Main Roads WA
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to Romeo Road Biological Surveys

Vegetation Condition
and Significant Weeds

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Revision No. 0
Date 23/07/2019

FIGURE 6
Page 1 of 4

377500 378000 378500 379000 379500 380000



Legend

Significant Weeds

- * *Asparagus asparagoides* DP/WoNS
- * *Gomphocarpus fruticosus* DP
- * *Moraea flaccida* DP
- * *Opuntia stricta* DP/WoNS
- * *Zantedeschia aethiopica* DP/WoNS

Vegetation Conditions

- Excellent - Very Good
- Very Good
- Very Good - Good
- Good
- Good - Degraded
- Degraded
- Degraded - Completely Degraded
- Cleared

Roads

- Major Road
- Minor Road

Survey Areas

- Survey Area
- Extended Survey Area

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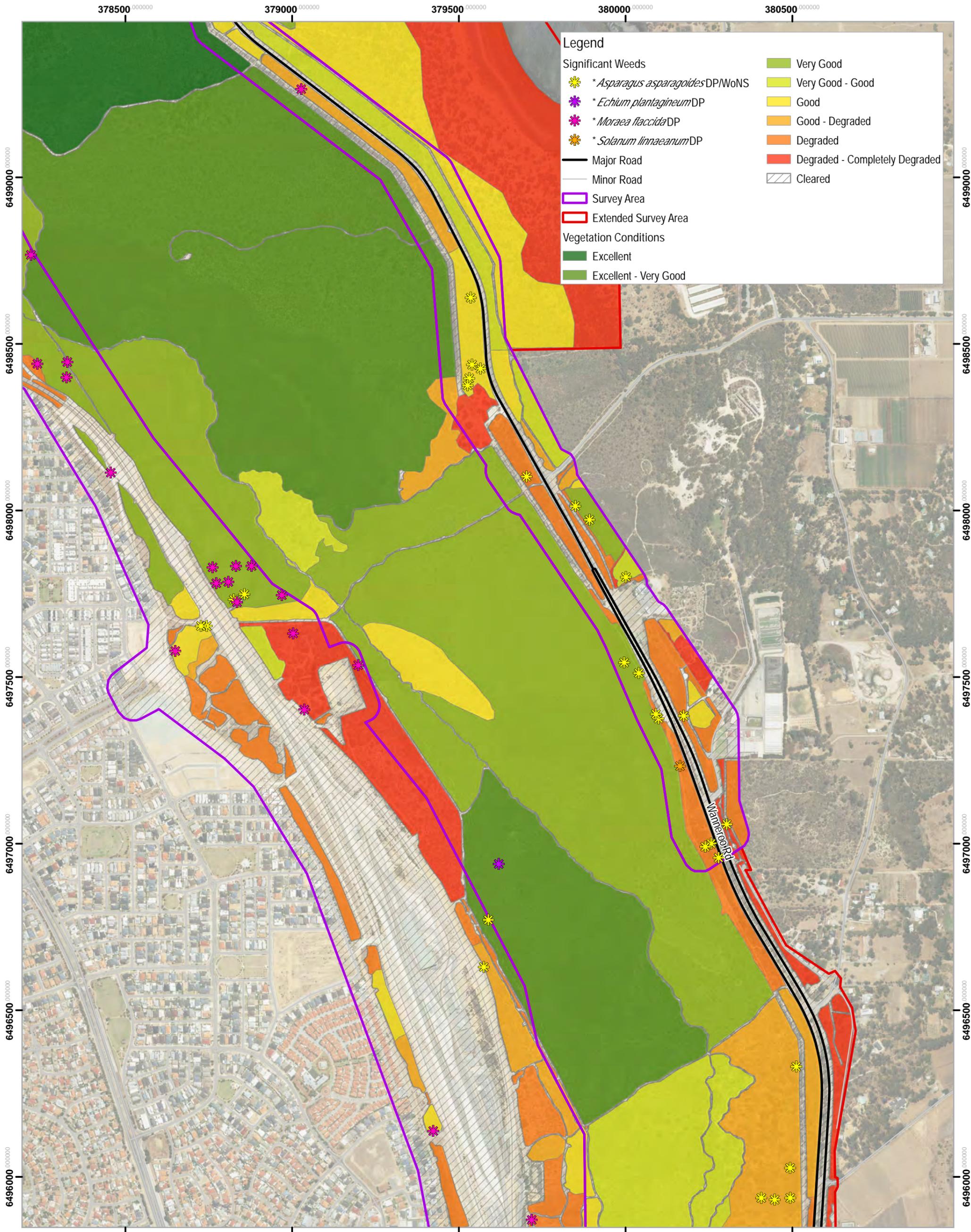


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Project No. 61-37375
Revision No. 0
Date 23/07/2019

**Vegetation Condition
and Significant Weeds**

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Legend

Significant Weeds

- * *Asparagus asparagoides* DP/WoNS
- * *Echium plantagineum* DP
- * *Moraea flaccida* DP
- * *Solanum linnaeanum* DP

Roads

- Major Road
- Minor Road

Survey Areas

- Survey Area
- Extended Survey Area

Vegetation Conditions

- Excellent
- Excellent - Very Good

Vegetation Condition Legend

- Very Good
- Very Good - Good
- Good
- Good - Degraded
- Degraded
- Degraded - Completely Degraded
- Cleared

Paper Size ISO A3

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50



Main Roads WA
Mitchell Freeway Extension Hester Avenue
to Romeo Road Biological Surveys

**Vegetation Condition
and Significant Weeds**

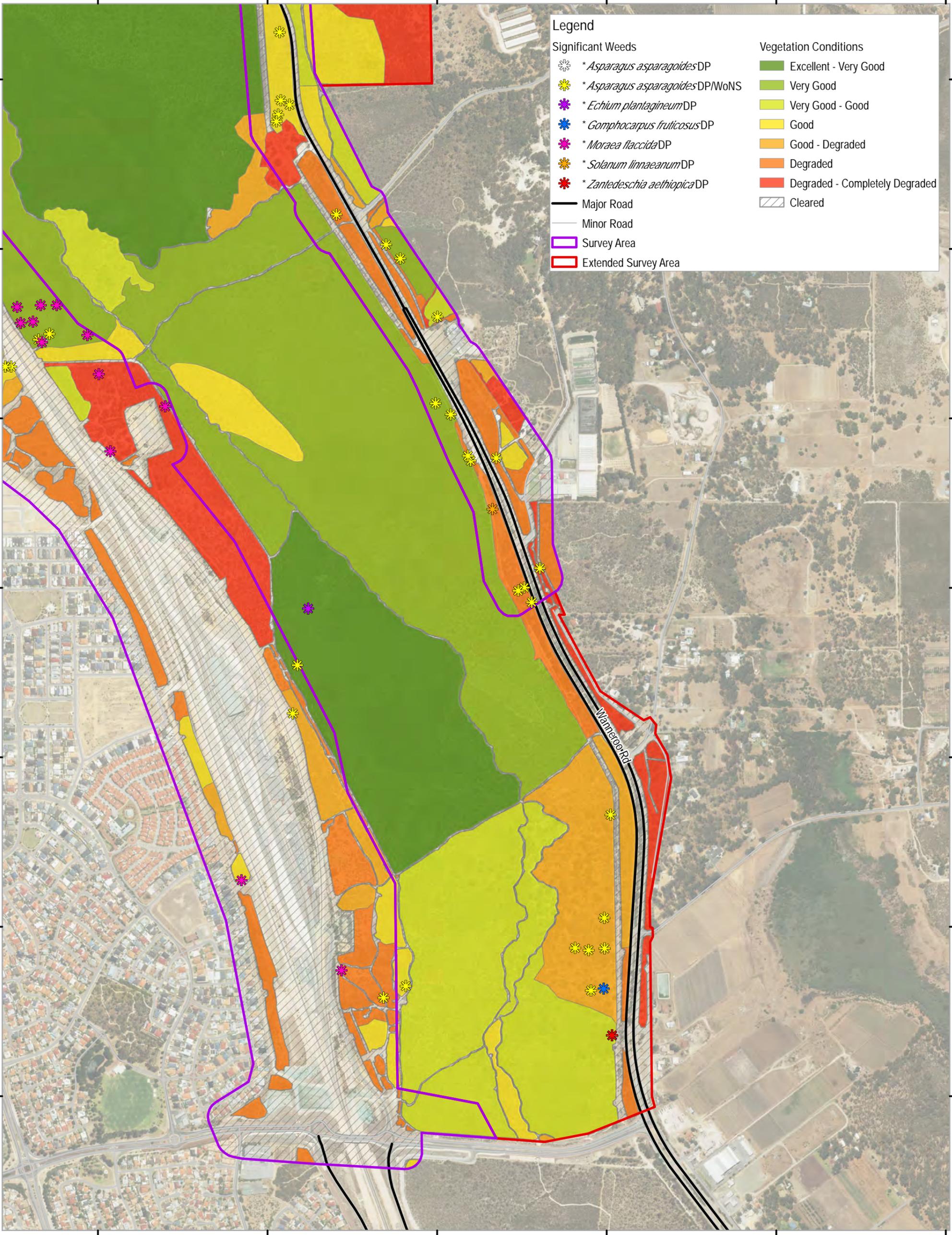
Project No. 61-37375
Revision No. 0
Date 23/07/2019

FIGURE 6
Page 3 of 4

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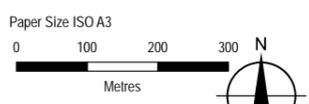
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Legend

Significant Weeds		Vegetation Conditions	
	* <i>Asparagus asparagoides</i> DP		Excellent - Very Good
	* <i>Asparagus asparagoides</i> DP/WoNS		Very Good
	* <i>Echium plantagineum</i> DP		Very Good - Good
	* <i>Gomphocarpus fruticosus</i> DP		Good
	* <i>Moraea flaccida</i> DP		Good - Degraded
	* <i>Solanum linnaeanum</i> DP		Degraded
	* <i>Zantedeschia aethiopica</i> DP		Degraded - Completely Degraded
	Major Road		Cleared
	Minor Road		
	Survey Area		
	Extended Survey Area		



Map Projection: Transverse Mercator
 Horizontal Datum: GDA 1994
 Grid: GDA 1994 MGA Zone 50



Main Roads WA
 Mitchell Freeway Extension Hester Avenue
 to Romeo Road Biological Surveys

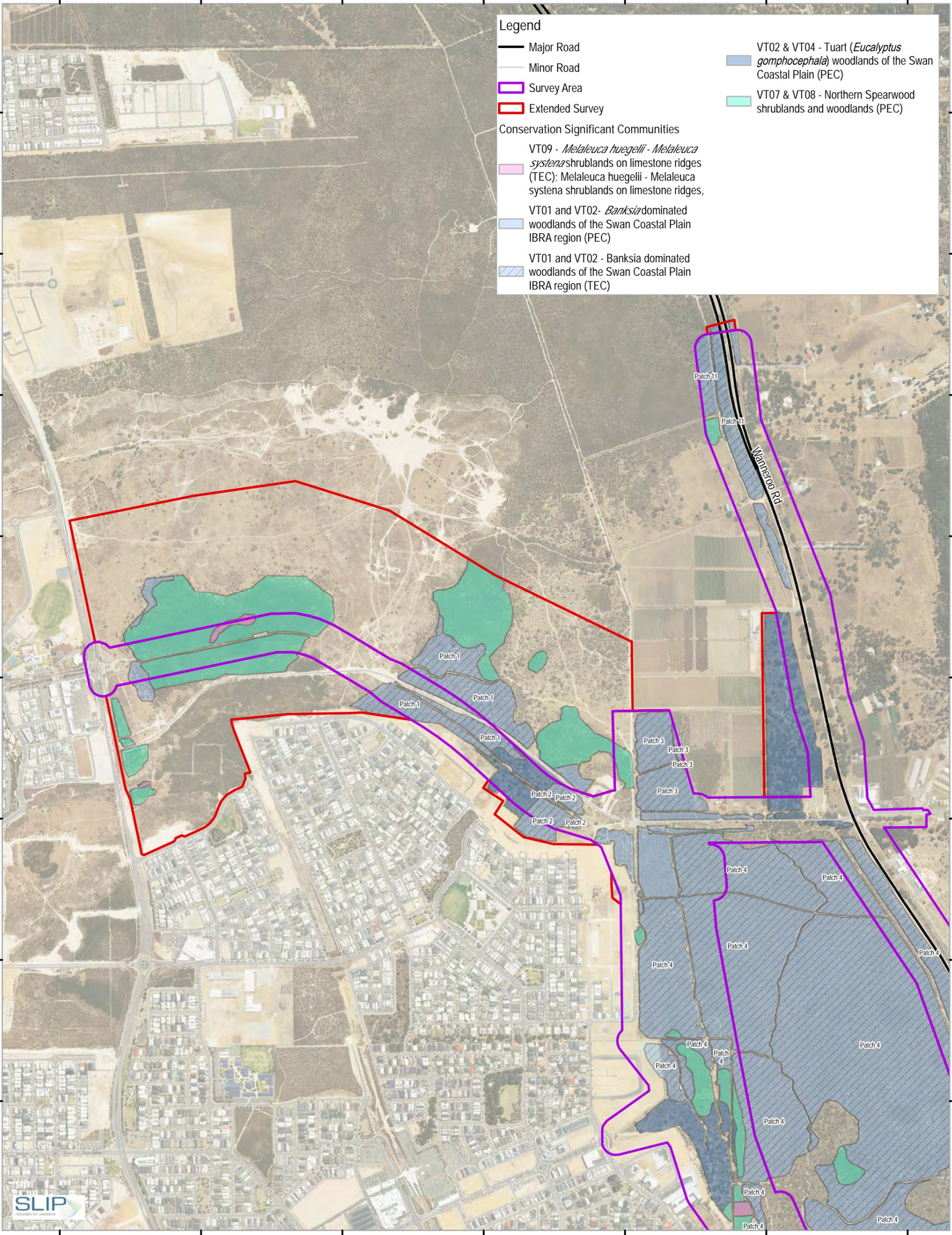
**Vegetation Condition
 and Significant Weeds**

Project No. 61-37375
 Revision No. 0
 Date 23/07/2019

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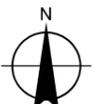
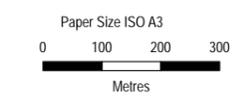


Legend

- Major Road
- Minor Road
- ▭ Survey Area
- ▭ Extended Survey

Conservation Significant Communities

- VT09 - *Melaleuca huegelii* - *Melaleuca systema* shrublands on limestone ridges (TEC); *Melaleuca huegelii* - *Melaleuca systema* shrublands on limestone ridges, (PEC)
- VT01 and VT02 - *Banksia* dominated woodlands of the Swan Coastal Plain IBRA region (PEC)
- VT01 and VT02 - *Banksia* dominated woodlands of the Swan Coastal Plain IBRA region (TEC)
- VT02 & VT04 - Tuart (*Eucalyptus gomphocephala*) woodlands of the Swan Coastal Plain (PEC)
- VT07 & VT08 - Northern Spearwood shrublands and woodlands (PEC)



Map Projection: Transverse Mercator
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Grid: GDA 1994 MGA Zone 50

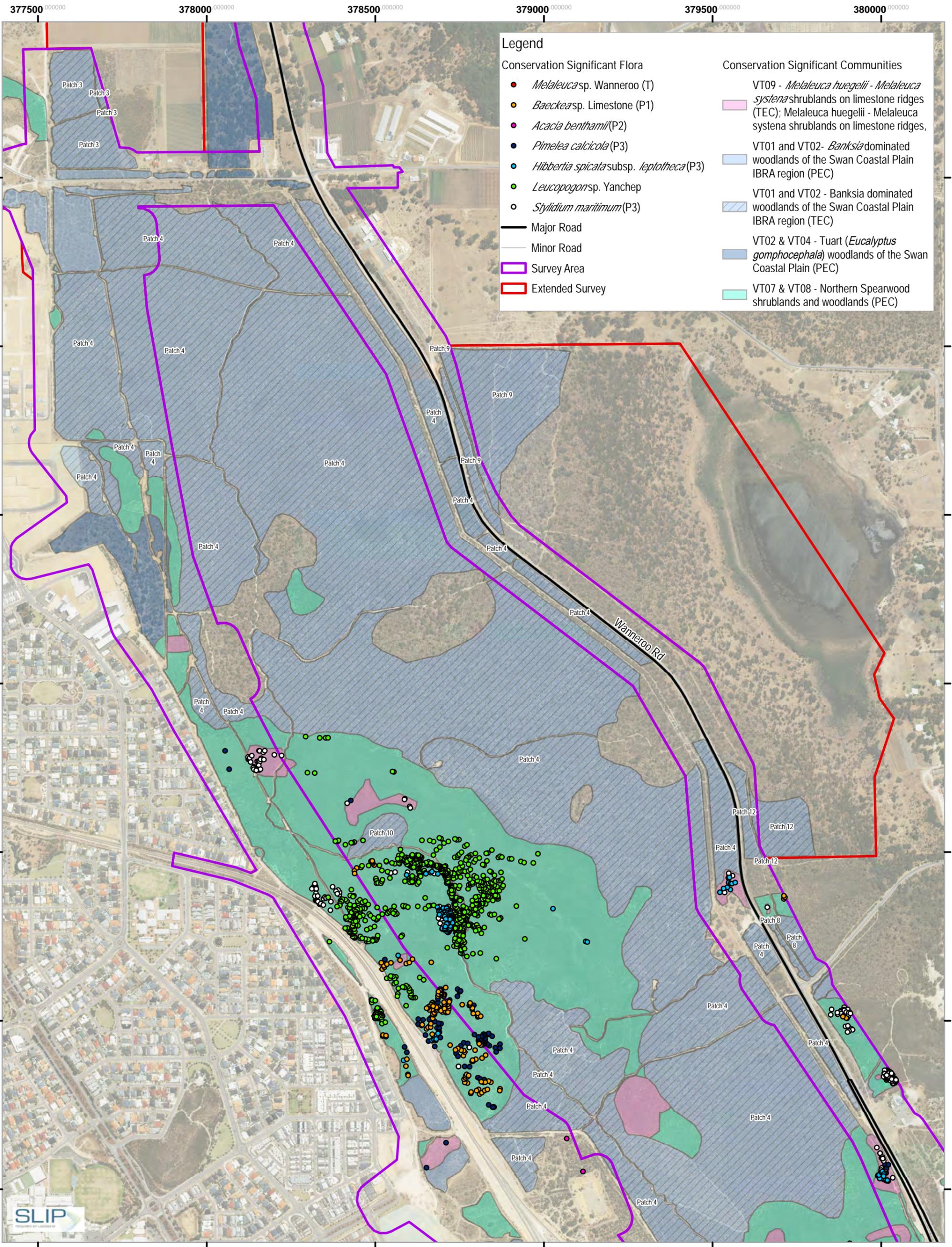


Main Roads WA
Mitchell Freeway Extension Hester Avenue
to Romeo Road Biological Surveys

Conservation Significant Communities
and Flora

Project No. 61-37375
Revision No. 0
Date 23/07/2019

FIGURE 7
Page 1 of 4



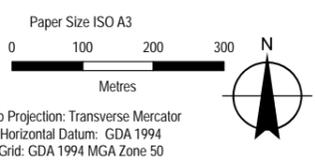
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Conservation Significant Flora

- *Melaleuca* sp. Wanneroo (T)
- *Baeckea* sp. Limestone (P1)
- *Acacia benthamii* (P2)
- *Pimelea calcicola* (P3)
- *Hibbertia spicata* subsp. *leptotheca* (P3)
- *Leucopogon* sp. Yanchep
- *Styliidium maritimum* (P3)
- Major Road
- Minor Road
- ▭ Survey Area
- ▭ Extended Survey

Conservation Significant Communities

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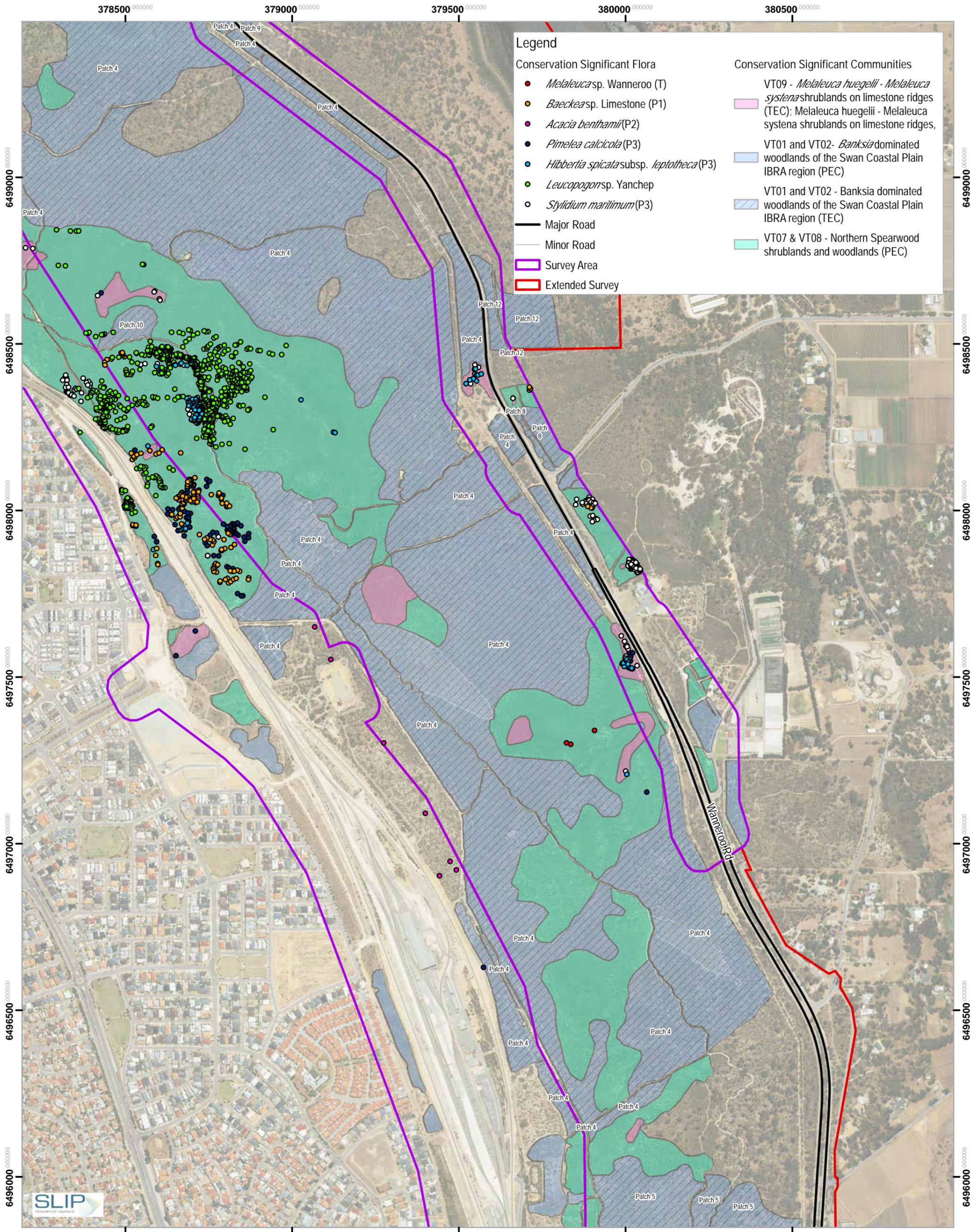


Main Roads WA
Mitchell Freeway Extension Hester Avenue
to Romeo Road Biological Surveys

**Conservation Significant Communities
and Flora**

Project No. 61-37375
Revision No. 0
Date 23/07/2019

FIGURE 7
Page 2 of 4



Legend

Conservation Significant Flora

- *Melaleuca* sp. Wanneroo (T)
- *Baeckea* sp. Limestone (P1)
- *Acacia benthamii* (P2)
- *Pimelea calcicola* (P3)
- *Hibbertia spicata* subsp. *leptotheca* (P3)
- *Leucopogon* sp. Yanchepp
- *Stylidium maritimum* (P3)
- Major Road
- Minor Road
- ▭ Survey Area
- ▭ Extended Survey

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Map Projection: Transverse Mercator
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 Grid: GDA 1994 MGA Zone 50



Main Roads WA
 Mitchell Freeway Extension Hester Avenue
 to Romeo Road Biological Surveys

Conservation Significant Communities and Flora

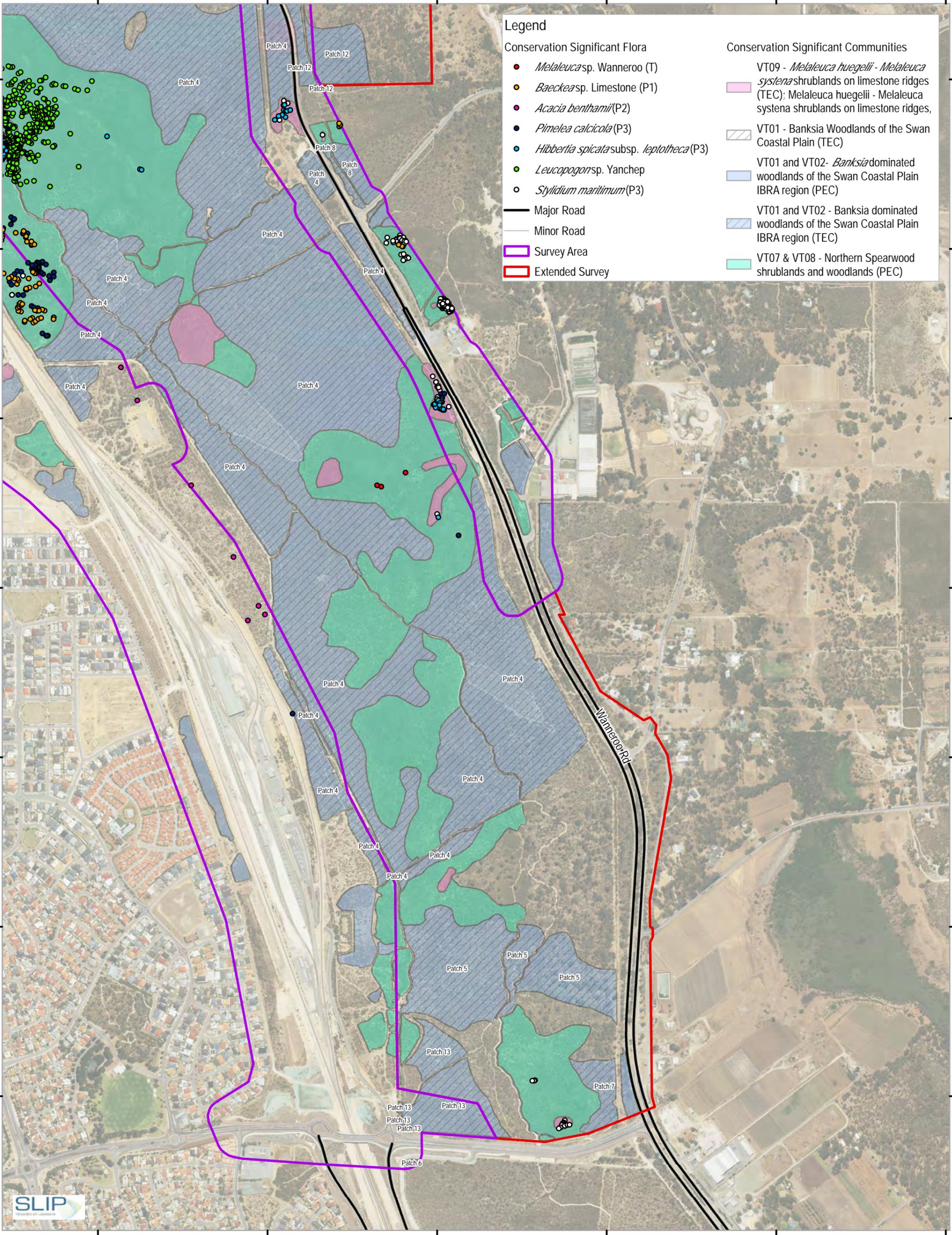
Project No. 61-37375
 Revision No. 0
 Date 23/07/2019

FIGURE 7
 Page 3 of 4

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Legend

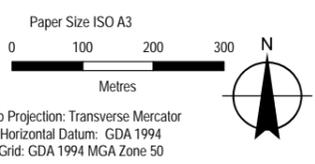
Conservation Significant Flora

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- *Baeckea* sp. Limestone (P1)
- *Acacia benthamii* (P2)
- *Pimelea calcicola* (P3)
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- Major Road
- Minor Road
- ▭ Survey Area
- ▭ Extended Survey

Conservation Significant Communities

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- VT01 and VT02 - *Banksia* dominated woodlands of the Swan Coastal Plain IBRA region (TEC)
- VT07 & VT08 - Northern Spearwood shrublands and woodlands (PEC)

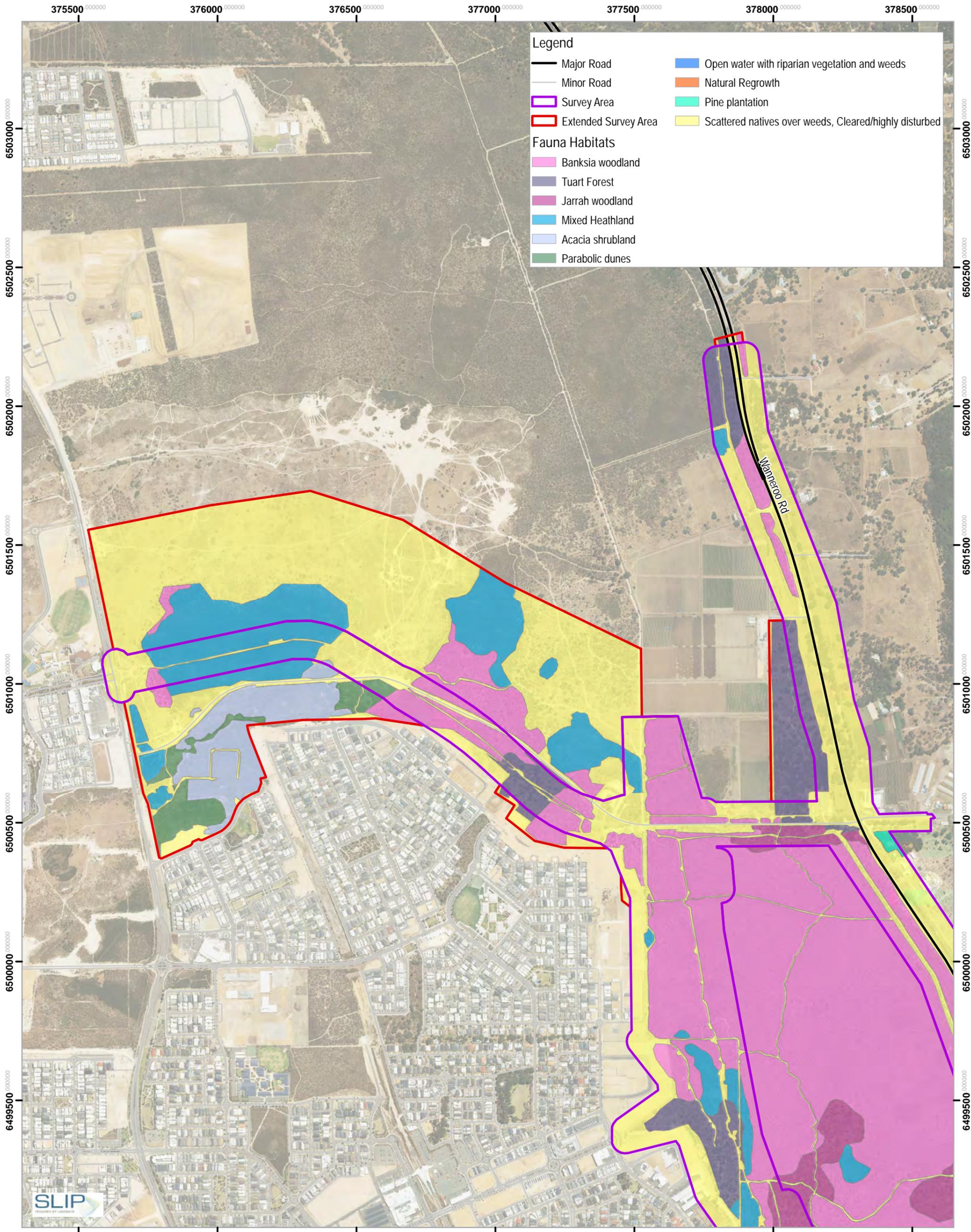


Main Roads WA
Mitchell Freeway Extension Hester Avenue
to Romeo Road Biological Surveys

**Conservation Significant Communities
and Flora**

Project No. 61-37375
Revision No. 0
Date 23/07/2019

FIGURE 7
Page 4 of 4

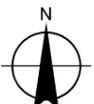
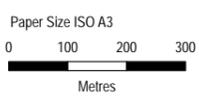


Legend

- Major Road
- Minor Road
- Survey Area
- Extended Survey Area
- Open water with riparian vegetation and weeds
- Natural Regrowth
- Pine plantation
- Scattered natives over weeds, Cleared/highly disturbed

Fauna Habitats

- Banksia woodland
- Tuart Forest
- Jarrah woodland
- Mixed Heathland
- Acacia shrubland
- Parabolic dunes



Map Projection: Transverse Mercator
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 Grid: GDA 1994 MGA Zone 50

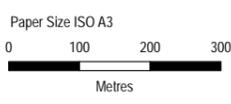
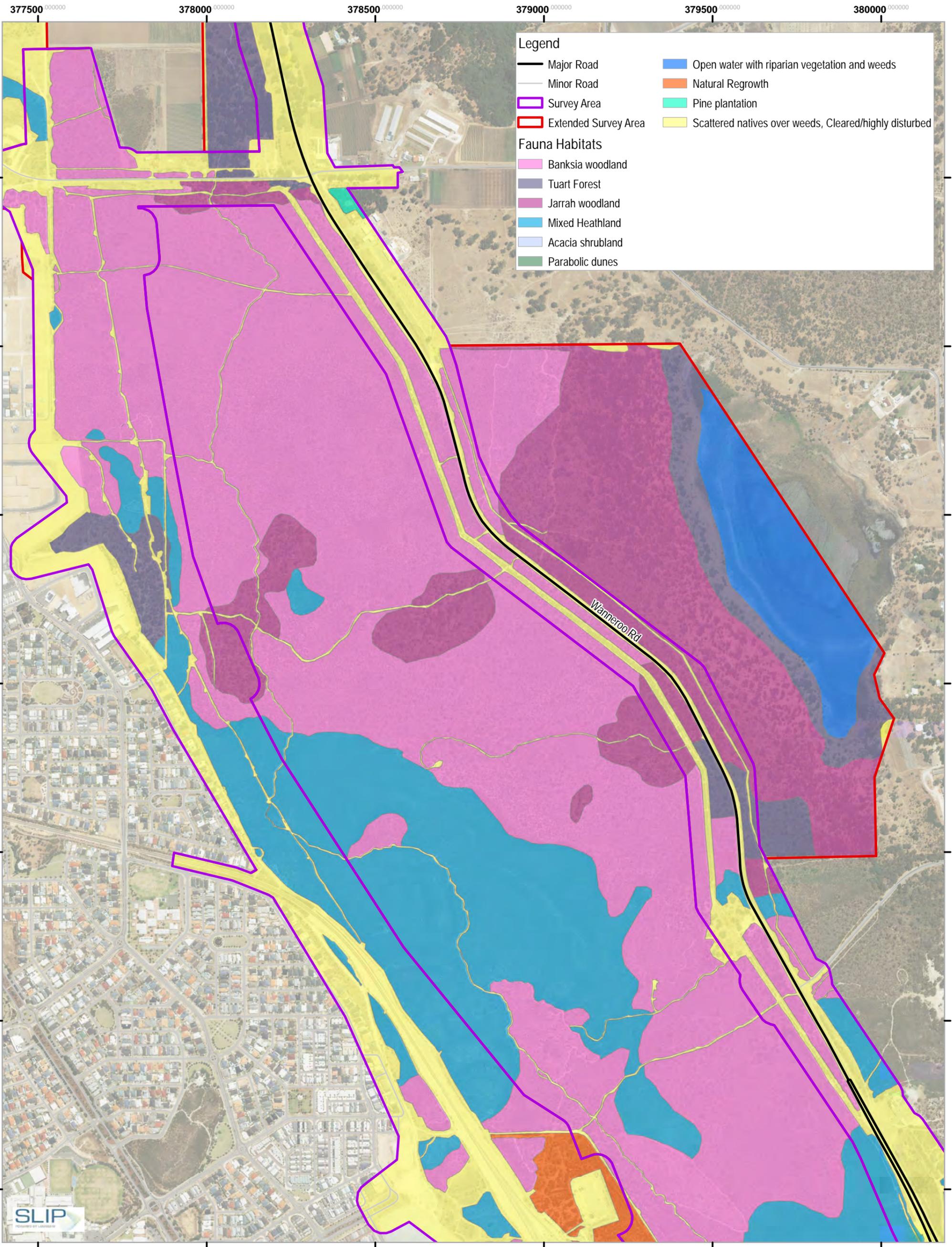


Main Roads WA
 Mitchell Freeway Extension Hester Avenue
 to Romeo Road Biological Surveys

Project No. 61-37375
 Revision No. 0
 Date 23/07/2019

Fauna Habitat Types

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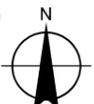
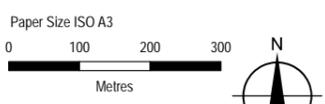
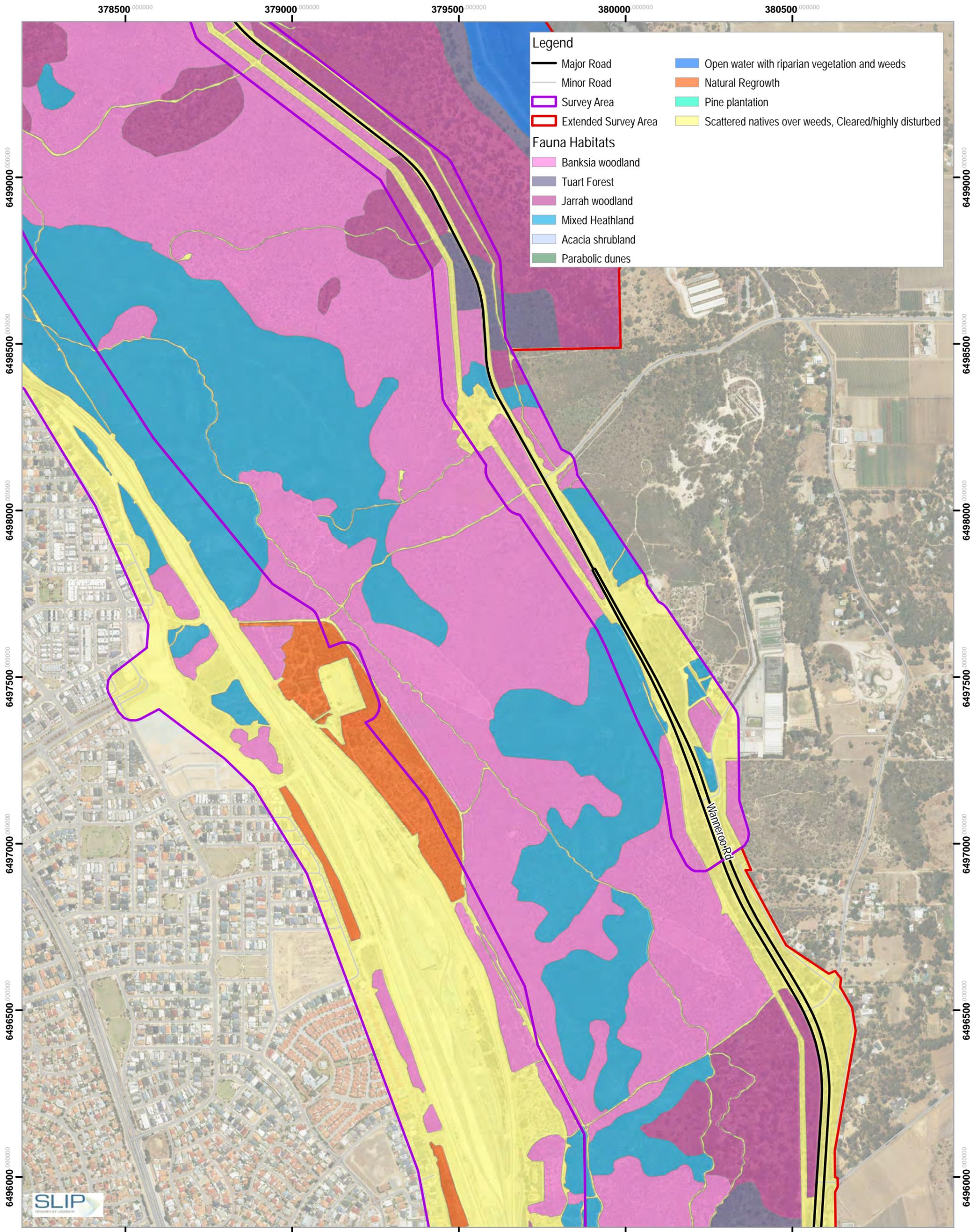
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Main Roads WA
Mitchell Freeway Extension Hester Avenue
to Romeo Road Biological Surveys

Project No. 61-37375
Revision No. 0
Date 23/07/2019

Fauna Habitat Types



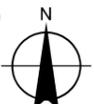
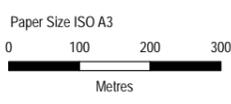
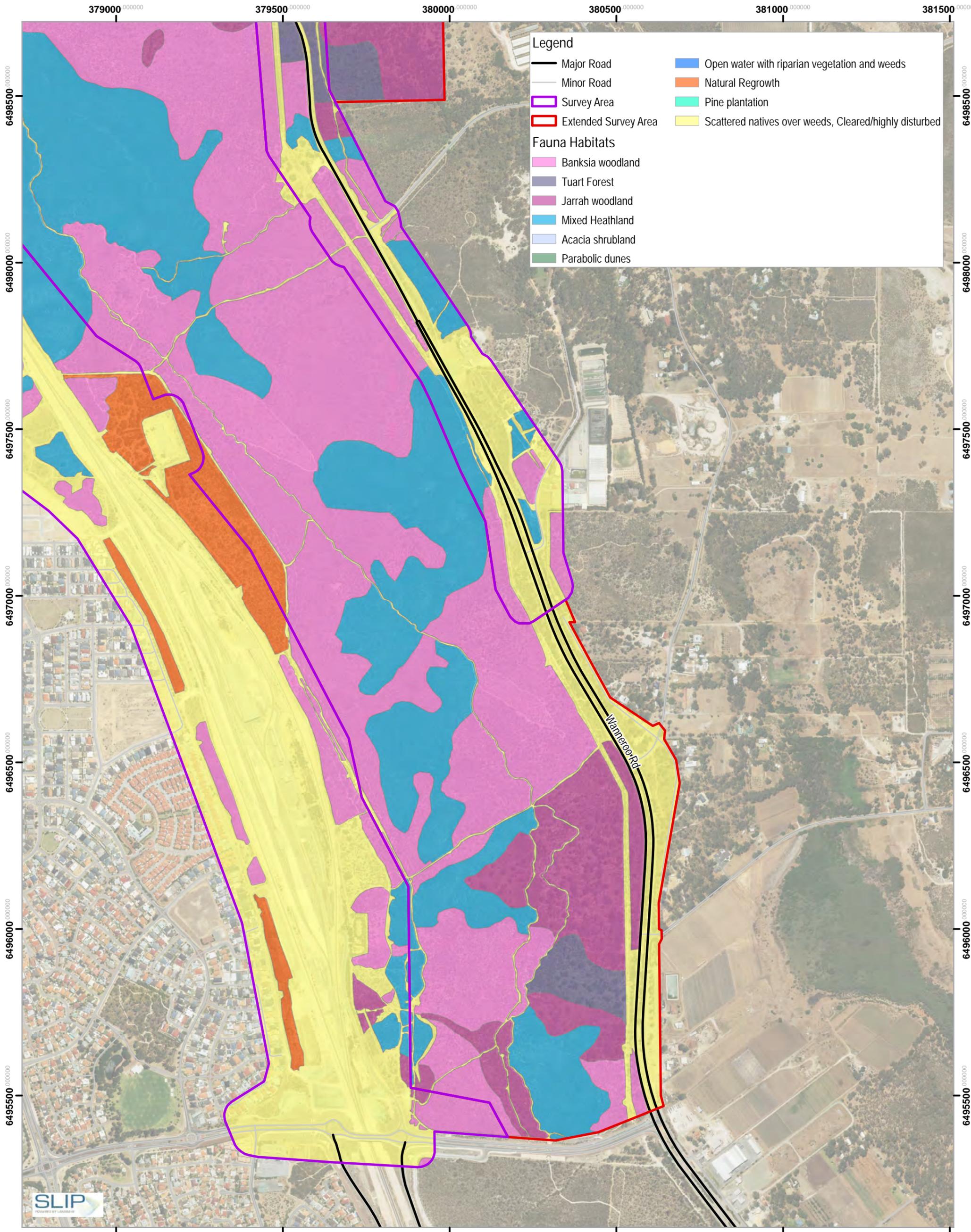
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Main Roads WA
Mitchell Freeway Extension Hester Avenue
to Romeo Road Biological Surveys

Fauna Habitat Types

Project No. 61-37375
Revision No. 0
Date 23/07/2019



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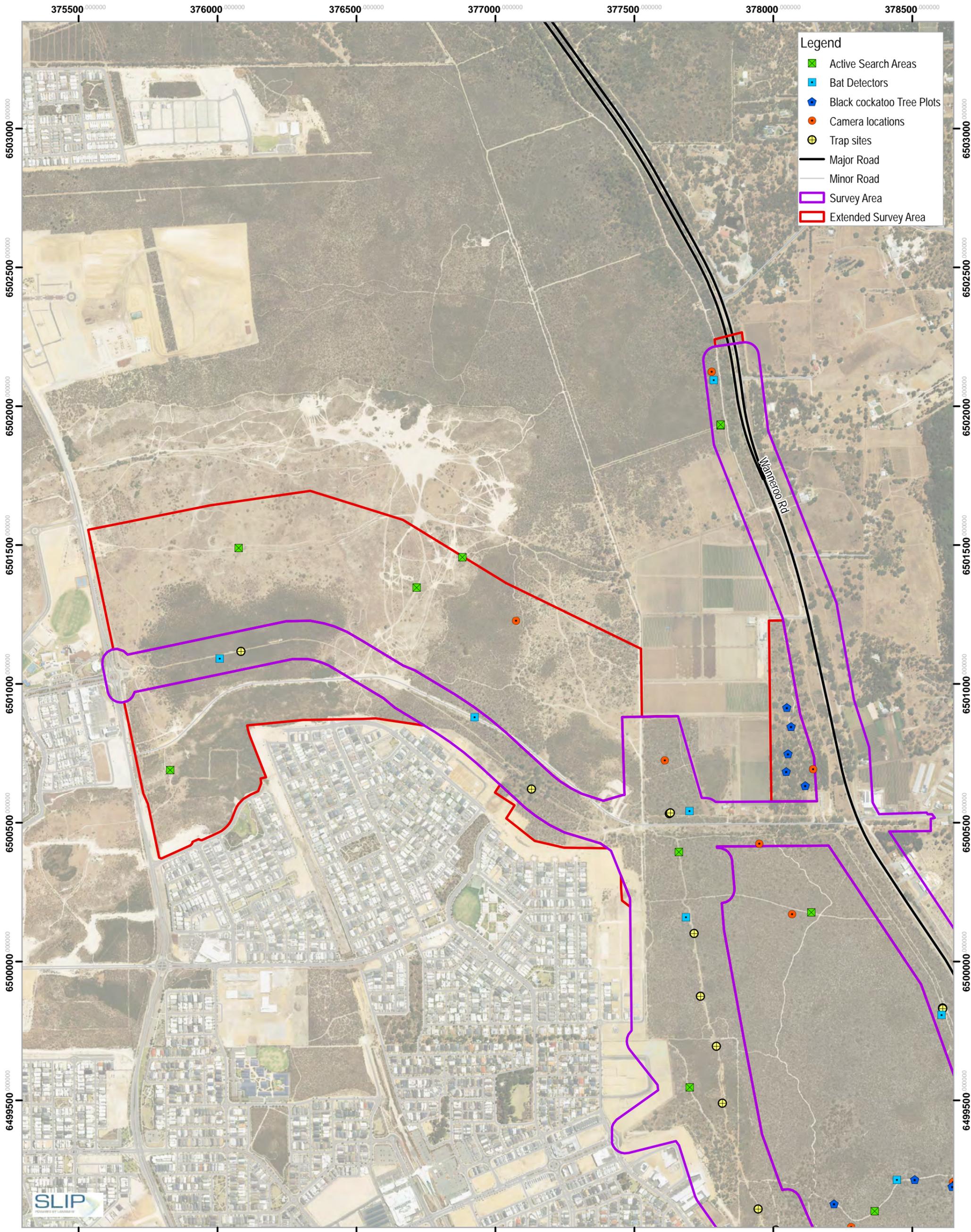


Main Roads WA
Mitchell Freeway Extension Hester Avenue
to Romeo Road Biological Surveys

Project No. 61-37375
Revision No. 0
Date 23/07/2019

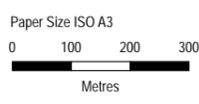
Fauna Habitat Types

FIGURE 8
Page 4 of 4



Legend

- Active Search Areas
- Bat Detectors
- ⬠ Black cockatoo Tree Plots
- Camera locations
- ⊕ Trap sites
- Major Road
- Minor Road
- ▭ Survey Area
- ▭ Extended Survey Area

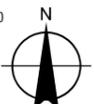
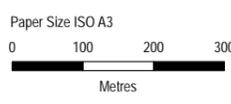
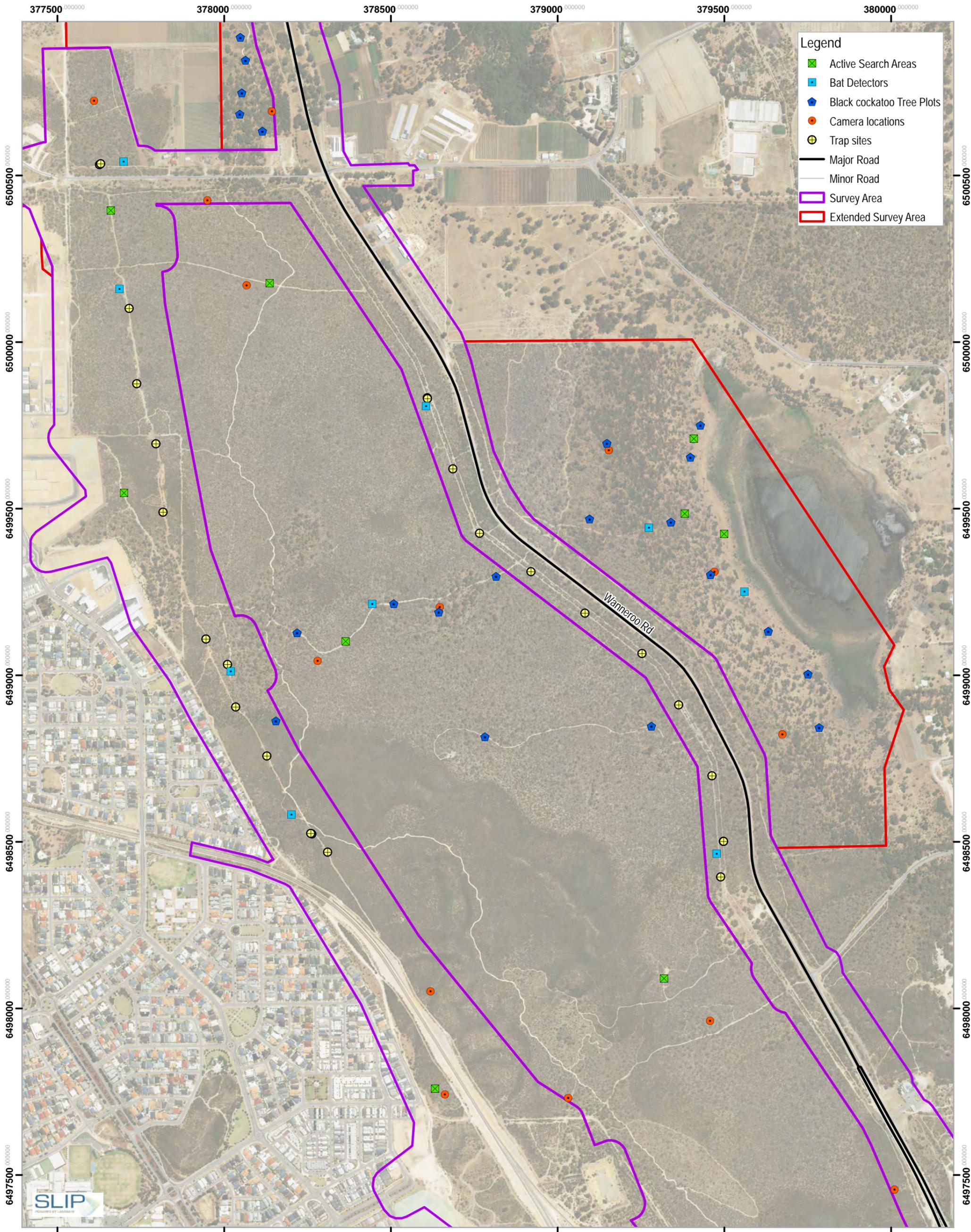


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Main Roads WA
 Mitchell Freeway Extension Hester Avenue
 to Romeo Road Biological Surveys

Project No. 61-37375
 Revision No. 0
 Date 23/07/2019

Fauna Survey Method



Map Projection: Transverse Mercator
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Grid: GDA 1994 MGA Zone 50

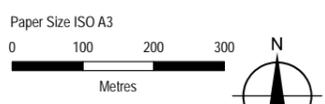
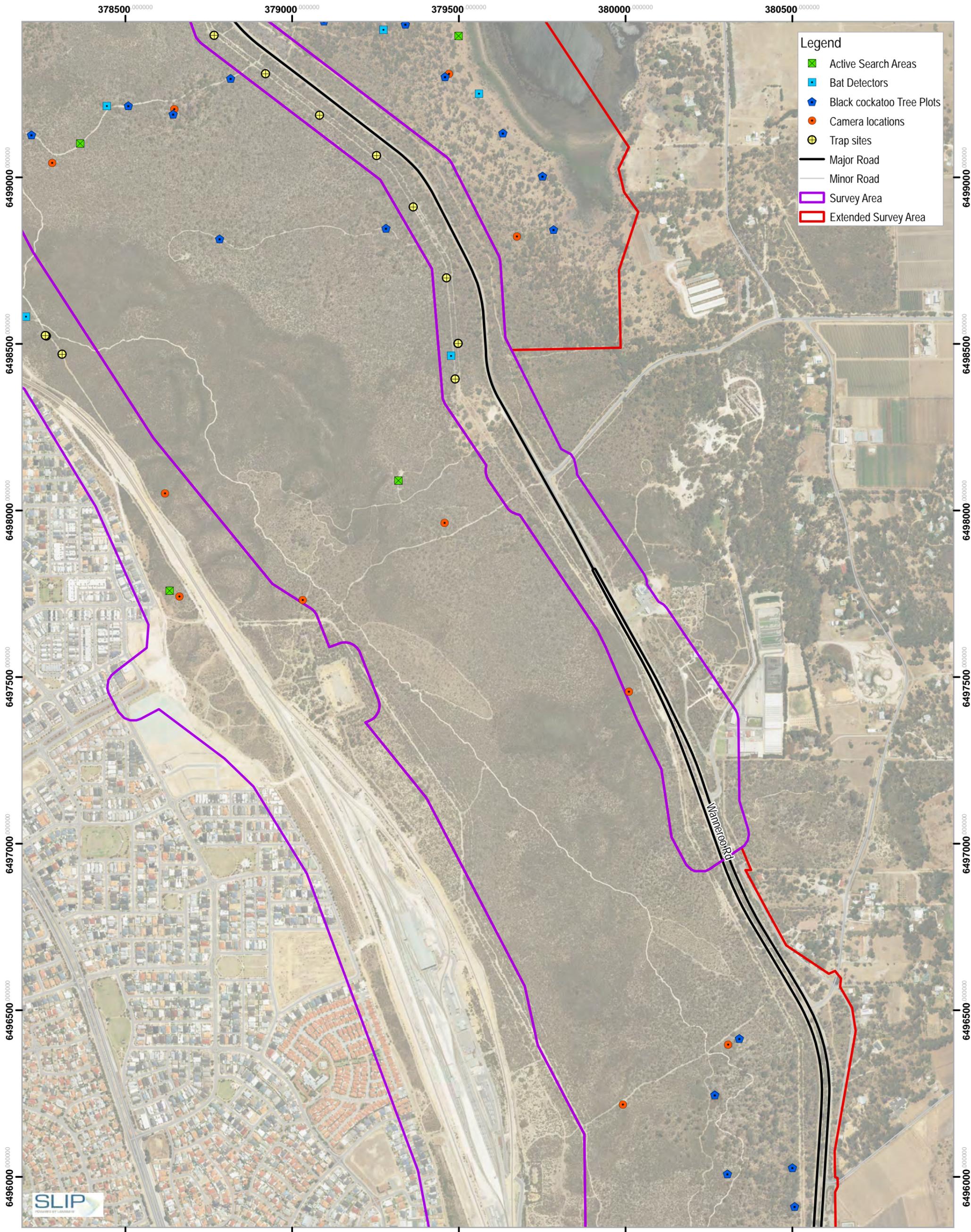


Main Roads WA
Mitchell Freeway Extension Hester Avenue
to Romeo Road Biological Surveys

Fauna Survey Method

Project No. 61-37375
Revision No. 0
Date 23/07/2019

FIGURE 9
Page 2 of 4



Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50



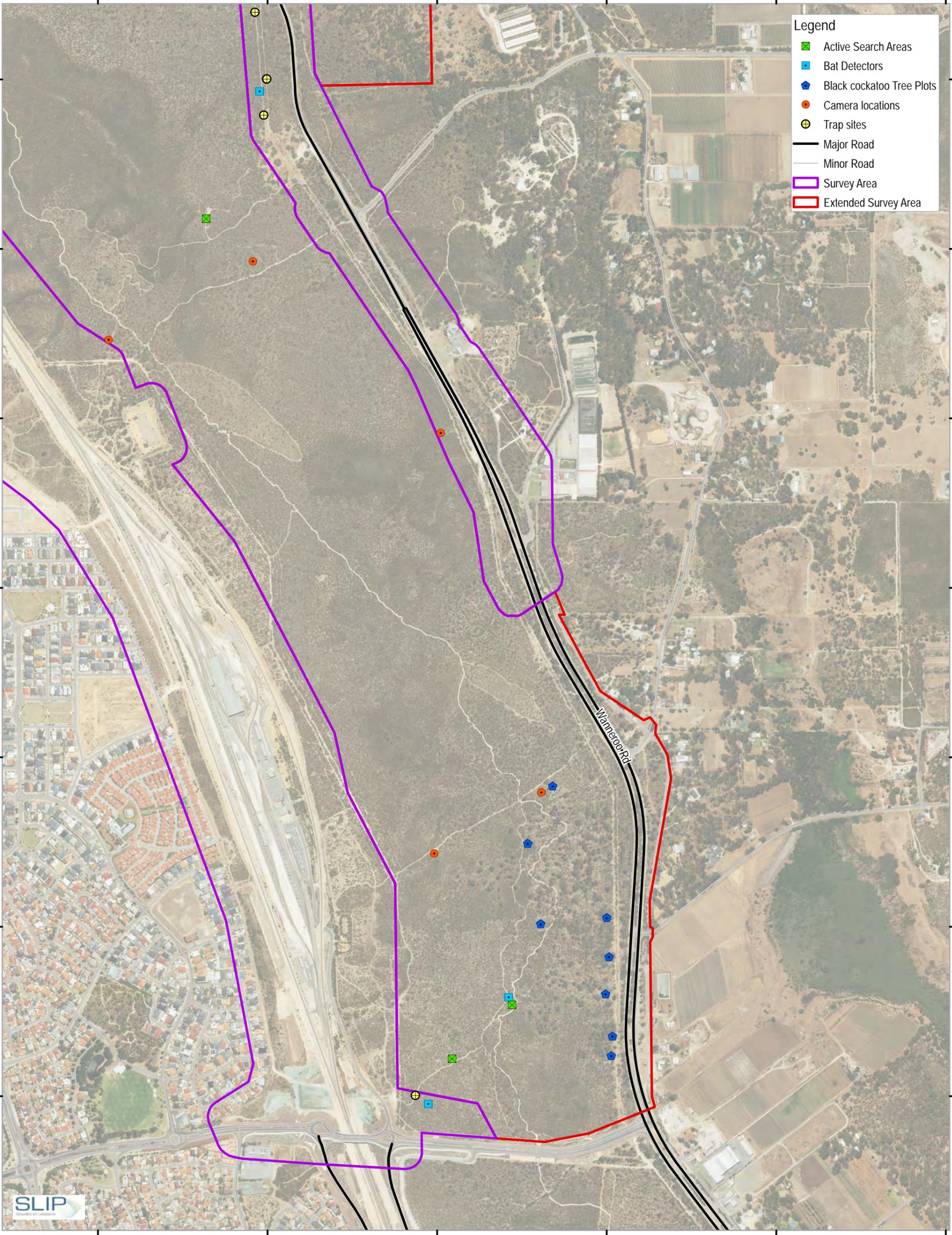
Main Roads WA
Mitchell Freeway Extension Hester Avenue
to Romeo Road Biological Surveys

Fauna Survey Method

Project No. 61-37375
Revision No. 0
Date 23/07/2019

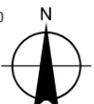
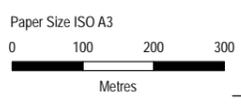
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Legend

- Active Search Areas
- Bat Detectors
- ⬠ Black cockatoo Tree Plots
- Camera locations
- ⊕ Trap sites
- Major Road
- Minor Road
- Survey Area
- Extended Survey Area



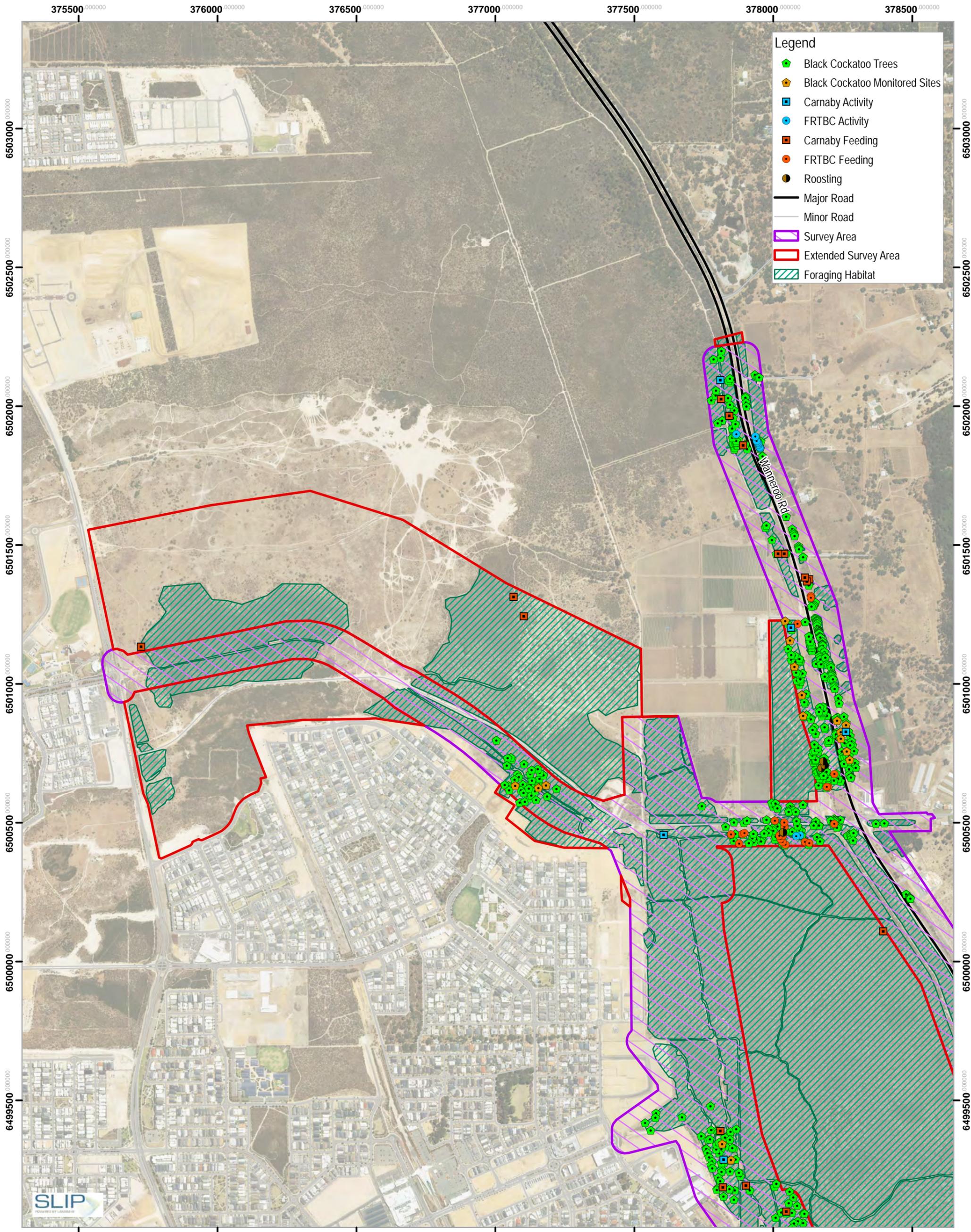
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Main Roads WA
 Mitchell Freeway Extension Hester Avenue
 to Romeo Road Biological Surveys

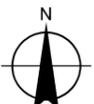
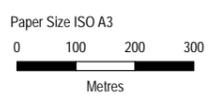
Fauna Survey Method

Project No. 61-37375
 Revision No. 0
 Date 23/07/2019



Legend

- ◆ Black Cockatoo Trees
- Black Cockatoo Monitored Sites
- Carnaby Activity
- FRTBC Activity
- Carnaby Feeding
- FRTBC Feeding
- Roosting
- Major Road
- Minor Road
- ▭ Survey Area
- ▭ Extended Survey Area
- ▨ Foraging Habitat



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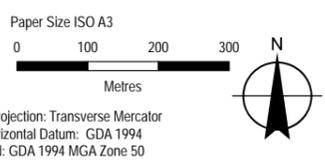
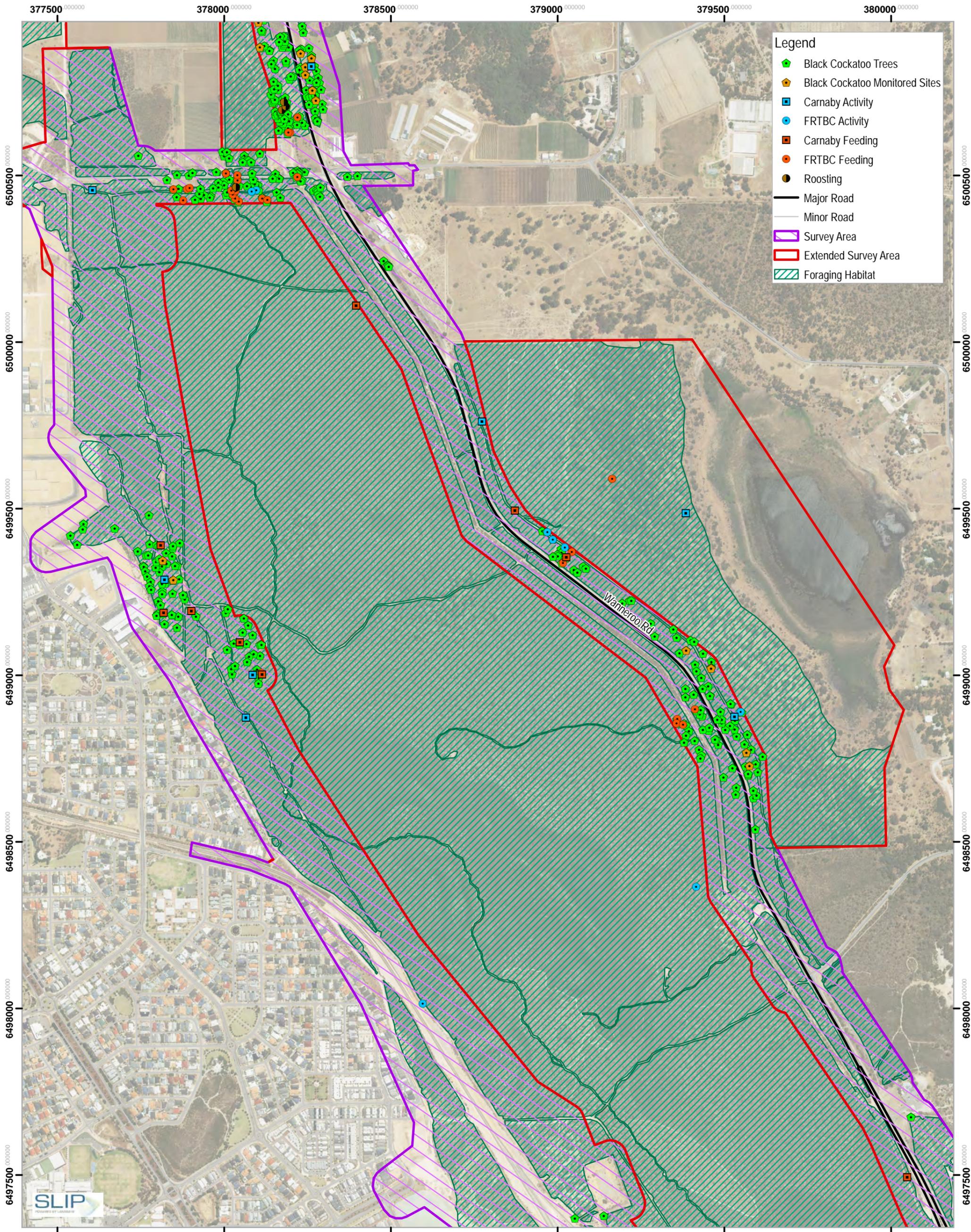


Main Roads WA
 Mitchell Freeway Extension Hester Avenue
 to Romeo Road Biological Surveys

Fauna Results - Black Cockatoo Habitat

Project No. 61-37375
 Revision No. 0
 Date 23/07/2019

FIGURE 10
 Page 1 of 4

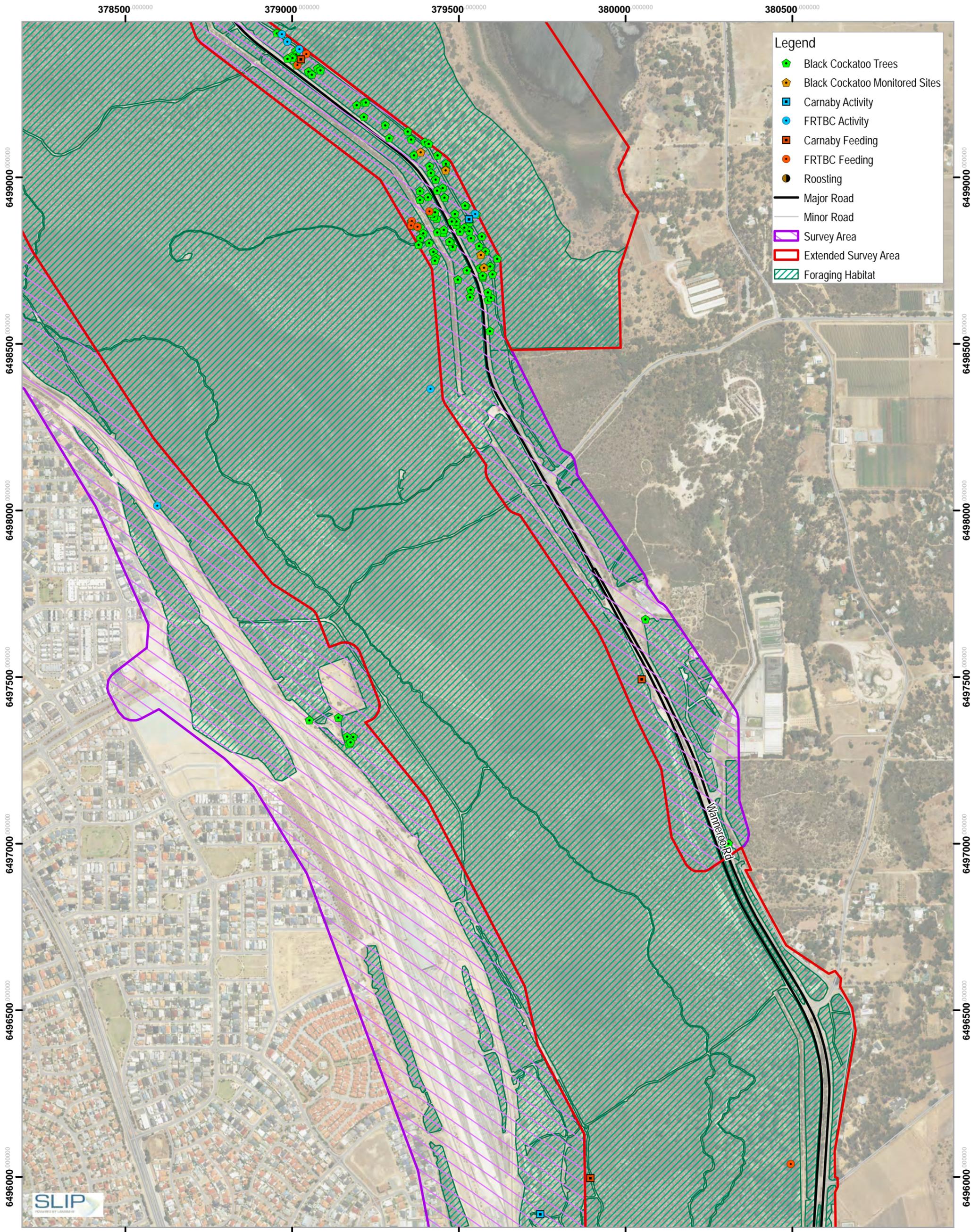


Main Roads WA
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to Romeo Road Biological Surveys

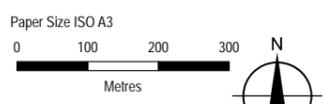
Fauna Results - Black Cockatoo Habitat

Project No. 61-37375
Revision No. 0
Date 23/07/2019

FIGURE 10
Page 2 of 4



- Legend**
- ◆ Black Cockatoo Trees
 - Black Cockatoo Monitored Sites
 - Carnaby Activity
 - Carnaby Feeding
 - FRTBC Feeding
 - Roosting
 - Major Road
 - Minor Road
 - Survey Area
 - Extended Survey Area
 - Foraging Habitat



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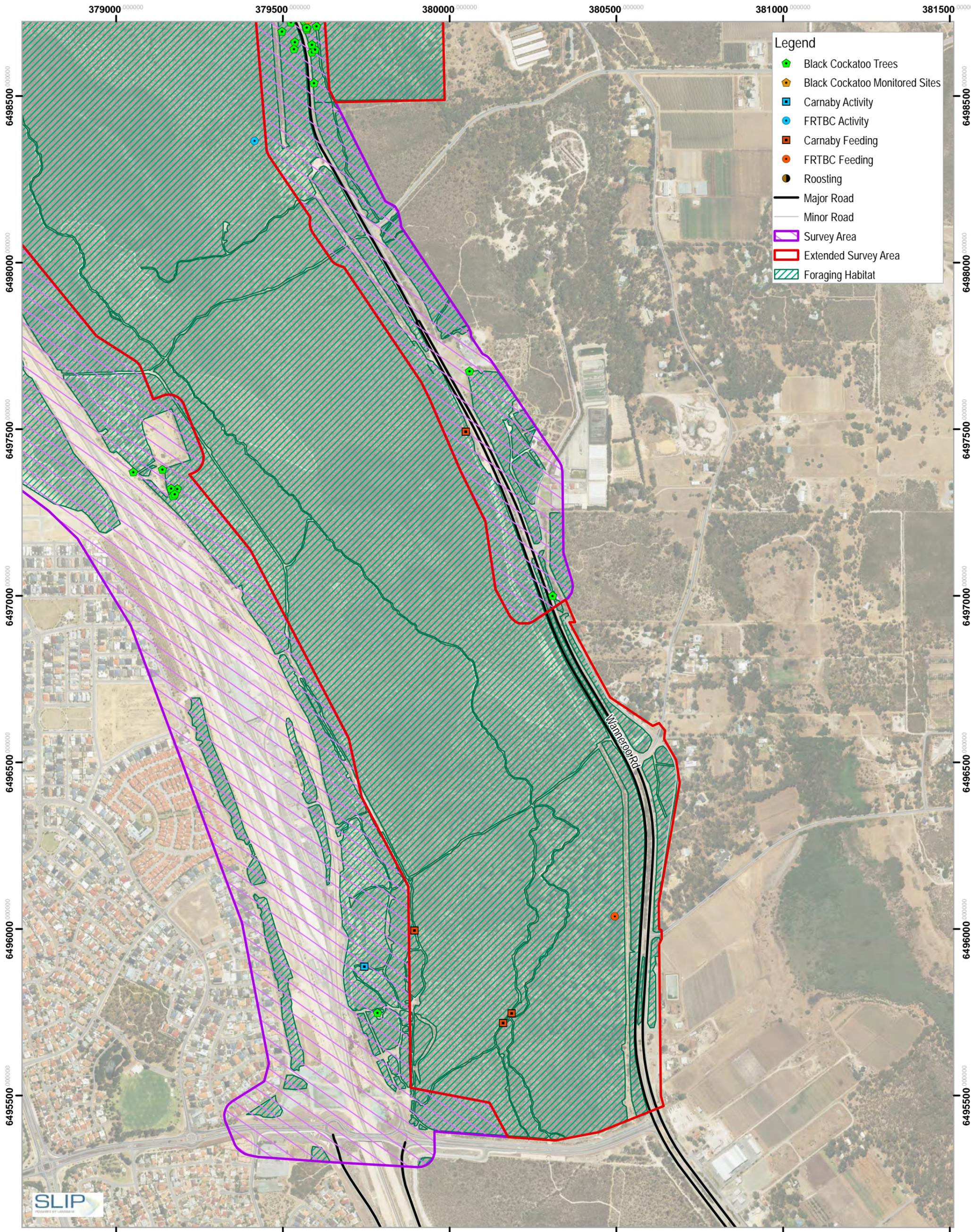


Main Roads WA
 Mitchell Freeway Extension Hester Avenue
 to Romeo Road Biological Surveys

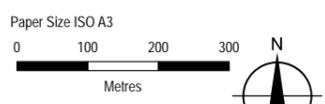
Fauna Results - Black Cockatoo Habitat

Project No. 61-37375
 Revision No. 0
 Date 23/07/2019

FIGURE 10
 Page 3 of 4



- Legend**
- ◆ Black Cockatoo Trees
 - Black Cockatoo Monitored Sites
 - Carnaby Activity
 - FRTBC Activity
 - Carnaby Feeding
 - FRTBC Feeding
 - Roosting
 - Major Road
 - Minor Road
 - Survey Area
 - Extended Survey Area
 - Foraging Habitat



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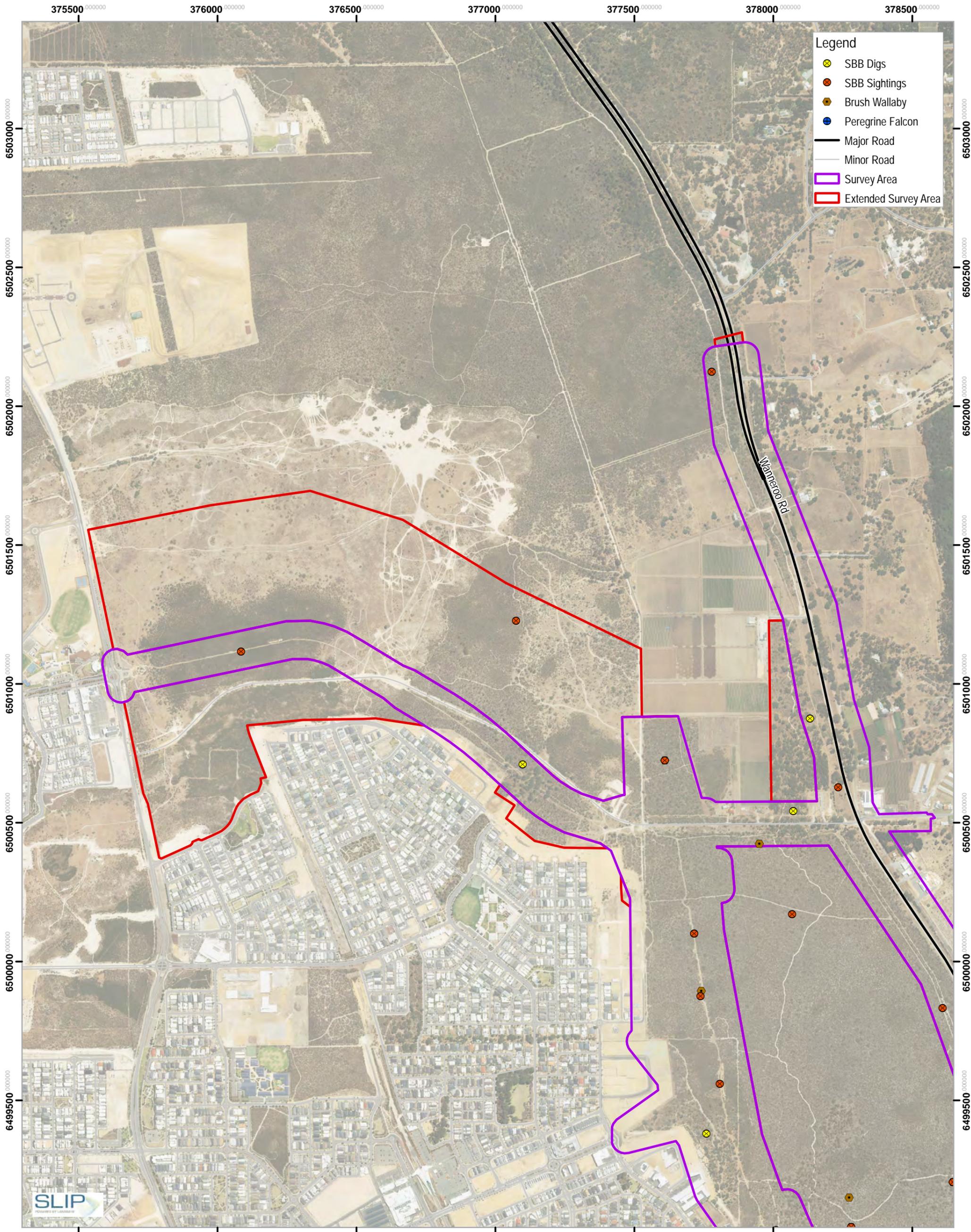


Main Roads WA
 Mitchell Freeway Extension Hester Avenue
 to Romeo Road Biological Surveys

Fauna Results - Black Cockatoo Habitat

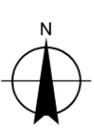
Project No. 61-37375
 Revision No. 0
 Date 23/07/2019

FIGURE 10
 Page 4 of 4



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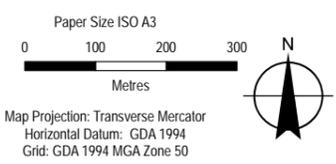
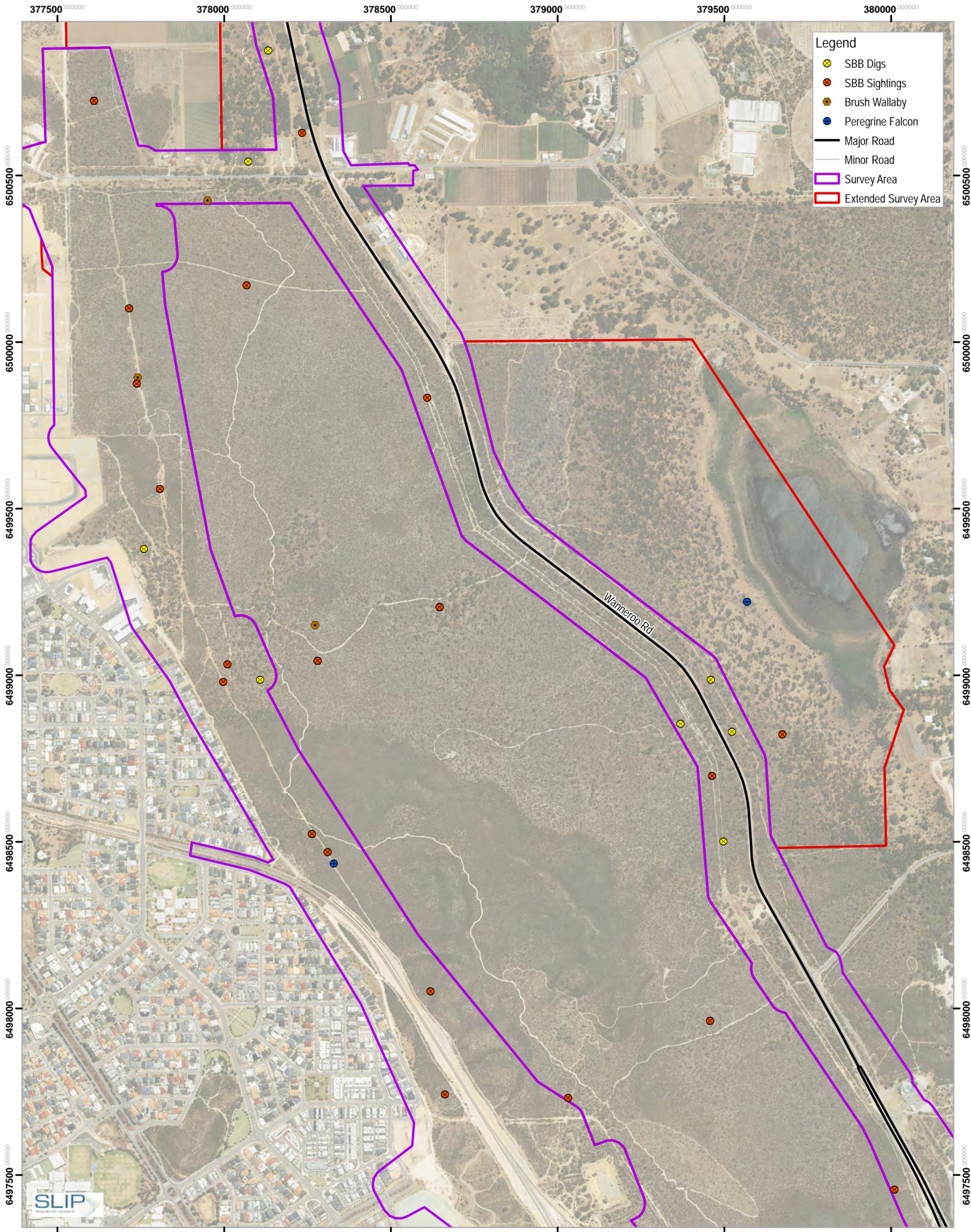


Main Roads WA
 Mitchell Freeway Extension Hester Avenue
 to Romeo Road Biological Surveys

Fauna Results - Conservation
 Significant Fauna

Project No. 61-37375
 Revision No. 0
 Date 23/07/2019

FIGURE 11
 Page 1 of 4

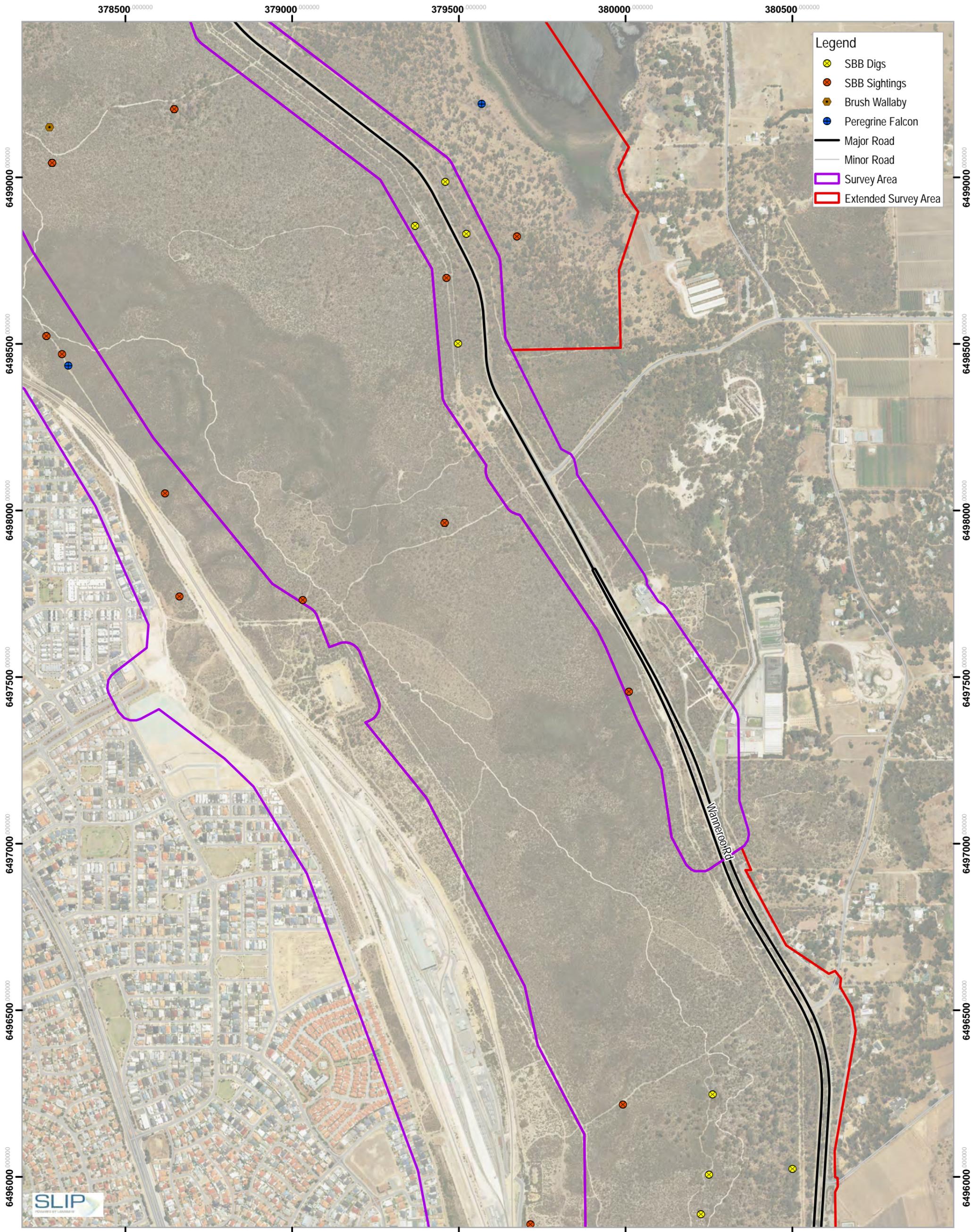


Main Roads WA
 Mitchell Freeway Extension Hester Avenue
 to Romeo Road Biological Surveys

Fauna Results - Conservation
 Significant Fauna

Project No. 61-37375
 Revision No. 0
 Date 23/07/2019

FIGURE 11
 Page 2 of 4



Map Projection: Transverse Mercator
 Horizontal Datum: GDA 1994
 Grid: GDA 1994 MGA Zone 50



Main Roads WA
 Mitchell Freeway Extension Hester Avenue
 to Romeo Road Biological Surveys

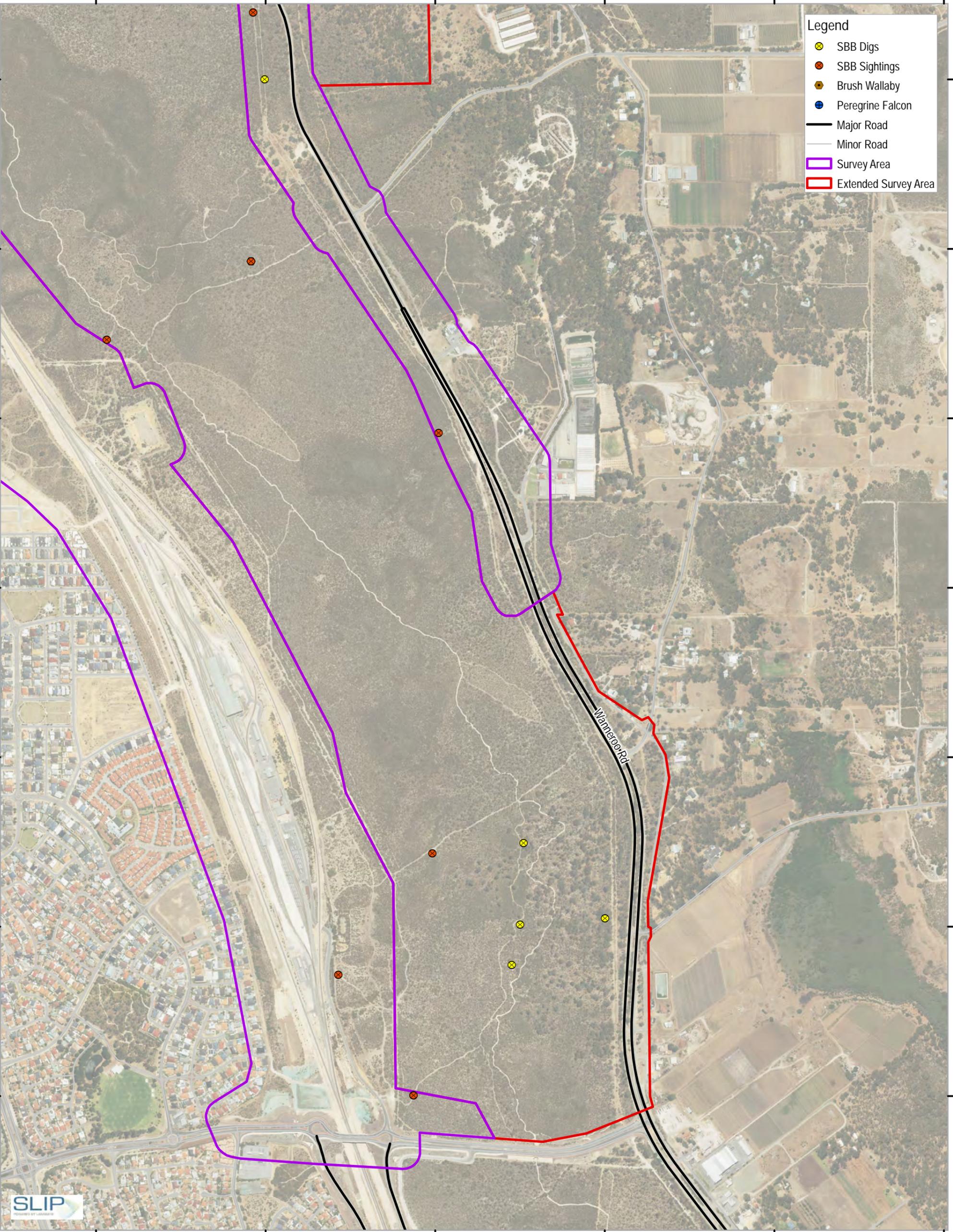
Fauna Results - Conservation
 Significant Fauna

Project No. 61-37375
 Revision No. 0
 Date 23/07/2019

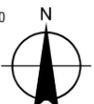
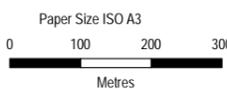
FIGURE 11
 Page 3 of 4

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- Legend**
- SBB Digs
 - SBB Sightings
 - Brush Wallaby
 - Peregrine Falcon
 - Major Road
 - Minor Road
 - Survey Area
 - Extended Survey Area



Map Projection: Transverse Mercator
 Horizontal Datum: GDA 1994
 Grid: GDA 1994 MGA Zone 50



Main Roads WA
 Mitchell Freeway Extension Hester Avenue
 to Romeo Road Biological Surveys

Project No. 61-37375
 Revision No. 0
 Date 23/07/2019

**Fauna Results - Conservation
 Significant Fauna**

Appendix B – Relevant legislation, background information and conservation code

Relevant legislation

Federal *Environment Protection and Biodiversity Conservation Act 1999*

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the Federal Government's central piece of environmental legislation. It provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places, which are defined in the EPBC Act as Matters of National Environmental Significance (MNES).

The biological aspects listed as MNES include:

- Nationally threatened flora and fauna species and ecological communities
- Migratory species

A person must not undertake an action that has, will have, or is likely to have a significant impact (direct or indirect) on MNES, without approval from the Federal Minister for the Environment.

The EPBC Act is administered by the Department of the Environment and Energy (DEE).

State *Environmental Protection Act 1986*

The *Environmental Protection Act 1986* (EP Act) is the primary legislative Act dealing with the protection of the environment in Western Australia. The Act allows the Environmental Protection Authority (EPA), to prevent, control and abate pollution and environmental harm, for the conservation, preservation, protection, enhancement and management of the environment and for matters incidental to or connected with the foregoing. Part IV of the EP Act is administered by the EPA and makes provisions for the EPA to undertake environmental impact assessment of significant proposals, strategic proposals and land use planning schemes.

The Department of Water and Environment Regulation (DWER) is responsible for administering the clearing provisions of the EP Act (Part V). Clearing of native vegetation in Western Australia requires a permit from the DWER, unless exemptions apply. Applications for clearing permits are assessed by the Department and decisions are made to grant or refuse the application in accordance with the Act. When making a decision the assessment considers clearing against the ten clearing principles as specified in Schedule 5 of the EP Act:

- a) Native vegetation should not be cleared if it comprises a high level of biodiversity.
- b) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of a significance habitat for fauna indigenous to Western Australia.
- c) Native vegetation should not be cleared if it includes, or is necessary, for the continued existence of rare flora.
- d) Native vegetation should not be cleared if it comprises the whole or part of native vegetation in an area that has been extensively cleared.
- e) Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.
- f) Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.
- g) Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.
- h) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.

- i) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water.
- j) Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence of flooding.

Exemptions for clearing include clearing that is a requirement of a written law or authorised under certain statutory processes (listed in Schedule 6 of the EP Act) and exemptions for prescribed low impact day-to-day activities (prescribed in the Environmental Protection (Clearing of Native Vegetation) Regulations 2004); these exemptions do not apply in environmentally sensitive areas (ESAs).

State Biodiversity and Conservation Act 2016

The *Biodiversity Conservation Act 2016* (BC Act) provides for the conservation, protection and promotion of the ecologically sustainable use of biodiversity components in Western Australia. The BC Act replaced both the *Wildlife Conservation Act 1950* (WC Act) and the *Sandalwood Act 1929* (Sandalwood Act) as of 1 January 2016. To attain the objectives of the BC Act, principles of ecological sustainable development have been established:

- Decision-making processes should effectively integrate both long-term and short-term economic, environmental, social and equitable considerations
- If there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation
- The present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations
- The conservation of biodiversity and ecological integrity should be a fundamental consideration in decision-making
- Improved valuation, pricing and incentive mechanisms should be promoted

The BC Act is administered by the Department of Biodiversity Conservation and Attractions (DBCA)

State Biosecurity and Agriculture Management Act 2007

The *Biosecurity and Agriculture Management Act 2007* (BAM Act) and associated regulations are administered by the Department of Primary Industries and Regional Development (DPIRD) and replace the repealed *Agriculture and Related Resources Protection Act 1976*. The main purposes of the BAM Act and its regulations are to:

- Prevent new animal and plant pests (vermin and weeds) and diseases from entering WA
- Manage the impact and spread of those pests already present in the state
- Safely manage the use of agricultural and veterinary chemicals
- Increased control over the sale of agricultural products that contain violative chemical residues

The Western Australian Organism List (WAOL) provides the status of organisms which have been categorised under the BAM Act. A Declared Pest is a prohibited organism or an organism for which a declaration under Section 22(2) of the Act is in force. Declared Pests may be assigned a control category including: C1 (exclusion), C2 (eradication) and C3 (management). The category may apply to the whole of the State, LGAs, districts, individual properties or even paddocks, and all landholders are obliged to comply with the specific category of control. Categories of control are defined below.

DPIRD Categories for Declared Pests under the BAM Act

Control class code	Description
C1 (Exclusion)	Pests will be assigned to this category if they are not established in Western Australia and control measures are to be taken, including border checks, in order to prevent them entering and establishing in the State.
C2 (Eradication)	Pests will be assigned to this category if they are present in Western Australia in low enough numbers or in sufficiently limited areas that their eradication is still a possibility.
C3 (Management)	Pests will be assigned to this category if they are established in Western Australia but it is feasible, or desirable, to manage them in order to limit their damage. Control measures can prevent a C3 pest from increasing in population size or density or moving from an area in which it is established into an area which currently is free of that pest.

Background information

Environmentally Sensitive Areas

Environmentally Sensitive Areas (ESAs) are declared by the Minister for Environment under Section 51B of the EP Act. The Table below outlines the aspects of areas declared as ESA in the Environmental Protection (Environmentally Sensitive Areas) Notice 2005.

Aspects of ESAs

Aspects of Environmentally Sensitive Areas
A declared World Heritage property as defined in Section 13 of the EPBC Act.
An area that is included on the Register of the National Estate (RNE), because of its natural values, under the <i>Australian Heritage Commission Act 1975</i> of the Commonwealth (the RNE was closed in 2007 and is no longer a statutory list – all references to the RNE were removed from the EPBC Act on 19 February 2012).
A defined wetland and the area within 50 m of the wetland. Defined wetlands include Ramsar wetlands, conservation category wetlands and nationally important wetlands.
The area covered by vegetation within 50 m of rare flora, to the extent to which the vegetation is continuous with the vegetation in which the rare flora is located.
The area covered by a Threatened Ecological Community.
A Bush Forever Site listed in “Bush Forever” Volumes 1 and 2 (2000), published by the Western Australia Planning Commission, except to the extent to which the site is approved to be developed by the Western Australia Planning Commission.
The areas covered by the <i>Environmental Protection (Gnangara Mound Crown Land) Policy 1992</i> .
The areas covered by the <i>Environmental Protection (Western Swamp Tortoise Habitat) Policy 2002</i> .
The areas covered by the lakes to which the <i>Environmental Protection (Swan Coastal Plain Lakes) Policy 1992</i> (EPP Lakes) applies.
Protected wetlands as defined in the <i>Environmental Protection (South West Agricultural Zone Wetlands) Policy 1998</i> .

Reserves and conservation areas

Bush Forever

Bush Forever, which was released in December 2000 and proclaimed in 2010, is a Government initiative aimed to retain and protect regionally significant bushland on the Swan Coastal Plain within the Perth Metropolitan Region. Bush Forever aims to protect more than 51,000 hectares of regionally significant bushland within 287 sites across the metropolitan portion of the Swan Coastal Plain (Government of Western Australia (GoWA) 2000). Bush Forever sites constitute ESAs as declared by a notice under Section 51B of the EP Act.

Department of Biodiversity, Conservation and Attractions managed lands and waters

DBCA manages lands and waters throughout Western Australia to conserve ecosystems and species, and to provide for recreation and appreciation of the natural environment. DBCA managed lands and waters include national parks, conservation parks and reserves, marine parks and reserves, regional

parks, nature reserves, State forest and timber reserves. DBCA managed conservation estate, is vested with the Conservation Commission of Western Australia. Access to, or through, some areas of DBCA managed lands may require a permit or could be restricted due to management activities. Proposed land use changes and development proposals that abut DBCA managed lands will generally be referred to DBCA throughout the assessment process.

Wetlands

Wetlands include not only lakes with open water, but areas of seasonally, intermittently or permanently waterlogged soil. Approximately 25 percent of the Swan Coastal Plain between Moore River and Mandurah is classified as wetland (Hill et al. 1996).

Though extensive in area, not all wetlands retain significant ecological values due to the concentration of urban and agricultural development in the region. Most wetlands have been cleared, filled or developed over, leaving only 20 percent of all the wetlands that were present on the Swan Coastal Plain prior to European settlement. Of these, an estimated 15 percent of the wetland area has retained high ecological values (Hill et al. 1996).

Ramsar Listed Wetlands

The Convention of Wetlands of International Importance was signed in 1971 at the Iranian town of Ramsar. The Convention has since been referred to as the Ramsar Convention. Ramsar Listed wetlands are “sites containing representative, rare or unique wetlands, or wetlands that are important for conserving biological diversity ... because of their ecological, botanical, zoological, limnological or hydrological importance” (DEE 2018b). Once a Ramsar Listed Wetland is designated, the country agrees to manage its conservation and ensure its wise use. Under the Convention, wise use is broadly defined as “maintaining the ecological character of a wetland” (DEE 2018b).

Nationally important wetlands

Wetlands of national significance are listed under the Directory of Important Wetlands in Australia. Nationally important wetlands are wetlands which meet at least one of the following criteria (DEE 2018a):

- It is a good example of a wetland type occurring within a biogeographic region in Australia
- It is a wetland which plays an important ecological or hydrological role in the natural functioning of a major wetland system/complex
- It is a wetland which is important as the habitat for animal taxa at a vulnerable stage in their life cycles, or provides a refuge when adverse conditions such as drought prevail
- The wetland supports one percent or more of the national populations of any native plant or animal taxa
- The wetland supports native plant or animal taxa or communities which are considered endangered or vulnerable at the national level
- The wetland is of outstanding historical or cultural significance

Geomorphic wetlands

Categorisation of wetlands has been conducted by Hill et al. (1996), delineating Swan Coastal Plain wetlands into levels of protection and management categories. Conservation Category Wetlands are wetlands that support high levels of attributes and functions. Resource Enhancement Wetlands are those that have been partly modified but still support substantial functions and attributes. Multiple Use Wetlands are classified as those wetlands with few attributes that still provide important wetland functions. Multiple Use wetlands have few important ecological attributes and functions remaining.

The Geomorphic Wetlands Swan Coastal Plain dataset displays the location, boundary, geomorphic classification (wetland type) and management category of wetlands on the Swan Coastal Plain.

Vegetation extent and status

The National Objectives and Targets for Biodiversity Conservation 2001–2005 (Commonwealth of Australia 2001) recognise that the retention of 30 percent or more of the pre-clearing extent of each ecological community is necessary if Australia’s biological diversity is to be protected. This is the threshold level below which species loss appears to accelerate exponentially and loss below this level should not be permitted. This level of recognition is in keeping with the targets recommended in the review of the National Strategy for the Conservation of Australia’s Biological Diversity (ANZECC 2000).

The extent of remnant native vegetation in WA has been assessed by Shepherd et al. (2002) and the GoWA (2018), based on broadscale vegetation association mapping by Beard (various publications). The GoWA produces Statewide Vegetation Statistics Reports that are used for a number of purposes including conservation planning, land use planning and when assessing development applications. The reports are updated at least every two years.

Within the Swan Coastal Plain, EPA Position Statement No. 9 (EPA 2006) identifies vegetation complexes with 30 percent or less of their pre-clearing extent remaining in a bioregion, or 10 percent or less of their pre-clearing extent remaining in constrained areas (i.e. areas of urban development in cities and major town) on the Swan Coastal Plain, to be critical assets.

Vegetation condition

The vegetation condition can be assessed in accordance with the vegetation condition rating scale for the South West and Interzone Botanical Provinces (EPA 2016a). The scale recognises the intactness of vegetation and consists of six rating levels as outlined below.

Vegetation condition rating scale for the South West and Interzone Botanical Provinces

Condition	South West and Interzone Botanical Provinces description
Pristine	Pristine or nearly so, no obvious signs of 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.

Condition	South West and Interzone Botanical Provinces description
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 vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees or shrubs.

Conservation codes

Species of significant flora, fauna and communities are protected under both Federal and State Acts. The Federal EPBC Act provides a legal framework to protect and manage nationally important flora and communities. The State WC Act is the primary wildlife conservation legislation in Western Australia. Information on the conservation codes is summarised in the following sections.

Ecological communities

Conservation significant communities

Ecological communities are defined as naturally occurring biological assemblages that occur in a particular type of habitat (English and Blyth 1997). Federally listed Threatened Ecological Communities (TECs) are protected under the EPBC Act. The BC Act provides for the statutory listing of TECs by the Minister. The new legislation also describes statutory processes for preparing recovery plans for TECs, the registration of their critical habitat, and penalties for unauthorised modification of TECs. TECs are ecological communities that have been assessed and assigned to one of four categories related to the status of the threat to the community, i.e. Presumed Totally Destroyed, Critically Endangered, Endangered and Vulnerable.

Possible TECs that do not meet survey criteria are added to the DBCA Priority Ecological Community (PEC) List under Priorities 1, 2 and 3. These are ecological communities that are adequately known; are rare but not threatened, or meet criteria for Near Threatened. PECs that have been recently removed from the threatened list are placed in Priority 4. These ecological communities require regular monitoring. Conservation dependent ecological communities are placed in Priority 5. PECs are not listed under any formal Federal or State legislation, however, may be listed as TECs under the EPBC Act and/ or BC Act.

Conservation codes and definitions for TECs listed under the EPBC Act and/ or BC Act

Categories	Definition
Federal Government Conservation Categories (EPBC Act)	
Critically Endangered (CR)	An ecological community if, at that time, is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria (as outlined in Environment Protection and Biodiversity Conservation Regulations 2000)
Endangered (EN)	An ecological community if, at that time: A) is not critically endangered; and B) is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria (as outlined in Environment Protection and Biodiversity Conservation Regulations 2000)
Vulnerable (VU)	An ecological community if, at that time: A) is not critically endangered or endangered; and B) is facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria (as outlined in Environment Protection and Biodiversity Conservation Regulations 2000)
Western Australia Conservation Categories	

Categories	Definition
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.
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.
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.
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.

Conservation categories and definitions for PECS as listed by the DBCA

Category	Description
Priority 1	<p>Poorly known ecological communities.</p> <p>Ecological communities that are known from very few occurrences with a very restricted distribution (generally ≤ 5 occurrences or a total area of ≤ 100 ha). Occurrences are believed to be under threat either due to limited extent, or being on lands under immediate threat (e.g. within agricultural or pastoral lands, urban areas, active mineral leases) or for which current threats exist. May include communities with occurrences on protected lands. Communities may be included if they are comparatively well-known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under immediate threat from known threatening processes across their range.</p>
Priority 2	<p>Poorly known ecological communities.</p> <p>Communities that are known from few occurrences with a restricted distribution (generally ≤ 10 occurrences or a total area of ≤ 200 ha). At least some occurrences are not believed to be under immediate 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.</p>

Category	Description
Priority 3	<p>Poorly known ecological communities.</p> <p>(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:</p> <p>(ii) communities known from a few widespread occurrences, which are either large or with significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat, or;</p> <p>(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.</p> <p>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.</p>
Priority 4	<p>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.</p> <p>(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.</p> <p>(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.</p> <p>(iii) Ecological communities that have been removed from the list of threatened communities during the past five years.</p>
Priority 5	<p>Conservation Dependent ecological communities.</p> <p>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.</p>

Banksia Woodlands of the Swan Coastal Plain TEC

The Banksia Woodlands of the Swan Coastal Plain was listed in September 2016 as an Endangered TEC under the EPBC Act. The Commonwealth TEC encompasses a number of FCTs, some of which area also listed as State TECs/PECs. The TSSC (2016) provides guidance for determining whether the TEC is present. These criteria are listed below

Diagnostic characteristics and condition thresholds to determine Banksia Woodlands TEC

Diagnostics characteristics / condition thresholds	Criteria
Floristic Community Type	<p>Location and physical environment:</p> <ul style="list-style-type: none"> Occurs in the SCP IBRA bioregion <p>Soil and landform:</p>

Diagnostics characteristics / condition thresholds	Criteria
	<ul style="list-style-type: none"> Typically occurs on well drained, low nutrient soils on sandplain landforms, particularly in deep Bassendean and Spearwood sands and occasionally on Quindalup sands. <p>Structure:</p> <ul style="list-style-type: none"> The community is a low woodland to forest, but may also include shrubland, open woodland or forest under some classification systems. The percentage canopy cover is more than 2% and typically less than 50%. The structure and appearance may also vary due to disturbance history. <p>Composition:</p> <ul style="list-style-type: none"> The canopy is commonly dominated by <i>Banksia attenuata</i> and or <i>B. menziesii</i>. Other <i>Banksia</i> species that dominate include <i>B. prionotes</i> or <i>B. ilicifolia</i>. The patch must include at least one of these diagnostic species.
Vegetation condition ¹ and minimum patch size	<ul style="list-style-type: none"> Pristine – no minimum Excellent – 0.5 ha Very Good – 1 ha Good – 2 ha
Surrounding context	<p>A patch is a discrete and mostly continuous area of ecological community. A patch may include small scale (<30 m) variations, gaps and disturbances, such as tracks, that do not significantly alter the overall functionality of the ecological community. Such breaks are generally included in patch size calculations. The landscape and position of the patch including its position relative to surrounding vegetation also influences how important it is in the broader landscape.</p>

Other significant vegetation

Vegetation may be significant for a range of reasons other than a statutory listing. The EPA (2016b) states that significant vegetation may include vegetation that includes the following:

- Restricted distribution
- Degree of historical impact from threatening processes
- Local endemism in restricted habitats
- Novel combinations of taxa
- A role as a refuge
- A role as a key habitat for Threatened species or large population representing a significant proportion of the local to regional total population of a species
- Being representative of a vegetation unit in 'pristine' condition in a highly cleared landscape, recently discovered range extensions, or isolated outliers of the main range)

¹ As per the Keighery (1994) condition scale presented in Bush Forever (Government of Western Australia 2000).

- Being poorly reserved

This may apply at a number of levels, so the unit may be significant when considered at the fine-scale (intra-locality), intermediate-scale (locality or inter-locality) or broad-scale (local to region).

Flora and fauna

Conservation significant flora and fauna

Species of significant flora are protected under both Federal and State legislation. Any activities that are deemed to have a significant impact on species that are recognised by the EPBC Act, and/or the BC Act can warrant referral to the DEE and/or the EPA.

The Federal conservation level of flora and fauna species and their significance status is assessed under the EPBC Act. The significance levels for fauna used in the EPBC Act are those recommended by the International Union for Conservation of Nature (IUCN).

The EPBC Act also protects land and migratory species that are listed under International Agreements. The list of migratory species established under section 209 of the EPBC Act comprises:

- Migratory species which are native to Australia and are included in the appendices to the Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animals Appendices I and II)
- Migratory species included in annexes established under the Japan-Australia Migratory Bird Agreement (JAMBA) and the China–Australia Migratory Bird Agreement (CAMBA)
- Native, migratory species identified in a list established under, or an instrument made under, an international agreement approved by the Minister, such as the republic of Korea–Australia Migratory Bird Agreement (ROKAMBA)

Under the BC Act aligns with the EPBC Act in that flora and fauna can be Specially Protected, listed as Threatened (Critically Endangered, Endangered or Vulnerable) or Extinct in Western Australia. Threatened species are those are species which have been adequately searched for and are deemed to be, in the wild, either rare, under identifiable threat of extinction, or otherwise in need of special protection, and have been gazetted as such.

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 flora or fauna.

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.

For the purposes of this assessment, all species listed under the EPBC Act, BC Act and DBCA Priority species are considered conservation significant.

Conservation categories and definitions for EPBC Act and BC Act listed flora and fauna species

Conservation category	Definition
Extinct	There is no reasonable doubt that the last member of the species has died.

Conservation category	Definition
Extinct in the Wild	<p>A) A species known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or</p> <p>B) A species that 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.</p>
Critically Endangered	A species facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria (as outlined in Environment Protection and Biodiversity Conservation Regulations 2000).
Endangered	<p>A) A species not critically endangered; and</p> <p>B) A species facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria.</p>
Vulnerable	<p>A) A species not critically endangered or endangered; and</p> <p>B) A species facing a high risk of extinction in the wild in the medium-term, as determined in accordance with the prescribed criteria.</p>
Conservation Dependent	<p>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</p> <p>B) The following subparagraphs are satisfied:</p> <ul style="list-style-type: none"> (i) the species is a species of fish; (ii) the species is the focus of a plan of management that Section 180 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.

Conservation codes for DBCA listed Priority flora and fauna

Priority category	Definition
Priority 1	<p>Poorly-known taxa</p> <p>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.</p>
Priority 2	<p>Poorly-known taxa</p> <p>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</p>

Priority category	Definition
	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.
Priority 3	<p>Poorly-known taxa</p> <p>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.</p>
Priority 4	<p>Rare, Near Threatened and other taxa in need of monitoring</p> <p>A. Rare: Taxa 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 taxa are usually represented on conservation lands.</p> <p>B. Near Threatened. Taxa that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable.</p> <p>C. Taxa that have been removed from the list of threatened taxa during the past five years for reasons other than taxonomy.</p>

Other significant flora

Flora species, subspecies, varieties, hybrids and ecotypes may be significant for a range of reasons, other than a statutory listing. The EPA (2016b) states that significant flora may include taxa that have:

- A keystone role in a particular habitat for threatened or Priority flora or fauna species, or large populations representing a considerable proportion of the local or regional total population of a species
- Relictual status, being representation of taxonomic or physiognomic groups that no longer occur widely in the broader landscape
- Anomalous features that indicate a potential new discovery
- Being representative of the range of a species (particularly, at the extremes of range, recently discovered range extensions, or isolated outliers of the main range)
- The presence of restricted subspecies, varieties, or naturally occurring hybrids
- Local endemism (a restricted distribution) or association with a restricted habitat type (e.g. surface water or groundwater dependent ecosystems)
- Being poorly reserved

Other significant fauna

Fauna species may be significant for a range of reasons other than those protected by international agreement or treaty, Specially Protected or Priority Fauna. Significant fauna may include short-range endemic species, species that have declining populations or declining distributions, species at the extremes of their range, or isolated outlying populations, or species which may be undescribed (EPA 2010).

Introduced plants (weeds)

Declared Pests

Information on species considered to be Declared Pests is provided under *State Biosecurity and Agriculture Management Act 2007*.

Weeds of National Significance

The spread of weeds across a range of land uses or ecosystems is important in the context of socio-economic and environmental values. The assessment of Weeds of National Significance (WoNS) is based on four major criteria:

- Invasiveness
- Impacts
- Potential for spread
- Socio-economic and environmental values

Australian state and territory governments have identified thirty-two Weeds of National Significance (WoNS); a list of 20 WoNS was endorsed in 1999 and a further 12 were added in 2012.

References

- ANZECC 2000, *Core Environmental Indicators for Reporting on the State of Environment*, ANZECC State of the Environment Reporting Task Force.
- Commonwealth of Australia 2001, *National Targets and Objectives for Biodiversity Conservation 2001–2005*, Canberra, AGPS.
- DEE 2018a, *Criteria for determining nationally important wetlands*, retrieved 2017, from <http://www.environment.gov.au/topics/water/water-our-environment/wetlands/australian-wetlands-database/directory-important>.
- DEE 2018b, *The Ramsar Convention on Wetlands*, retrieved 2017, from <http://www.environment.gov.au/topics/water/water-our-environment/wetlands/ramsar-convention-wetlands>.
- English, V and Blyth, J 1997, *Identifying and Conserving Threatened Ecological Communities in the South West Botanical Province*, Perth, Department of Conservation and Land Management.
- EPA 2006, *Position Statement No. 9: Environmental Offsets*, Perth, Environmental Protection Authority.
- EPA 2010, *Technical Guide – Terrestrial Fauna Surveys*, EPA, Perth, WA.
- EPA 2016a, *Technical Guide – Flora and Vegetation Surveys for Environmental Impact Assessment*, EPA, Perth, WA.
- EPA 2016b, *Environmental Factor Guideline - Flora and Vegetation*, EPA, Perth, WA.
- GoWA 2000, *Bush Forever – Keeping the Bush in the City. Volumes 1 (Policies, Principals and Processes) & 2 (Directory of Bush Forever Sites)*, Perth, Government of Western Australia.
- GoWA 2018, *Statewide Vegetation Statistics incorporating the CAR Reserve Analysis (Full report)*, Current as of December 2017, Perth Western Australia, Department of Environment and Conservation, retrieved January 2019 from <https://www2.landgate.wa.gov.au/web/guest/downloader>.
- Hill, AL, Semeniuk, CA, Semeniuk, V and del Marco, A 1996, *Wetlands of the Swan Coastal Plain. Volume 2: Wetland Mapping, Classification and Evaluation – Wetland Atlas*, Prepared for the Water and Rivers Commission and the Department of Environmental Protection, Perth, Western Australia.
- Shepherd, DP, Beeston, GR & Hopkins, AJM 2002, *Native Vegetation in Western Australia – Extent, Type and Status, Resource Management Technical Report 249*, Perth, Department of Agriculture.
- Threatened Species Scientific Community (TSSC) 2016, *Environmental Protection and Biodiversity Conservation Act 1999 Approved Conservation Advice (incorporating listing advice) for the Banksia Woodlands of the Swan Coastal Plain Ecological Community*, Department of the Environment and Energy, Canberra. Available at: <http://www.environment.gov.au/biodiversity/threatened/communities/pubs/131-conservation-advice.pdf>.

Appendix C – Desktop searches

EPBC Act PMST (5 km)

Naturemap Flora Report (5 km)

Naturemap Fauna Report (5 km)



EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about [Environment Assessments](#) and the EPBC Act including significance guidelines, forms and application process details.

Report created: 25/07/18 15:29:22

[Summary](#)

[Details](#)

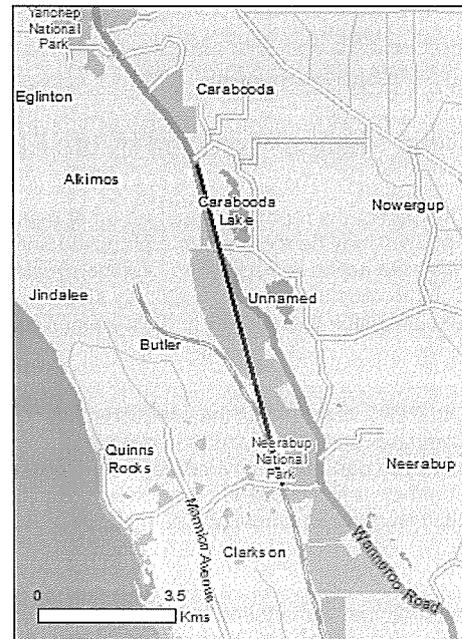
[Matters of NES](#)

[Other Matters Protected by the EPBC Act](#)

[Extra Information](#)

[Caveat](#)

[Acknowledgements](#)



This map may contain data which are
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[Coordinates](#)

[Buffer: 5.0Km](#)



Summary

Matters of National Environmental Significance

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

<u>World Heritage Properties:</u>	None
<u>National Heritage Places:</u>	None
<u>Wetlands of International Importance:</u>	None
<u>Great Barrier Reef Marine Park:</u>	None
<u>Commonwealth Marine Area:</u>	None
<u>Listed Threatened Ecological Communities:</u>	3
<u>Listed Threatened Species:</u>	46
<u>Listed Migratory Species:</u>	42

Other Matters Protected by the EPBC Act

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

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

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

<u>Commonwealth Land:</u>	1
<u>Commonwealth Heritage Places:</u>	None
<u>Listed Marine Species:</u>	66
<u>Whales and Other Cetaceans:</u>	12
<u>Critical Habitats:</u>	None
<u>Commonwealth Reserves Terrestrial:</u>	None
<u>Australian Marine Parks:</u>	None

Extra Information

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

<u>State and Territory Reserves:</u>	3
<u>Regional Forest Agreements:</u>	None
<u>Invasive Species:</u>	35
<u>Nationally Important Wetlands:</u>	None
<u>Key Ecological Features (Marine)</u>	None

Details

Matters of National Environmental Significance

Listed Threatened Ecological Communities [Resource Information]

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

Name	Status	Type of Presence
Aquatic Root Mat Community in Caves of the Swan Coastal Plain	Endangered	Community known to occur within area
Banksia Woodlands of the Swan Coastal Plain ecological community	Endangered	Community likely to occur within area
Sedgeland in Holocene dune swales of the southern Swan Coastal Plain	Endangered	Community known to occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Anous tenuirostris melanops Australian Lesser Noddy [26000]	Vulnerable	Species or species habitat may occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat likely to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area
Calyptorhynchus banksii naso Forest Red-tailed Black-Cockatoo, Karrak [67034]	Vulnerable	Species or species habitat likely to occur within area
Calyptorhynchus latirostris Carnaby's Cockatoo, Short-billed Black-Cockatoo [59523]	Endangered	Species or species habitat known to occur within area
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely

Name	Status	Type of Presence
<u>Leipoa ocellata</u> Malleefowl [934]	Vulnerable	to occur within area Species or species habitat likely to occur within area
<u>Limosa lapponica baueri</u> Bar-tailed Godwit (baueri), Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat may occur within area
<u>Limosa lapponica menzbieri</u> Northern Siberian Bar-tailed Godwit, Bar-tailed Godwit (menzbieri) [86432]	Critically Endangered	Species or species habitat may occur within area
<u>Macronectes giganteus</u> Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
<u>Macronectes halli</u> Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
<u>Numenius madagascariensis</u> Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
<u>Pachyptila turtur subantarctica</u> Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat likely to occur within area
<u>Phoebastria fusca</u> Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
<u>Rostratula australis</u> Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
<u>Sternula nereis nereis</u> Australian Fairy Tern [82950]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
<u>Thalassarche cauta cauta</u> Shy Albatross, Tasmanian Shy Albatross [82345]	Vulnerable	Species or species habitat may occur within area
<u>Thalassarche cauta steadi</u> White-capped Albatross [82344]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<u>Thalassarche impavida</u> Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
<u>Thalassarche melanophris</u> Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Mammals		
<u>Balaenoptera musculus</u> Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
<u>Dasyurus geoffroii</u> Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat likely to occur within area
<u>Eubalaena australis</u> Southern Right Whale [40]	Endangered	Breeding known to occur within area
<u>Megaptera novaeangliae</u> Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area

Name	Status	Type of Presence
<u>Neophoca cinerea</u> Australian Sea-lion, Australian Sea Lion [22]	Vulnerable	Species or species habitat known to occur within area
Plants		
<u>Andersonia gracilis</u> Slender Andersonia [14470]	Endangered	Species or species habitat may occur within area
<u>Anigozanthos viridis subsp. terraspectans</u> Dwarf Green Kangaroo Paw [3435]	Vulnerable	Species or species habitat may occur within area
<u>Diuris micrantha</u> Dwarf Bee-orchid [55082]	Vulnerable	Species or species habitat likely to occur within area
<u>Diuris purdiei</u> Purdie's Donkey-orchid [12950]	Endangered	Species or species habitat may occur within area
<u>Drakaea elastica</u> Glossy-leaved Hammer Orchid, Glossy-leaved Hammer Orchid, Warty Hammer Orchid [16753]	Endangered	Species or species habitat likely to occur within area
<u>Drakaea micrantha</u> Dwarf Hammer-orchid [56755]	Vulnerable	Species or species habitat may occur within area
<u>Eleocharis keigheryi</u> Keighery's Eleocharis [64893]	Vulnerable	Species or species habitat may occur within area
<u>Eucalyptus argutifolia</u> Yanchep Mallee, Wabling Hill Mallee [24263]	Vulnerable	Species or species habitat likely to occur within area
<u>Lepidosperma rostratum</u> Beaked Lepidosperma [14152]	Endangered	Species or species habitat likely to occur within area
<u>Marianthus paralius</u> [83925]	Endangered	Species or species habitat known to occur within area
Reptiles		
<u>Caretta caretta</u> Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
<u>Chelonia mydas</u> Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
<u>Dermochelys coriacea</u> Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
<u>Natator depressus</u> Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area
Sharks		
<u>Carcharias taurus (west coast population)</u> Grey Nurse Shark (west coast population) [68752]	Vulnerable	Species or species habitat known to occur within area
<u>Carcharodon carcharias</u> White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
<u>Rhincodon typus</u> Whale Shark [66680]	Vulnerable	Species or species

Name	Status	Type of Presence
Listed Migratory Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
<u>Migratory Marine Birds</u>		
<u>Anous stolidus</u>		
Common Noddy [825]		Species or species habitat may occur within area
<u>Apus pacificus</u>		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
<u>Ardenna carneipes</u>		
Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Species or species habitat likely to occur within area
<u>Diomedea amsterdamensis</u>		
Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area
<u>Diomedea epomophora</u>		
Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<u>Diomedea exulans</u>		
Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<u>Diomedea sanfordi</u>		
Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
<u>Hydroprogne caspia</u>		
Caspian Tern [808]		Foraging, feeding or related behaviour known to occur within area
<u>Macronectes giganteus</u>		
Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
<u>Macronectes halli</u>		
Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
<u>Onychoprion anaethetus</u>		
Bridled Tern [82845]		Foraging, feeding or related behaviour likely to occur within area
<u>Phoebastria fusca</u>		
Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
<u>Sterna dougallii</u>		
Roseate Tern [817]		Foraging, feeding or related behaviour likely to occur within area
<u>Thalassarche cauta</u>		
Tasmanian Shy Albatross [89224]	Vulnerable*	Species or species habitat may occur within area
<u>Thalassarche impavida</u>		
Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
<u>Thalassarche melanophris</u>		
Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
<u>Thalassarche steadi</u>		
White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or

Name	Threatened	Type of Presence related behaviour likely to occur within area
Migratory Marine Species		
<u>Balaena glacialis australis</u> Southern Right Whale [75529]	Endangered*	Breeding known to occur within area
<u>Balaenoptera edeni</u> Bryde's Whale [35]		Species or species habitat may occur within area
<u>Balaenoptera musculus</u> Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
<u>Caperea marginata</u> Pygmy Right Whale [39]		Species or species habitat may occur within area
<u>Carcharodon carcharias</u> White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
<u>Caretta caretta</u> Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
<u>Chelonia mydas</u> Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
<u>Derموchelys coriacea</u> Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
<u>Lamna nasus</u> Porbeagle, Mackerel Shark [83288]		Species or species habitat may occur within area
<u>Manta alfredi</u> Reef Manta Ray, Coastal Manta Ray, Inshore Manta Ray, Prince Alfred's Ray, Resident Manta Ray [84994]		Species or species habitat may occur within area
<u>Manta birostris</u> Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat may occur within area
<u>Megaptera novaeangliae</u> Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
<u>Natator depressus</u> Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area
<u>Orcinus orca</u> Killer Whale, Orca [46]		Species or species habitat may occur within area
<u>Rhincodon typus</u> Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
Migratory Terrestrial Species		
<u>Motacilla cinerea</u> Grey Wagtail [642]		Species or species habitat may occur within area
Migratory Wetlands Species		
<u>Actitis hypoleucos</u> Common Sandpiper [59309]		Species or species habitat known to occur within area

Name	Threatened	Type of Presence
<u>Calidris acuminata</u> Sharp-tailed Sandpiper [874]		Species or species habitat likely to occur within area
<u>Calidris canutus</u> Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
<u>Calidris ferruginea</u> Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area
<u>Calidris melanotos</u> Pectoral Sandpiper [858]		Species or species habitat may occur within area
<u>Limosa lapponica</u> Bar-tailed Godwit [844]		Species or species habitat may occur within area
<u>Numenius madagascariensis</u> Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
<u>Pandion haliaetus</u> Osprey [952]		Species or species habitat known to occur within area
<u>Tringa nebularia</u> Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [\[Resource Information \]](#)

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

Name Commonwealth Land -

Listed Marine Species [\[Resource Information \]](#)

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
<u>Actitis hypoleucos</u> Common Sandpiper [59309]		Species or species habitat known to occur within area
<u>Anous stolidus</u> Common Noddy [825]		Species or species habitat may occur within area
<u>Anous tenuirostris melanops</u> Australian Lesser Noddy [26000]	Vulnerable	Species or species habitat may occur within area
<u>Apus pacificus</u> Fork-tailed Swift [678]		Species or species habitat likely to occur within area
<u>Ardea alba</u> Great Egret, White Egret [59541]		Species or species habitat known to occur within area
<u>Ardea ibis</u> Cattle Egret [59542]		Species or species

Name	Threatened	Type of Presence
<u>Calidris acuminata</u> Sharp-tailed Sandpiper [874]		habitat may occur within area Species or species habitat likely to occur within area
<u>Calidris canutus</u> Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
<u>Calidris ferruginea</u> Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area
<u>Calidris melanotos</u> Pectoral Sandpiper [858]		Species or species habitat may occur within area
<u>Diomedea amsterdamensis</u> Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area
<u>Diomedea epomophora</u> Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<u>Diomedea exulans</u> Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<u>Diomedea sanfordi</u> Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
<u>Haliaeetus leucogaster</u> White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
<u>Larus pacificus</u> Pacific Gull [811]		Foraging, feeding or related behaviour may occur within area
<u>Limosa lapponica</u> Bar-tailed Godwit [844]		Species or species habitat may occur within area
<u>Macronectes giganteus</u> Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
<u>Macronectes halli</u> Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
<u>Merops ornatus</u> Rainbow Bee-eater [670]		Species or species habitat may occur within area
<u>Motacilla cinerea</u> Grey Wagtail [642]		Species or species habitat may occur within area
<u>Numenius madagascariensis</u> Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
<u>Pachyptila turtur</u> Fairy Prion [1066]		Species or species habitat likely to occur within area
<u>Pandion haliaetus</u> Osprey [952]		Species or species habitat known to occur

Name	Threatened	Type of Presence
<u>Phoebastria fusca</u> Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
<u>Puffinus assimilis</u> Little Shearwater [59363]		Foraging, feeding or related behaviour known to occur within area
<u>Puffinus carneipes</u> Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Species or species habitat likely to occur within area
<u>Rostratula benghalensis (sensu lato)</u> Painted Snipe [889]	Endangered*	Species or species habitat may occur within area
<u>Sterna anaethetus</u> Bridled Tern [814]		Foraging, feeding or related behaviour likely to occur within area
<u>Sterna caspia</u> Caspian Tern [59467]		Foraging, feeding or related behaviour known to occur within area
<u>Sterna dougallii</u> Roseate Tern [817]		Foraging, feeding or related behaviour likely to occur within area
<u>Thalassarche cauta</u> Tasmanian Shy Albatross [89224]	Vulnerable*	Species or species habitat may occur within area
<u>Thalassarche impavida</u> Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
<u>Thalassarche melanophris</u> Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
<u>Thalassarche steadi</u> White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
<u>Thinornis rubricollis</u> Hooded Plover [59510]		Species or species habitat may occur within area
<u>Tringa nebularia</u> Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area
Fish		
<u>Acentronura australe</u> Southern Pygmy Pipehorse [66185]		Species or species habitat may occur within area
<u>Campichthys galei</u> Gale's Pipefish [66191]		Species or species habitat may occur within area
<u>Choeroichthys suillus</u> Pig-snouted Pipefish [66198]		Species or species habitat may occur within area
<u>Halicampus brocki</u> Brock's Pipefish [66219]		Species or species habitat may occur within area
<u>Hippocampus angustus</u> Western Spiny Seahorse, Narrow-bellied Seahorse [66234]		Species or species habitat may occur within

Name	Threatened	Type of Presence area
<u>Hippocampus breviceps</u> Short-head Seahorse, Short-snouted Seahorse [66235]		Species or species habitat may occur within area
<u>Hippocampus subelongatus</u> West Australian Seahorse [66722]		Species or species habitat may occur within area
<u>Lissocampus fatiloquus</u> Prophet's Pipefish [66250]		Species or species habitat may occur within area
<u>Maroubra perserrata</u> Sawtooth Pipefish [66252]		Species or species habitat may occur within area
<u>Mitotichthys meraculus</u> Western Crested Pipefish [66259]		Species or species habitat may occur within area
<u>Nannocampus subosseus</u> Bonyhead Pipefish, Bony-headed Pipefish [66264]		Species or species habitat may occur within area
<u>Phycodurus eques</u> Leafy Seadragon [66267]		Species or species habitat may occur within area
<u>Phyllopteryx taeniolatus</u> Common Seadragon, Weedy Seadragon [66268]		Species or species habitat may occur within area
<u>Pugnaso curtirostris</u> Pugnose Pipefish, Pug-nosed Pipefish [66269]		Species or species habitat may occur within area
<u>Solegnathus lettiensis</u> Gunther's Pipehorse, Indonesian Pipefish [66273]		Species or species habitat may occur within area
<u>Stigmatopora argus</u> Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276]		Species or species habitat may occur within area
<u>Stigmatopora nigra</u> Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area
<u>Syngnathoides biaculeatus</u> Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
<u>Urocampus carinirostris</u> Hairy Pipefish [66282]		Species or species habitat may occur within area
<u>Vanacampus margaritifer</u> Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area
Mammals		
<u>Arctocephalus forsteri</u> Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area
<u>Neophoca cinerea</u> Australian Sea-lion, Australian Sea Lion [22]	Vulnerable	Species or species habitat known to occur within area
Reptiles		
<u>Aipysurus pooleorum</u> Shark Bay Seasnake [66061]		Species or species

Name	Threatened	Type of Presence
<u>Caretta caretta</u> Loggerhead Turtle [1763]	Endangered	habitat may occur within area Species or species habitat known to occur within area
<u>Chelonia mydas</u> Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
<u>Dermodochelys coriacea</u> Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
<u>Disteira kingii</u> Spectacled Seasnake [1123]		Species or species habitat may occur within area
<u>Natator depressus</u> Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area
<u>Pelamis platurus</u> Yellow-bellied Seasnake [1091]		Species or species habitat may occur within area

Whales and other Cetaceans		[Resource Information]
Name	Status	Type of Presence
<u>Mammals</u>		
<u>Balaenoptera acutorostrata</u> Minke Whale [33]		Species or species habitat may occur within area
<u>Balaenoptera edeni</u> Bryde's Whale [35]		Species or species habitat may occur within area
<u>Balaenoptera musculus</u> Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
<u>Caperea marginata</u> Pygmy Right Whale [39]		Species or species habitat may occur within area
<u>Delphinus delphis</u> Common Dolphin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
<u>Eubalaena australis</u> Southern Right Whale [40]	Endangered	Breeding known to occur within area
<u>Grampus griseus</u> Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
<u>Megaptera novaeangliae</u> Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
<u>Orcinus orca</u> Killer Whale, Orca [46]		Species or species habitat may occur within area
<u>Stenella attenuata</u> Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area
<u>Tursiops aduncus</u> Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
<u>Tursiops truncatus s. str.</u> Bottlenose Dolphin [68417]		Species or species habitat may occur within area

Extra Information

State and Territory Reserves [\[Resource Information \]](#)

Name	State
Neerabup	WA
Neerabup	WA
Yanchep	WA

Invasive Species [\[Resource Information \]](#)

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resources Audit, 2001.

Name	Status	Type of Presence
Birds		

Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Passer montanus Eurasian Tree Sparrow [406]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Streptopelia senegalensis Laughing Turtle-dove, Laughing Dove [781]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area

Mammals

Name	Status	Type of Presence
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Funambulus pennantii Northern Palm Squirrel, Five-striped Palm Squirrel [129]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus norvegicus Brown Rat, Norway Rat [83]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Asparagus aethiopicus Asparagus Fern, Ground Asparagus, Basket Fern, Sprengi's Fern, Bushy Asparagus, Emerald Asparagus [62425]		Species or species habitat likely to occur within area
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Brachiaria mutica Para Grass [5879]		Species or species habitat may occur within area
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species habitat may occur within area
Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]		Species or species habitat may occur within area
Chrysanthemoides monilifera subsp. monilifera Boneseed [16905]		Species or species habitat likely to occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Lantana camara Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]		Species or species habitat likely to occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur

Name	Status	Type of Presence
Olea europaea Olive, Common Olive [9160]		within area Species or species habitat may occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Salvinia molesta Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to occur within area
Tamarix aphylla Athel Pine, Athel Tree, Tamarisk, Athel Tamarisk, Athel Tamarix, Desert Tamarisk, Flowering Cypress, Salt Cedar [16018]		Species or species habitat likely to occur within area
Reptiles		
Hemidactylus frenatus Asian House Gecko [1708]		Species or species habitat likely to occur within area
Ramphotyphlops braminus Flowerpot Blind Snake, Brahminy Blind Snake, Cacing Besi [1258]		Species or species habitat likely to occur within area

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

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

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

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

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

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

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

Coordinates

-31.608165 115.712394,-31.67022 115.731878,-31.67022 115.731878,-31.67022 115.731878

Acknowledgements

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

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

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

Please feel free to provide feedback via the [Contact Us](#) page.

NatureMap Species Report

Created By Guest user on 05/12/2018

Current Names Only Yes

Core Datasets Only Yes

Data Source Priority Flora Survey or Swan Coastal Plain Survey or Threatened and Priority Flora

Method Database or WA Herbarium Specimen Database

Vertices 'By Line'

Group By 31° 34' 33" S, 115° 40' 14" E 31° 30' 35" S, 115° 38' 59" E

Family

Family	Species	Records
Acrotylaceae	2	3
Aizoaceae	2	4
Amanitaceae	1	1
Amaranthaceae	4	15
Anacardiaceae	1	1
Anarthriaceae	1	1
Apiaceae	7	20
Araceae	2	2
Araliaceae	7	22
Areschougaceae	1	1
Asparagaceae	20	54
Asphodelaceae	1	3
Asteraceae	54	130
Auriscalpiaceae	1	1
Bangiaceae	1	1
Bonnemaisoniaceae	1	1
Brassicaceae	8	18
Bryaceae	2	6
Campanulaceae	8	19
Caprifoliaceae	1	4
Caryophyllaceae	6	12
Casuarinaceae	3	7
Caulerpaceae	6	7
Celastraceae	4	6
Centrolepidaceae	2	7
Ceramiaceae	6	8
Champiaceae	1	1
Chenopodiaceae	2	9
Cladophoraceae	1	1
Cladostephaceae	1	2
Codiaceae	1	1
Colchicaceae	2	6
Convolvulaceae	1	1
Crassulaceae	5	7
Crepidaceae	1	1
Cucurbitaceae	1	2
Cyperaceae	36	95
Cystocloniaceae	2	2
Dacrymycetaceae	1	1
Dasyaceae	1	1
Dasyogonaceae	1	5
Delesseriaceae	1	1
Dicranaceae	1	1
Dicranemataceae	1	1
Dictyotaceae	4	10
Dilleniaceae	7	43
Droseraceae	2	8
Ericaceae	19	104
Euphorbiaceae	3	3
Fabaceae	62	169
Funariaceae	1	2
Gentianaceae	2	3
Geraniaceae	5	10
Gigaspermaceae	1	1
Goodeniaceae	16	37
Gracilariaceae	1	1
Graphidaceae	1	1
Gyrostemonaceae	2	5
Haemodoraceae	20	50
Halimedaaceae	1	1
Haloragaceae	1	1
Halymeniaceae	1	1
Hemerocallidaceae	6	15
Hymenochaetaceae	1	1
Hymenocladaceae	1	1
Iridaceae	7	17
Juncaceae	1	1
Juncaginaceae	3	6
Kallymeniaceae	1	1
Lamiaceae	7	14
Lauraceae	5	11
Lecanoraceae	1	1
Lentibulariaceae	1	2
Linaceae	1	1
Loganiaceae	2	6

Loranthaceae	1	6
Lythraceae	1	1
Macarthuriaceae	1	1
Malvaceae	5	9
Montiaceae	3	3
Moraceae	1	1
Myrtaceae	39	101
Olacaceae	1	2
Onagraceae	6	12
Orchidaceae	23	43
Orobanchaceae	4	8
Oxalidaceae	2	3
Papaveraceae	4	4
Passifloraceae	1	1
Pezizaceae	4	8
Phallaceae	1	2
Phanerochaetaceae	1	2
Phyllanthaceae	3	12
Physaraceae	2	2
Physciaceae	4	4
Pittosporaceae	1	1
Placynthiaceae	1	1
Plantaginaceae	3	5
Pleosporeae	1	1
Plocamiaceae	2	3
Poaceae	32	49
Polygalaceae	5	8
Polygonaceae	4	13
Polyporaceae	3	5
Pottiaceae	4	5
Primulaceae	1	1
Proteaceae	28	123
Psoraceae	1	1
Pteridaceae	1	1
Racopilaceae	1	1
Ramalinaceae	2	2
Ranunculaceae	3	10
Restionaceae	6	22
Rhamnaceae	7	33
Rhodomelaceae	13	20
Rhodymeniaceae	1	1
Ricciaceae	1	1
Rubiaceae	3	7
Rutaceae	5	8
Santalaceae	4	6
Sapindaceae	1	4
Sargassaceae	5	7
Scrophulariaceae	5	12
Scytosiphonaceae	3	9
Solanaceae	7	24
Solieriaceae	1	1
Strophariaceae	2	2
Styliaceae	19	59
Tamaricaceae	1	1
Teloschistaceae	2	2
Thuidiaceae	1	1
Thymelaeaceae	8	14
Tremellaceae	1	1
Typhaceae	1	1
Ulvaceae	1	1
Urticaceae	1	3
Verbenaceae	2	2
Violaceae	2	13
Vitaceae	1	1
Wrangeliaceae	1	1
Xanthorrhoeaceae	1	5
Zamiaceae	1	1
TOTAL	705	1737

Name ID	Species Name	Naturalised	Conservation Code	Endemic To Query Area
Acrotylaceae				
1.	26665 <i>Claviconium ovatum</i>			
2.	26915 <i>Hennedya crispa</i>			
Aizoaceae				
3.	2795 <i>Carpobrotus edulis</i> (Hottentot Fig)	Y		
4.	2798 <i>Carpobrotus virescens</i> (Coastal Pigface, Kolboko, Bain)			
Amanitaceae				
5.	48599 <i>Amanita arenaria</i>			
Amaranthaceae				
6.	2718 <i>Ptilotus drummondii</i> (Narrowleaf Mulla Mulla)			
7.	11260 <i>Ptilotus drummondii</i> var. <i>drummondii</i> (Pussytail)			
8.	2751 <i>Ptilotus polystachyus</i> (Prince of Wales Feather)			
9.	40841 <i>Ptilotus stirlingii</i> subsp. <i>stirlingii</i>			
Anacardiaceae				
10.	11027 <i>Schinus terebinthifolius</i>	Y		
Anarthriaceae				
11.	18049 <i>Lyginia imberbis</i>			
Apiaceae				
12.	12040 <i>Apium prostratum</i> var. <i>prostratum</i> (Sea Celery)			
13.	6214 <i>Centella asiatica</i>			
14.	6218 <i>Daucus glochidiatus</i> (Australian Carrot)			
15.	6219 <i>Eryngium pinnatifidum</i> (Blue Devils)			
16.	6222 <i>Homalosciadium homalocarpum</i>			
17.	18355 <i>Petroselinum crispum</i> (Parsley)	Y		
18.	6289 <i>Xanthosia huegelii</i>			
Araceae				
19.	28342 <i>Landoltia punctata</i> (Thin Duckweed)			
20.	1051 <i>Lemna disperma</i> (Duckweed)			
Araliaceae				
21.	6224 <i>Hydrocotyle blepharocarpa</i>			
22.	6226 <i>Hydrocotyle callicarpa</i> (Small Pennywort)			
23.	6229 <i>Hydrocotyle diantha</i>			
24.	6232 <i>Hydrocotyle hispidula</i>			
25.	11546 <i>Hydrocotyle pilifera</i> var. <i>glabrata</i>			
26.	19041 <i>Trachymene coerulea</i> subsp. <i>coerulea</i>			
27.	6280 <i>Trachymene pilosa</i> (Native Parsnip)			
Areschougiaceae				
28.	26534 <i>Callophycus dorsifer</i>			
Asparagaceae				
29.	1208 <i>Acanthocarpus preissii</i>			
30.	1201 <i>Asparagus officinalis</i> (Asparagus)	Y		
31.	1287 <i>Dichopogon capillipes</i>			
32.	16091 <i>Lachenalia bulbifera</i>	Y		
33.	1308 <i>Laxmannia sessiliflora</i> (Nodding Lily)			
34.	11464 <i>Laxmannia sessiliflora</i> subsp. <i>australis</i>			
35.	1223 <i>Lomandra caespitosa</i> (Tufted Mat Rush)			
36.	1228 <i>Lomandra hermaphrodita</i>			
37.	1231 <i>Lomandra maritima</i>			
38.	14542 <i>Lomandra micrantha</i> subsp. <i>micrantha</i>			
39.	1234 <i>Lomandra nigricans</i>			
40.	1239 <i>Lomandra preissii</i>			
41.	1243 <i>Lomandra sericea</i> (Silky Mat Rush)			
42.	1246 <i>Lomandra suaveolens</i>			
43.	1312 <i>Sowerbaea laxiflora</i> (Purple Tassels)			
44.	1319 <i>Thysanotus arenarius</i>			
45.	1343 <i>Thysanotus patersonii</i>			
46.	46055 <i>Thysanotus</i> sp. Coastal plain (N.H. Brittan 66/63)			
47.	1351 <i>Thysanotus sparteus</i>			
48.	1358 <i>Thysanotus triandrus</i>			
Asphodelaceae				
49.	1368 <i>Trachyandra divaricata</i>	Y		

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
Asteraceae				
50.	7838 <i>Arctotheca calendula</i> (Cape Weed, African Marigold)	Y		
51.	7840 <i>Arctotis stoechadifolia</i> (White Arctotis, Silver Arctotis)	Y		
52.	7851 <i>Asteridea pulverulenta</i> (Common Bristle Daisy)			
53.	7856 <i>Blennospora drummondii</i>			
54.	7867 <i>Brachyscome bellidioides</i>			
55.	7878 <i>Brachyscome iberidifolia</i>			
56.	7909 <i>Carduus pycnocephalus</i> (Slender Thistle)	Y		
57.	7916 <i>Centaurea melitensis</i> (Maltese Cockspur, Malta Thistle)	Y		
58.	7937 <i>Cirsium vulgare</i> (Spear Thistle, Scotch Thistle)	Y		
59.	20074 <i>Conyza sumatrensis</i>	Y		
60.	7943 <i>Cotula australis</i> (Common Cotula)			
61.	7947 <i>Cotula turbinata</i> (Funnel Weed)	Y		
62.	7961 <i>Dittrichia graveolens</i> (Stinkwort)	Y		
63.	15137 <i>Euchiton sphaericus</i>			
64.	7976 <i>Galinsoga parviflora</i> (Potato Weed)	Y		
65.	16311 <i>Gazania linearis</i>	Y		
66.	12741 <i>Hyalosperma cotula</i>			
67.	8086 <i>Hypochoeris glabra</i> (Smooth Catsear)	Y		
68.	9352 <i>Hypochoeris radicata</i> (Flat Weed, Cats-ear)	Y		
69.	29046 <i>Lactuca serriola forma serriola</i>	Y		
70.	18585 <i>Lagenophora huegelii</i>			
71.	17852 <i>Leptorhynchos scaber</i> (Lanky Buttons)			
72.	16449 <i>Leucophyta brownii</i>			
73.	8105 <i>Millotia myosotidifolia</i>			
74.	8106 <i>Millotia tenuifolia</i> (Soft Millotia)			
75.	8127 <i>Olearia axillaris</i> (Coastal Daisybush)			
76.	8149 <i>Olearia rudis</i> (Rough Daisybush)			
77.	42281 <i>Pithocarpa cordata</i>			
78.	8165 <i>Pithocarpa pulchella</i> (Beautiful Pithocarpa)			
79.	18353 <i>Pithocarpa pulchella var. pulchella</i>			
80.	8175 <i>Podolepis gracilis</i> (Slender Podolepis)			
81.	8177 <i>Podolepis lessonii</i>			
82.	8182 <i>Podotheca angustifolia</i> (Sticky Longheads)			
83.	8183 <i>Podotheca chrysantha</i> (Yellow Podotheca)			
84.	8184 <i>Podotheca gnaphalioides</i> (Golden Long-heads)			
85.	8189 <i>Pseudognaphalium luteoalbum</i> (Jersey Cudweed)			
86.	8195 <i>Quinetia urvillei</i>			
87.	13300 <i>Rhodanthe citrina</i>			
88.	15035 <i>Rhodanthe corymbosa</i>			
89.	20663 <i>Senecio multicaulis subsp. multicaulis</i>			
90.	25884 <i>Senecio pinnatifolius var. latilobus</i>			
91.	8218 <i>Senecio ramosissimus</i> (Auricled Groundsel)			
92.	8220 <i>Senecio vulgaris</i> (Common Groundsel)	Y		
93.	8225 <i>Siloxerus humifusus</i> (Procumbent Siloxerus)			
94.	8231 <i>Sonchus oleraceus</i> (Common Sowthistle)	Y		
95.	8254 <i>Urospermum picroides</i> (False Hawkbit)	Y		
96.	8255 <i>Ursinia anthemoides</i> (Ursinia)	Y		
97.	38388 <i>Ursinia anthemoides subsp. anthemoides</i>	Y		
98.	13331 <i>Waitzia acuminata var. acuminata</i>			
99.	13328 <i>Waitzia nitida</i>			
100.	8282 <i>Waitzia suaveolens</i> (Fragrant Waitzia)			
101.	13333 <i>Waitzia suaveolens var. suaveolens</i>			
102.	8286 <i>Xanthium occidentale</i> (Noogoora Burr)	Y		
103.	44861 <i>Xerochrysum macranthum</i>			
Auriscalpiaceae				
104.	38805 <i>Lentinellus pulvinulus</i>			
Bangiaceae				
105.	27184 <i>Porphyra lucasii</i>			
Bonnemaisoniaceae				
106.	26486 <i>Asparagopsis taxiformis</i>			
Brassicaceae				
107.	3000 <i>Brassica tournefortii</i> (Mediterranean Turnip)	Y		
108.	3016 <i>Heliophila pusilla</i>	Y		
109.	3042 <i>Lepidium pseudotasmanicum</i>		P4	
110.	3044 <i>Lepidium rotundum</i> (Veined Peppergrass)			
111.	3049 <i>Matthiola incana</i> (Common Stock)	Y		
112.	3061 <i>Raphanus raphanistrum</i> (Wild Radish)	Y		

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
113.	19403 <i>Stenopetalum gracile</i>			
114.	3080 <i>Stenopetalum robustum</i>			
Bryaceae				
115.	32331 <i>Bryum lanatum</i>			
116.	32380 <i>Gemmabryum pachythecum</i>			
Campanulaceae				
117.	37500 <i>Grammatotheca bergiana</i> var. <i>bergiana</i>	Y		
118.	7396 <i>Isotoma hypocrateriformis</i> (Woodbridge Poison)			
119.	9289 <i>Lobelia anceps</i> (Angled Lobelia)			
120.	7402 <i>Lobelia gibbosa</i> (Tall Lobelia)			
121.	7403 <i>Lobelia heterophylla</i> (Wing-seeded Lobelia)			
122.	7408 <i>Lobelia tenuior</i> (Slender Lobelia)			
123.	7384 <i>Wahlenbergia capensis</i> (Cape Bluebell)	Y		
124.	7389 <i>Wahlenbergia preissii</i>			
Caprifoliaceae				
125.	7368 <i>Scabiosa atropurpurea</i> (Purple Pincushion)	Y		
Caryophyllaceae				
126.	2889 <i>Cerastium glomeratum</i> (Mouse Ear Chickweed)	Y		
127.	19825 <i>Petrohragia dubia</i>	Y		
128.	2905 <i>Polycarpon tetraphyllum</i> (Fourleaf Allseed)	Y		
129.	2906 <i>Sagina apetala</i> (Annual Pearlwort)	Y		
130.	2909 <i>Silene gallica</i> (French Catchfly)	Y		
131.	2918 <i>Stellaria media</i> (Chickweed)	Y		
Casuarinaceae				
132.	1728 <i>Allocasuarina fraseriana</i> (Sheoak, Kondil)			
133.	1732 <i>Allocasuarina humilis</i> (Dwarf Sheoak)			
134.	13908 <i>Allocasuarina lehmanniana</i> subsp. <i>lehmanniana</i>			
Caulerpaceae				
135.	44539 <i>Caulerpa cylindracea</i>			
136.	26562 <i>Caulerpa fergusonii</i>			
137.	27382 <i>Caulerpa longifolia</i> forma <i>crispata</i>			
138.	26570 <i>Caulerpa obscura</i>			
139.	26571 <i>Caulerpa papillosa</i>			
140.	46993 <i>Caulerpa taxifolia</i> var. <i>distichophylla</i>			
Celastraceae				
141.	9069 <i>Stackhousia huegelii</i>			
142.	4733 <i>Stackhousia monogyna</i>			
143.	9070 <i>Stackhousia pubescens</i> (Downy Stackhousia)			
144.	4737 <i>Tripterococcus brunonis</i> (Winged Stackhousia)			
Centrolepidaceae				
145.	1121 <i>Centrolepis aristata</i> (Pointed Centrolepis)			
146.	1125 <i>Centrolepis drummondiana</i>			
Ceramiaceae				
147.	26471 <i>Antithamnion armatum</i>			
148.	26475 <i>Antithamnion hanovioides</i>			
149.	26511 <i>Bornetia binderiana</i>			
150.	26599 <i>Ceramium puberulum</i>			
151.	26600 <i>Ceramium pusillum</i>			
152.	26942 <i>Hirsutithallia loricina</i>			
Champiaceae				
153.	26621 <i>Champia zostericola</i>			
Chenopodiaceae				
154.	2463 <i>Atriplex isatidea</i> (Coast Saltbush)			
155.	11341 <i>Rhagodia baccata</i> subsp. <i>baccata</i>			
Cladophoraceae				
156.	26607 <i>Chaetomorpha aerea</i>			
Cladostephaceae				
157.	26662 <i>Cladostephus spongiosus</i>			
Codiaceae				
158.	26672 <i>Codium galeatum</i>			
Colchicaceae				
159.	12770 <i>Burchardia congesta</i>			
160.	1398 <i>Wurmbea monantha</i>			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
Convolvulaceae				
161.	11021 <i>Cuscuta planiflora</i>	Y		
Crassulaceae				
162.	3137 <i>Crassula colorata</i> (Dense Stonecrop)			
163.	11709 <i>Crassula colorata</i> var. <i>acuminata</i>			
164.	11563 <i>Crassula colorata</i> var. <i>colorata</i>			
165.	11349 <i>Crassula decumbens</i> var. <i>decumbens</i>			
166.	3140 <i>Crassula glomerata</i>	Y		
Crepidotaceae				
167.	<i>Crepidotus nephrodes</i>			
Cucurbitaceae				
168.	25825 <i>Cucurbita pepo</i>	Y		
Cyperaceae				
169.	740 <i>Baumea arthropphylla</i>			
170.	741 <i>Baumea articulata</i> (Jointed Rush)			
171.	743 <i>Baumea juncea</i> (Bare Twigrush)			
172.	744 <i>Baumea laxa</i>			
173.	745 <i>Baumea preissii</i>			
174.	753 <i>Carex appressa</i> (Tall Sedge)			
175.	755 <i>Carex fascicularis</i> (Tassel Sedge)			
176.	43241 <i>Carex thecata</i>			
177.	760 <i>Caustis dioica</i>			
178.	783 <i>Cyperus congestus</i> (Dense Flat-sedge)	Y		
179.	810 <i>Cyperus rotundus</i> (Nut Grass)	Y		
180.	816 <i>Cyperus tenuiflorus</i> (Scaly Sedge)	Y		
181.	20216 <i>Ficinia nodosa</i> (Knotted Club Rush)			
182.	907 <i>Gahnia trifida</i> (Coast Saw-sedge)			
183.	20200 <i>Isolepis cernua</i> var. <i>setiformis</i>			
184.	917 <i>Isolepis marginata</i> (Coarse Club-rush)			
185.	925 <i>Lepidosperma angustatum</i>			
186.	42742 <i>Lepidosperma calcicola</i>			
187.	932 <i>Lepidosperma effusum</i> (Spreading Sword-sedge)			
188.	933 <i>Lepidosperma gladiatum</i> (Coast Sword-sedge, Kerbin)			
189.	936 <i>Lepidosperma leptostachyum</i>			
190.	937 <i>Lepidosperma longitudinale</i> (Pithy Sword-sedge)			
191.	940 <i>Lepidosperma pubisquamum</i>			
192.	944 <i>Lepidosperma scabrum</i>			
193.	945 <i>Lepidosperma squamatum</i>			
194.	946 <i>Lepidosperma striatum</i>			
195.	955 <i>Mesomelaena pseudostygia</i>			
196.	48356 <i>Schoenoplectus tabernaemontani</i>			
197.	984 <i>Schoenus curvifolius</i>			
198.	992 <i>Schoenus grandiflorus</i> (Large Flowered Bogrush)			
199.	997 <i>Schoenus lanatus</i> (Woolly Bog-rush)			
200.	998 <i>Schoenus latitans</i>			
201.	1002 <i>Schoenus nanus</i> (Tiny Bog Rush)			
202.	1026 <i>Schoenus unispiculatus</i>			
203.	1036 <i>Tetraria octandra</i>			
204.	1038 <i>Tricostularia neesii</i>			
Cystocloniaceae				
205.	35898 <i>Hypnea musciformis</i>			
206.	26971 <i>Hypnea ramentacea</i>			
Dacrymycetaceae				
207.	<i>Calocera guepinioides</i>			
Dasyaceae				
208.	26738 <i>Dasya elongata</i>			
Dasypogonaceae				
209.	19309 <i>Calectasia narragara</i>			
Delesseriaceae				
210.	27149 <i>Platysiphonia mutabilis</i>			
Dicranaceae				
211.	32338 <i>Campylopus introflexus</i>	Y		
Dicranemataceae				
212.	27347 <i>Tylopus obtusatus</i>			

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Dictyotaceae				
213.	26767 <i>Dictyopteris plagiogramma</i>			
214.	27043 <i>Lobophora variegata</i>			
215.	27044 <i>Lobospira bicuspidata</i>			
216.	27373 <i>Zonaria turneriana</i>			
Dilleniaceae				
217.	5112 <i>Hibbertia aurea</i>			
218.	5135 <i>Hibbertia hypericoides</i> (Yellow Buttercups)			
219.	45534 <i>Hibbertia hypericoides</i> subsp. <i>hypericoides</i>			
220.	5162 <i>Hibbertia racemosa</i> (Stalked Guinea Flower)			
221.	<i>Hibbertia</i> sp.			
222.	11461 <i>Hibbertia spicata</i> subsp. <i>leptotheca</i>		P3	
223.	48381 <i>Hibbertia striata</i>			
Droseraceae				
224.	3095 <i>Drosera erythrorhiza</i> (Red Ink Sundew)			
225.	3118 <i>Drosera pallida</i> (Pale Rainbow)			
Ericaceae				
226.	6295 <i>Acrotriche cordata</i> (Coast Ground Berry)			
227.	6314 <i>Andersonia lehmanniana</i>			
228.	11471 <i>Andersonia lehmanniana</i> subsp. <i>lehmanniana</i>			
229.	6331 <i>Astroloma microcalyx</i> (Native Cranberry)			
230.	6334 <i>Astroloma pallidum</i> (Kick Bush)			
231.	6347 <i>Conostephium minus</i> (Pink-tipped Pearl flower)			
232.	6348 <i>Conostephium pendulum</i> (Pearl Flower)			
233.	6349 <i>Conostephium preissii</i>			
234.	6405 <i>Leucopogon insularis</i>			
235.	40801 <i>Leucopogon maritimus</i>		P1	
236.	6425 <i>Leucopogon oxycedrus</i>			
237.	6427 <i>Leucopogon parviflorus</i> (Coast Beard-heath)			
238.	6434 <i>Leucopogon polymorphus</i>			
239.	6436 <i>Leucopogon propinquus</i>			
240.	6440 <i>Leucopogon racemosus</i>			
241.	19460 <i>Leucopogon</i> sp. <i>Yanchep</i> (M. Hislop 1986)		P3	
242.	40803 <i>Leucopogon squarrosus</i> subsp. <i>squarrosus</i>			
243.	34736 <i>Lysinema pentapetalum</i>			
244.	48297 <i>Styphelia filifolia</i>		P3	
Euphorbiaceae				
245.	4636 <i>Euphorbia paralias</i> (Sea Spurge)	Y		
246.	4638 <i>Euphorbia peplus</i> (Petty Spurge)	Y		
247.	4648 <i>Euphorbia terracina</i> (Geraldton Carnation Weed)	Y		
Fabaceae				
248.	15430 <i>Acacia alata</i> var. <i>tetrantha</i>			
249.	15466 <i>Acacia applanata</i>			
250.	15470 <i>Acacia barbinervis</i> subsp. <i>borealis</i>			
251.	3237 <i>Acacia benthamii</i>		P2	
252.	3262 <i>Acacia cochlearis</i> (Rigid Wattle)			
253.	3282 <i>Acacia cyclops</i> (Coastal Wattle)			
254.	3374 <i>Acacia huegelii</i>			
255.	3409 <i>Acacia lasiocarpa</i> (Panjang)			
256.	11611 <i>Acacia lasiocarpa</i> var. <i>lasiocarpa</i>			
257.	3502 <i>Acacia pulchella</i> (Prickly Moses)			
258.	15481 <i>Acacia pulchella</i> var. <i>glaberrima</i>			
259.	15482 <i>Acacia pulchella</i> var. <i>goadbyi</i>			
260.	3525 <i>Acacia rostellifera</i> (Summer-scented Wattle)			
261.	30032 <i>Acacia saligna</i> subsp. <i>saligna</i>			
262.	3541 <i>Acacia sessilis</i>			
263.	3557 <i>Acacia stenoptera</i> (Narrow Winged Wattle)			
264.	3584 <i>Acacia truncata</i>			
265.	3602 <i>Acacia willdenowiana</i> (Grass Wattle)			
266.	3604 <i>Acacia xanthina</i> (White-stemmed Wattle)			
267.	3692 <i>Aotus procumbens</i>			
268.	3710 <i>Bossiaea eriocarpa</i> (Common Brown Pea)			
269.	3805 <i>Daviesia decurrens</i> (Prickly Bitter-pea)			
270.	19747 <i>Daviesia decurrens</i> subsp. <i>decurrens</i>			
271.	18560 <i>Daviesia divaricata</i> subsp. <i>divaricata</i>			
272.	16585 <i>Daviesia nudiflora</i> subsp. <i>nudiflora</i>			
273.	3832 <i>Daviesia physodes</i>			

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274.	3833 <i>Daviesia podophylla</i>			
275.	20483 <i>Gastrolobium linearifolium</i>			
276.	20482 <i>Gastrolobium nervosum</i>			
277.	3945 <i>Gompholobium aristatum</i>			
278.	10909 <i>Gompholobium confertum</i>			
279.	3950 <i>Gompholobium knightianum</i>			
280.	19295 <i>Gompholobium pungens</i>			
281.	11083 <i>Gompholobium scabrum</i>			
282.	3957 <i>Gompholobium tomentosum</i> (Hairy Yellow Pea)			
283.	3961 <i>Hardenbergia comptoniana</i> (Native Wisteria)			
284.	3966 <i>Hovea pungens</i> (Devil's Pins, Puyenak)			
285.	3968 <i>Hovea trisperma</i> (Common Hovea)			
286.	12859 <i>Hovea trisperma</i> var. <i>trisperma</i>			
287.	3992 <i>Isotropis cuneifolia</i> (Granny Bonnets)			
288.	19700 <i>Isotropis cuneifolia</i> subsp. <i>cuneifolia</i>			
289.	14783 <i>Jacksonia calcicola</i>			
290.	4012 <i>Jacksonia furcellata</i> (Grey Stinkwood)			
291.	4029 <i>Jacksonia sternbergiana</i> (Stinkwood, Kapur)			
292.	4042 <i>Kennedia nigricans</i> (Black Kennedia)			
293.	4044 <i>Kennedia prostrata</i> (Scarlet Runner)			
294.	4066 <i>Lupinus cosentinii</i>	Y		
295.	4085 <i>Melilotus indicus</i>	Y		
296.	4155 <i>Psoralea pinnata</i> (African Scurfpea)	Y		
297.	4181 <i>Pultenaea reticulata</i>			
298.	19183 <i>Retama raetam</i>	Y		
299.	20348 <i>Sphaerolobium calcicola</i>		P3	
300.	17551 <i>Sphaerolobium drummondii</i>			
301.	4207 <i>Sphaerolobium medium</i>			
302.	4256 <i>Templetonia retusa</i> (Cockies Tongues)			
303.	4291 <i>Trifolium arvense</i> (Hare's Foot Clover)	Y		
304.	17542 <i>Trifolium arvense</i> var. <i>arvense</i>	Y		
305.	4292 <i>Trifolium campestre</i> (Hop Clover)	Y		
306.	4309 <i>Trifolium scabrum</i> (Rough Clover)	Y		
307.	4310 <i>Trifolium spumosum</i> (Bladder Clover)	Y		
308.	11474 <i>Vicia sativa</i> subsp. <i>nigra</i>	Y		
309.	4325 <i>Viminaria juncea</i> (Swishbush, Koweda)			
Funariaceae				
310.	32370 <i>Funaria hygrometrica</i>			
Gentianaceae				
311.	17800 <i>Centaurium pulchellum</i>	Y		
312.	6542 <i>Centaurium tenuiflorum</i>	Y		
Geraniaceae				
313.	4333 <i>Erodium cicutarium</i> (Common Storksbill)	Y		
314.	4336 <i>Erodium moschatum</i> (Musky Crowfoot)	Y		
315.	4339 <i>Geranium molle</i> (Dove's Foot Cranesbill)	Y		
316.	4343 <i>Pelargonium capitatum</i> (Rose Pelargonium)	Y		
317.	4346 <i>Pelargonium littorale</i>			
Gigaspermaceae				
318.	32384 <i>Gigaspermum repens</i>			
Goodeniaceae				
319.	7451 <i>Dampiera lavandulacea</i>			
320.	7454 <i>Dampiera linearis</i> (Common Dampiera)			
321.	7568 <i>Lechenaultia biloba</i> (Blue Leschenaultia)			
322.	7574 <i>Lechenaultia floribunda</i> (Free-flowering Leschenaultia)			
323.	7577 <i>Lechenaultia hirsuta</i> (Hairy Leschenaultia)			
324.	7580 <i>Lechenaultia linarioides</i> (Yellow Leschenaultia)			
325.	7586 <i>Lechenaultia stenosepala</i> (Narrow-sepaled Leschenaultia)			
326.	7603 <i>Scaevola canescens</i> (Grey Scaevola)			
327.	7606 <i>Scaevola crassifolia</i> (Thick-leaved Fan-flower)			
328.	7614 <i>Scaevola globulifera</i>			
329.	7626 <i>Scaevola nitida</i> (Shining Fanflower)			
330.	13181 <i>Scaevola repens</i> var. <i>angustifolia</i>			
331.	13182 <i>Scaevola repens</i> var. <i>repens</i>			
332.	7647 <i>Scaevola thesioides</i>			
333.	13152 <i>Scaevola thesioides</i> subsp. <i>thesioides</i>			
334.	7666 <i>Verreauxia reinwardtii</i> (Common Verreauxia)			
Gracilariaceae				

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335.	26876 <i>Gracilaria verrucosa</i>			
Graphidaceae				
336.	44221 <i>Xalocoa ocellata</i>			
Gyrostemonaceae				
337.	2784 <i>Gyrostemon ramulosus</i> (Corkybark)			
338.	2791 <i>Tersonia cyathiflora</i> (Button Creeper)			
Haemodoraceae				
339.	1409 <i>Anigozanthos humilis</i> (Catspaw)			
340.	11434 <i>Anigozanthos humilis</i> subsp. <i>humilis</i>			
341.	11261 <i>Anigozanthos manglesii</i> subsp. <i>manglesii</i>			
342.	1418 <i>Conostylis aculeata</i> (Prickly Conostylis)			
343.	11826 <i>Conostylis aculeata</i> subsp. <i>aculeata</i>			
344.	11552 <i>Conostylis aculeata</i> subsp. <i>bromelioides</i>			
345.	11513 <i>Conostylis aculeata</i> subsp. <i>cygnorum</i>			
346.	1425 <i>Conostylis bracteata</i>		P3	
347.	1427 <i>Conostylis candicans</i> (Grey Cottonhead)			
348.	12027 <i>Conostylis candicans</i> subsp. <i>calcicola</i>			
349.	11438 <i>Conostylis candicans</i> subsp. <i>candicans</i>			
350.	11388 <i>Conostylis pauciflora</i> subsp. <i>euryrhipis</i>		P4	
351.	11657 <i>Conostylis pauciflora</i> subsp. <i>pauciflora</i>		P4	
352.	1454 <i>Conostylis setigera</i> (Bristly Cottonhead)			
353.	11597 <i>Conostylis setigera</i> subsp. <i>setigera</i>			
354.	11870 <i>Conostylis teretifolia</i> subsp. <i>teretifolia</i>			
355.	1468 <i>Haemodorum laxum</i>			
356.	1470 <i>Haemodorum paniculatum</i> (Mardja)			
357.	1475 <i>Haemodorum spicatum</i> (Mardja)			
358.	1478 <i>Phlebocarya ciliata</i>			
Halimedaceae				
359.	47213 <i>Halimeda versatilis</i>			
Haloragaceae				
360.	34676 <i>Meionectes brownii</i> (Swamp Raspwort)			
Hallymeniaceae				
361.	26850 <i>Gelinaria ulvoidea</i>			
Hemerocallidaceae				
362.	1264 <i>Arnocrinum preissii</i>			
363.	11283 <i>Corynotheca micrantha</i> var. <i>micrantha</i>			
364.	1259 <i>Dianella revoluta</i> (Blueberry Lily)			
365.	11636 <i>Dianella revoluta</i> var. <i>divaricata</i>			
366.	1260 <i>Stypandra glauca</i> (Blind Grass)			
367.	1361 <i>Tricoryne elatior</i> (Yellow Autumn Lily)			
Hymenochaetaceae				
368.	<i>Coltricia cinnamomea</i>			
Hymenocladaceae				
369.	26960 <i>Hymenocladia chondricola</i>			
Iridaceae				
370.	1515 <i>Ferraria crispa</i> (Black Flag)	Y		
371.	1520 <i>Gladiolus caryophyllaceus</i> (Wild Gladiolus)	Y		
372.	19179 <i>Moraea flaccida</i> (One-leaf Cape Tulip)	Y		
373.	11749 <i>Orthrosanthus laxus</i> var. <i>laxus</i> (Morning Iris)			
374.	30472 <i>Patersonia occidentalis</i> var. <i>occidentalis</i>			
375.	1552 <i>Patersonia rudis</i> (Hairy Flag)			
376.	11544 <i>Romulea rosea</i> var. <i>australis</i> (Guildford Grass)	Y		
Juncaceae				
377.	1188 <i>Juncus pallidus</i> (Pale Rush)			
Juncaginaceae				
378.	33276 <i>Triglochin isingiana</i>			
379.	18587 <i>Triglochin nana</i>			
380.	152 <i>Triglochin trichophora</i>			
Kallymeniaceae				
381.	48423 <i>Stauromenia lacerata</i>			
Lamiaceae				
382.	16933 <i>Hemiandra glabra</i>			
383.	6839 <i>Hemiandra pungens</i> (Snakebush)			

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384.	38320 <i>Hemiandra</i> sp. <i>Jurien</i> (B.J. Conn & M.E. Tozer BJC 3885)			
385.	6871 <i>Hemigenia sericea</i> (<i>Silky Hemigenia</i>)			
386.	41020 <i>Hemiphora bartlingii</i> (<i>Woolly Dragon</i>)			
387.	15994 <i>Mentha x piperita</i> var. <i>citrata</i>	Y		
388.	6939 <i>Westringia dampieri</i>			
Lauraceae				
389.	2951 <i>Cassytha flava</i> (<i>Dodder Laurel</i>)			
390.	11501 <i>Cassytha glabella</i> forma <i>casuarinae</i>			
391.	2956 <i>Cassytha pomiformis</i> (<i>Dodder Laurel</i>)			
392.	2957 <i>Cassytha racemosa</i> (<i>Dodder Laurel</i>)			
393.	11799 <i>Cassytha racemosa</i> forma <i>racemosa</i>			
Lecanoraceae				
394.	27815 <i>Lecanora sphaerospora</i>			
Lentibulariaceae				
395.	7125 <i>Utricularia australis</i>			
Linaceae				
396.	4362 <i>Linum marginale</i> (<i>Wild Flax</i>)			
Loganiaceae				
397.	6515 <i>Logania vaginalis</i> (<i>White Spray</i>)			
398.	16177 <i>Phyllangium paradoxum</i>			
Loranthaceae				
399.	2401 <i>Nuytsia floribunda</i> (<i>Christmas Tree, Mudja</i>)			
Lythraceae				
400.	5281 <i>Lythrum hyssopifolia</i> (<i>Lesser Loosestrife</i>)	Y		
Macarthuraceae				
401.	2838 <i>Macarthuria apetala</i>			
Malvaceae				
402.	4906 <i>Alyogyne huegelii</i> (<i>Lilac Hibiscus</i>)			
403.	5011 <i>Guichenotia ledifolia</i>			
404.	5038 <i>Lasiopetalum membranaceum</i>		P3	
405.	5077 <i>Thomasia cognata</i>			
406.	5105 <i>Thomasia triphylla</i>			
Montiaceae				
407.	2845 <i>Calandrinia brevipedata</i> (<i>Short-stalked Purslane</i>)			
408.	2856 <i>Calandrinia liniflora</i> (<i>Parakeelya</i>)			
409.	40827 <i>Calandrinia tholiformis</i>			
Moraceae				
410.	1747 <i>Ficus carica</i> (<i>Common Fig</i>)	Y		
Myrtaceae				
411.	20283 <i>Astartea scoparia</i> (<i>Common Astartea</i>)			
412.	5382 <i>Beaufortia elegans</i> (<i>Elegant Beaufortia</i>)			
413.	5426 <i>Calothamnus quadrifidus</i> (<i>One-sided Bottlebrush, Kwowdjard</i>)			
414.	35816 <i>Calothamnus quadrifidus</i> subsp. <i>quadrifidus</i>			
415.	5429 <i>Calothamnus sanguineus</i> (<i>Silky-leaved Blood flower, Pindak</i>)			
416.	5439 <i>Calytrix angulata</i> (<i>Yellow Starflower</i>)			
417.	5458 <i>Calytrix flavescens</i> (<i>Summer Starflower</i>)			
418.	5460 <i>Calytrix fraseri</i> (<i>Pink Summer Calytrix</i>)			
419.	5476 <i>Calytrix sapphirina</i>			
420.	5479 <i>Calytrix strigosa</i>			
421.	5498 <i>Chamelaucium uncinatum</i> (<i>Geraldton Wax</i>)			
422.	17104 <i>Corymbia calophylla</i> (<i>Marri</i>)			
423.	13949 <i>Eremaea asterocarpa</i>			
424.	13950 <i>Eremaea asterocarpa</i> subsp. <i>asterocarpa</i>			
425.	5540 <i>Eremaea fimbriata</i>			
426.	5541 <i>Eremaea pauciflora</i>			
427.	14104 <i>Eremaea pauciflora</i> var. <i>pauciflora</i>			
428.	13091 <i>Eucalyptus argutifolia</i> (<i>Wabling Hill Mallee</i>)		T	
429.	5615 <i>Eucalyptus decipiens</i> (<i>Limestone Marlock, Moit</i>)			
430.	5649 <i>Eucalyptus foecunda</i> (<i>Narrow-leaved Red Mallee</i>)			
431.	5659 <i>Eucalyptus gomphocephala</i> (<i>Tuart, Duart</i>)			
432.	5708 <i>Eucalyptus marginata</i> (<i>Jarra, Djara</i>)			
433.	13547 <i>Eucalyptus marginata</i> subsp. <i>marginata</i> (<i>Jarra</i>)			
434.	13541 <i>Eucalyptus petrensis</i>			
435.	13511 <i>Eucalyptus rudis</i> subsp. <i>rudis</i>			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
436.	5790 <i>Eucalyptus todtiana</i> (Coastal Blackbutt)			
437.	15498 <i>Kunzea glabrescens</i> (Spearwood)			
438.	5850 <i>Leptospermum laevigatum</i> (Coast Teatree)	Y		
439.	5857 <i>Leptospermum spinescens</i>			
440.	5887 <i>Melaleuca cardiophylla</i> (Tangling Melaleuca)			
441.	13271 <i>Melaleuca huegelii</i> subsp. <i>huegelii</i>			
442.	18394 <i>Melaleuca parviceps</i>			
443.	5959 <i>Melaleuca raphiophylla</i> (Swamp Paperbark)			
444.	18598 <i>Melaleuca systema</i>			
445.	5983 <i>Melaleuca trichophylla</i>			
446.	6012 <i>Regelia ciliata</i>			
447.	6033 <i>Scholtzia involucrata</i> (Spiked Scholtzia)			
448.	12411 <i>Verticordia densiflora</i> var. <i>cespitosa</i>			
449.	6101 <i>Verticordia nitens</i> (Morrison Featherflower, Kodjeningara)			
Olacaceae				
450.	2365 <i>Olax benthamiana</i>			
Onagraceae				
451.	11570 <i>Epilobium billardioreanum</i> subsp. <i>billardioreanum</i> (Smooth Willow Herb)			
452.	11992 <i>Epilobium billardioreanum</i> subsp. <i>intermedium</i>			
453.	6132 <i>Epilobium ciliatum</i>	Y		
454.	6133 <i>Epilobium hirtigerum</i> (Hairy Willow Herb)			
455.	14289 <i>Epilobium tetragonum</i> subsp. <i>tetragonum</i>	Y		
456.	6139 <i>Oenothera glazioviana</i> (Evening Primrose)	Y		
Orchidaceae				
457.	1592 <i>Caladenia flava</i> (Cowslip Orchid)			
458.	15348 <i>Caladenia flava</i> subsp. <i>flava</i>			
459.	15352 <i>Caladenia georgei</i>			
460.	1599 <i>Caladenia latifolia</i> (Pink Fairy Orchid)			
461.	15377 <i>Caladenia reptans</i> subsp. <i>reptans</i>			
462.	15114 <i>Cyanicula gemmata</i>			
463.	1635 <i>Diuris longifolia</i> (Common Donkey Orchid)			
464.	1643 <i>Elythranthera brunonis</i> (Purple Enamel Orchid)			
465.	1644 <i>Elythranthera emarginata</i> (Pink Enamel Orchid)			
466.	1646 <i>Eriochilus dilatatus</i> (White Bunny Orchid)			
467.	15418 <i>Leptoceras menziesii</i>			
468.	34158 <i>Microtis alboboviridis</i>			
469.	20460 <i>Pheladenia deformis</i>			
470.	15425 <i>Prasophyllum calcicola</i>			
471.	1680 <i>Prasophyllum parvifolium</i> (Autumn Leek Orchid)			
472.	<i>Pterostylis</i> aff. <i>nana</i>			
473.	15426 <i>Pterostylis aspera</i>			
474.	1693 <i>Pterostylis recurva</i> (Jug Orchid)			
475.	<i>Pterostylis</i> sp.			
476.	18658 <i>Pterostylis</i> sp. <i>short sepals</i> (W. Jackson BJ259)			
477.	1698 <i>Pterostylis vittata</i> (Banded Greenhood)			
478.	1708 <i>Thelymitra fuscolutea</i> (Chestnut Sun Orchid)			
479.	<i>Urochilus vittatus</i>			Y
Orobanchaceae				
480.	15037 <i>Bartsia trixago</i>	Y		
481.	7122 <i>Orobanche minor</i> (Lesser Broomrape)	Y		
482.	7089 <i>Parentucellia latifolia</i> (Common Bartsia)	Y		
483.	7090 <i>Parentucellia viscosa</i> (Sticky Bartsia)	Y		
Oxalidaceae				
484.	30375 <i>Oxalis exilis</i>			
485.	4356 <i>Oxalis pes-caprae</i> (Soursob)	Y		
Papaveraceae				
486.	2969 <i>Fumaria capreolata</i> (Whiteflower Fumitory)	Y		
487.	2971 <i>Fumaria muralis</i> (Wall Fumitory)	Y		
488.	31532 <i>Fumaria muralis</i> subsp. <i>muralis</i>	Y		
489.	2967 <i>Romneya coulteri</i> (California Tree Poppy)	Y		
Passifloraceae				
490.	5225 <i>Passiflora filamentosa</i>	Y		
Pezizaceae				
491.	<i>Peziza austrogeaster</i>			
492.	<i>Peziza badia</i>			
493.	<i>Peziza</i> sp.			

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494.	38819 <i>Peziza vesiculosa</i>			
Phallaceae				
495.	44926 <i>Ileodictyon gracile</i>			
Phanerochaetaceae				
496.	44729 <i>Porostereum crassum</i>			
Phyllanthaceae				
497.	4675 <i>Phyllanthus calycinus</i> (False Boronia)			
498.	4688 <i>Poranthera drummondii</i>			
499.	4691 <i>Poranthera microphylla</i> (Small Poranthera)			
Physaraceae				
500.	39061 <i>Physarum bitectum</i>			
501.	39063 <i>Physarum cinereum</i>			
Physciaceae				
502.	42104 <i>Buellia albula</i>			
503.	27598 <i>Buellia dissa</i>			
504.	27602 <i>Buellia georgei</i>			
505.	28049 <i>Rinodina bischoffii</i>		P2	Y
Pittosporaceae				
506.	25788 <i>Billardiera fraseri</i> (Elegant Pronaya)			
Placynthiaceae				
507.	27986 <i>Placynthium nigrum</i>		P3	
Plantaginaceae				
508.	7303 <i>Plantago lanceolata</i> (Ribwort Plantain)	Y		
509.	7109 <i>Veronica calycina</i> (Cup Speedwell)			
510.	7110 <i>Veronica distans</i>			
Pleosporaceae				
511.	<i>Alternaria alternata</i>			Y
Plocamiaceae				
512.	27155 <i>Plocamium cartilagineum</i>			
513.	27156 <i>Plocamium mertensii</i>			
Poaceae				
514.	184 <i>Aira caryophyllea</i> (Silvery Hairgrass)	Y		
515.	185 <i>Aira cupaniana</i> (Silvery Hairgrass)	Y		
516.	226 <i>Arundo donax</i> (Giant Reed)	Y		
517.	17234 <i>Austrostipa compressa</i>			
518.	17240 <i>Austrostipa flavescens</i>			
519.	244 <i>Briza maxima</i> (Blowfly Grass)	Y		
520.	245 <i>Briza minor</i> (Shivery Grass)	Y		
521.	247 <i>Bromus arenarius</i> (Sand Brome)			
522.	249 <i>Bromus diandrus</i> (Great Brome)	Y		
523.	250 <i>Bromus hordeaceus</i> (Soft Brome)	Y		
524.	253 <i>Bromus rubens</i> (Red Brome)	Y		
525.	13685 <i>Catapodium rigidum</i> (Rigid Fescue)	Y		
526.	283 <i>Cynodon dactylon</i> (Couch)	Y		
527.	347 <i>Ehrharta calycina</i> (Perennial Veldt Grass)	Y		
528.	376 <i>Eragrostis curvula</i> (African Lovegrass)	Y		
529.	444 <i>Holcus lanatus</i> (Yorkshire Fog)	Y		
530.	20019 <i>Lachnagrostis filiformis</i>			
531.	467 <i>Lagurus ovatus</i> (Hare's Tail Grass)	Y		
532.	476 <i>Lolium perenne</i> (Perennial Ryegrass)	Y		
533.	478 <i>Lolium rigidum</i> (Wimmera Ryegrass)	Y		
534.	485 <i>Microlaena stipoides</i> (Weeping Grass)			
535.	532 <i>Paspalum urvillei</i> (Vasey Grass)	Y		
536.	573 <i>Poa drummondiana</i> (Knotted Poa)			
537.	578 <i>Poa porphyroclados</i>			
538.	582 <i>Polypogon monspeliensis</i> (Annual Beardgrass)	Y		
539.	10970 <i>Rostraria cristata</i>	Y		
540.	40426 <i>Rytidosperma occidentale</i>			
541.	625 <i>Spinifex longifolius</i> (Beach Spinifex)			
542.	708 <i>Triticum aestivum</i> (Wheat)	Y		
543.	716 <i>Urochloa mutica</i>	Y		
544.	724 <i>Vulpia myuros</i> (Rat's Tail Fescue)	Y		
545.	33101 <i>Vulpia myuros forma myuros</i>	Y		
Polygalaceae				

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546.	4550 <i>Comesperma calymega</i> (Blue-spike Milkwort)			
547.	4552 <i>Comesperma confertum</i>			
548.	4554 <i>Comesperma flavum</i>			
549.	4555 <i>Comesperma integerrimum</i>			
550.	4564 <i>Comesperma virgatum</i> (Milkwort)			
Polygonaceae				
551.	2415 <i>Muehlenbeckia polybotrya</i>			
552.	13911 <i>Persicaria decipiens</i>			
553.	2433 <i>Rumex crispus</i> (Curled Dock)	Y		
554.	2440 <i>Rumex pulcher</i> (Fiddle Dock)	Y		
Polyporaceae				
555.	<i>Hexagonia vesparia</i>			
556.	<i>Phaeotrametes decipiens</i>			
557.	38835 <i>Royoporus badius</i>			
Pottiaceae				
558.	32315 <i>Barbula calycina</i>			
559.	32345 <i>Didymodon australasiae</i>			
560.	32346 <i>Didymodon torquatus</i>			
561.	32450 <i>Trichostomum eckelianum</i>			
Primulaceae				
562.	6483 <i>Samolus junceus</i>			
Proteaceae				
563.	1800 <i>Banksia attenuata</i> (Slender Banksia, Piara)			
564.	32580 <i>Banksia dallanneyi</i> var. <i>dallanneyi</i>			
565.	1819 <i>Banksia grandis</i> (Bull Banksia, Pulgarla)			
566.	1834 <i>Banksia menziesii</i> (Firewood Banksia)			
567.	1842 <i>Banksia prionotes</i> (Acorn Banksia)			
568.	32077 <i>Banksia sessilis</i> var. <i>cygnorum</i>			
569.	15607 <i>Conospermum acerosum</i> subsp. <i>acerosum</i>			
570.	15513 <i>Conospermum boreale</i> subsp. <i>boreale</i>			
571.	15041 <i>Conospermum canaliculatum</i>			
572.	15516 <i>Conospermum canaliculatum</i> subsp. <i>canaliculatum</i>			
573.	1885 <i>Conospermum triplinervium</i> (Tree Smokebush)			
574.	15839 <i>Grevillea preissii</i> subsp. <i>preissii</i>			
575.	2119 <i>Grevillea vestita</i>			
576.	12824 <i>Grevillea vestita</i> subsp. <i>vestita</i>			
577.	2146 <i>Hakea costata</i> (Ribbed Hakea)			
578.	2175 <i>Hakea lissocarpha</i> (Honey Bush)			
579.	2197 <i>Hakea prostrata</i> (Harsh Hakea)			
580.	2203 <i>Hakea ruscifolia</i> (Candle Hakea)			
581.	2214 <i>Hakea trifurcata</i> (Two-leaf Hakea)			
582.	2258 <i>Persoonia comata</i>			
583.	20368 <i>Petrophile axillaris</i>			
584.	2286 <i>Petrophile brevifolia</i>			
585.	2299 <i>Petrophile linearis</i> (Pixie Mops)			
586.	2301 <i>Petrophile macrostachya</i>			
587.	2309 <i>Petrophile serruriae</i>			
588.	2316 <i>Stirlingia latifolia</i> (Blueboy)			
589.	2329 <i>Synaphea spinulosa</i>			
590.	15532 <i>Synaphea spinulosa</i> subsp. <i>spinulosa</i>			
Psoraceae				
591.	28000 <i>Psora decipiens</i>			
Pteridaceae				
592.	45 <i>Pteris vittata</i> (Chinese Brake)			
Racopilaceae				
593.	32480 <i>Racopilum cuspidigerum</i> var. <i>convolutaceum</i>			
Ramalinaceae				
594.	27793 <i>Lecania sylvestris</i>		P2	Y
595.	31312 <i>Lecania turicensis</i> var. <i>turicensis</i>		P2	
Ranunculaceae				
596.	10804 <i>Clematis linearifolia</i>			
597.	2932 <i>Ranunculus colonorum</i> (Common Buttercup)			
598.	2933 <i>Ranunculus muricatus</i> (Sharp Buttercup)	Y		
Restionaceae				
599.	1056 <i>Alexgeorgea nitens</i>			

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600.	17663 <i>Desmocladus asper</i>			
601.	16595 <i>Desmocladus flexuosus</i>			
602.	1070 <i>Hypolaena exsulca</i>			
603.	17841 <i>Hypolaena pubescens</i>			
604.	18074 <i>Lepidobolus preissianus</i> subsp. <i>preissianus</i>			
Rhamnaceae				
605.	4802 <i>Cryptandra mutila</i>			
606.	4809 <i>Cryptandra pungens</i>			
607.	4810 <i>Cryptandra scoparia</i>			
608.	4828 <i>Spyridium globulosum</i> (<i>Basket Bush</i>)			
609.	15066 <i>Stenanthemum notiale</i> subsp. <i>chamelum</i>			
610.	11665 <i>Trymalium ledifolium</i> var. <i>ledifolium</i>			
611.	33418 <i>Trymalium odoratissimum</i> subsp. <i>odoratissimum</i>			
Rhodomelaceae				
612.	26689 <i>Coeloclonium umbellula</i>			
613.	26752 <i>Dasyclonium incisum</i>			
614.	26761 <i>Dictyomenia harveyana</i>			
615.	26762 <i>Dictyomenia sonderi</i>			
616.	26763 <i>Dictyomenia tridens</i>			
617.	26919 <i>Herposiphonia rostrata</i>			
618.	26922 <i>Herposiphonia versicolor</i>			
619.	26998 <i>Laurencia brongniartii</i>			
620.	27011 <i>Lenormandia latifolia</i>			
621.	27013 <i>Lenormandia spectabilis</i>			
622.	27108 <i>Osmundaria spiralis</i>			
623.	27173 <i>Polysiphonia decipiens</i>			
624.	27190 <i>Protokuetzia australasica</i>			
Rhodymeniaceae				
625.	27015 <i>Leptosomia rosea</i>			
Ricciaceae				
626.	<i>Riccia bifurca</i>			
Rubiaceae				
627.	7323 <i>Galium murale</i> (<i>Small Goosegrass</i>)	Y		
628.	7348 <i>Opercularia hispidula</i> (<i>Hispid Stinkweed</i>)			
629.	18255 <i>Opercularia vaginata</i> (<i>Dog Weed</i>)			
Rutaceae				
630.	11381 <i>Boronia ramosa</i> subsp. <i>anethifolia</i>			
631.	44593 <i>Coleonema pulchellum</i>	Y		
632.	4453 <i>Diplolaena angustifolia</i> (<i>Yanchep Rose</i>)			
633.	18529 <i>Philotheca spicata</i> (<i>Pepper and Salt</i>)			
634.	18547 <i>Rhadinothamnus anceps</i>			
Santalaceae				
635.	10765 <i>Exocarpos sparteus</i> (<i>Broom Ballart, Djuk</i>)			
636.	2344 <i>Leptomeria empetriformis</i>			
637.	2350 <i>Leptomeria pauciflora</i> (<i>Sparse-flowered Currant Bush</i>)			
638.	2352 <i>Leptomeria preissiana</i>			
Sapindaceae				
639.	18541 <i>Diplopeltis huegellii</i> subsp. <i>huegellii</i>			
Sargassaceae				
640.	26586 <i>Caulocystis uvifera</i>			
641.	26946 <i>Hormophysa cuneiformis</i>			
642.	27238 <i>Sargassum distichum</i>			
643.	42785 <i>Sirophysalis trinodis</i>			
644.	27345 <i>Turbinaria gracilis</i>			
Scrophulariaceae				
645.	7054 <i>Dischisma arenarium</i>	Y		
646.	17175 <i>Eremophila glabra</i> subsp. <i>albicans</i>			
647.	7289 <i>Myoporum caprarioides</i> (<i>Slender Myoporum</i>)			
648.	7291 <i>Myoporum insulare</i> (<i>Blueberry Tree, boobialla</i>)			
649.	7107 <i>Verbascum virgatum</i> (<i>Twiggy Mullein</i>)	Y		
Scytosiphonaceae				
650.	26694 <i>Colpomenia sinuosa</i>			
651.	27126 <i>Petalonia fascia</i>			
652.	35911 <i>Scytosiphon lomentaria</i>			

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Solanaceae				
653.	11725 <i>Anthocercis ilicifolia</i> subsp. <i>ilicifolia</i>			
654.	6949 <i>Anthocercis littorea</i> (Yellow Tailflower)			
655.	6983 <i>Physalis peruviana</i> (Cape Gooseberry)	Y		
656.	7020 <i>Solanum linnaeanum</i> (Apple of Sodom)	Y		
657.	7022 <i>Solanum nigrum</i> (Black Berry Nightshade)	Y		
658.	9259 <i>Solanum nodiflorum</i> (Glossy Nightshade)	Y		
659.	7037 <i>Solanum symonii</i>			
Solieriaceae				
660.	48503 <i>Betaphycus speciosus</i>			
Strophariaceae				
661.	<i>Gymnopilus allantopus</i>			
662.	38830 <i>Psilocybe coprophila</i>			
Stylidiaceae				
663.	7677 <i>Levenhookia stipitata</i> (Common Stylewort)			
664.	7679 <i>Stylidium adpressum</i> (Trigger-on-stilts)			
665.	30278 <i>Stylidium androsaceum</i>			
666.	30276 <i>Stylidium bicolor</i>			
667.	7693 <i>Stylidium brunonianum</i> (Pink Fountain Triggerplant)			
668.	7694 <i>Stylidium bulbiferum</i> (Circus Triggerplant)			
669.	7696 <i>Stylidium calcaratum</i> (Book Triggerplant)			
670.	7709 <i>Stylidium crossocephalum</i> (Posy Triggerplant)			
671.	7710 <i>Stylidium cygnorum</i>			
672.	7713 <i>Stylidium dichotomum</i> (Pins-and-needles)			
673.	25801 <i>Stylidium hesperium</i>			
674.	13127 <i>Stylidium maritimum</i>		P3	
675.	25829 <i>Stylidium neurophyllum</i> (Coastal Plain Triggerplant)			
676.	7774 <i>Stylidium piliferum</i> (Common Butterfly Triggerplant)			
677.	25837 <i>Stylidium purpureum</i> (Purple Fountain Triggerplant)			
678.	7785 <i>Stylidium repens</i> (Matted Triggerplant)			
679.	20521 <i>Stylidium rigidulum</i>			
680.	25806 <i>Stylidium scariosum</i>			
681.	7798 <i>Stylidium schoenoides</i> (Cow Kicks)			
Tamaricaceae				
682.	15741 <i>Tamarix aphylla</i> (Athel Tree)	Y		
Teloschistaceae				
683.	31099 <i>Caloplaca kantvilasii</i>			
684.	27754 <i>Fulgensia subbracteata</i>			
Thuidiaceae				
685.	32486 <i>Thuidium sparsum</i> var. <i>hastatum</i>			
Thymelaeaceae				
686.	5232 <i>Pimelea argentea</i> (Silvery Leaved Pimelea)			
687.	5237 <i>Pimelea calcicola</i>		P3	
688.	5243 <i>Pimelea ferruginea</i>			
689.	5244 <i>Pimelea floribunda</i>			
690.	5251 <i>Pimelea imbricata</i>			
691.	11402 <i>Pimelea imbricata</i> var. <i>piligera</i>			
692.	5254 <i>Pimelea leucantha</i>			
693.	5268 <i>Pimelea sulphurea</i> (Yellow Banjine)			
Tremellaceae				
694.	<i>Tremella mesenterica</i>			
Typhaceae				
695.	99 <i>Typha orientalis</i> (Bulrush, Cumbungi)			
Ulvaceae				
696.	27352 <i>Ulva lactuca</i>			
Urticaceae				
697.	1762 <i>Parietaria debilis</i> (Pellitory)			
Verbenaceae				
698.	18197 <i>Phyla nodiflora</i>	Y		
699.	6734 <i>Phyla nodiflora</i> var. <i>nodiflora</i>	Y		
Violaceae				
700.	5216 <i>Hybanthus calycinus</i> (Wild Violet)			
701.	12007 <i>Hybanthus floribundus</i> subsp. <i>floribundus</i>			

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Vitaceae				
702.	17042 <i>Vitis vinifera</i>	Y		
Wrangeliaceae				
703.	26884 <i>Griffithsia ovalis</i>			
Xanthorrhoeaceae				
704.	1256 <i>Xanthorrhoea preissii</i> (Grass tree, Palga)			
Zamiaceae				
705.	85 <i>Macrozamia riedlei</i> (Zamia, Djiridji)			

Conservation Codes
T - Rare or likely to become extinct
X - Presumed extinct
IA - Protected under international agreement
S - Other specially protected fauna
1 - Priority 1
2 - Priority 2
3 - Priority 3
4 - Priority 4
5 - Priority 5

¹ For NatureMap's purposes, species flagged as endemic are those whose records are wholly contained within the search area. Note that only those records complying with the search criterion are included in the calculation. For example, if you limit records to those from a specific datasource, only records from that datasource are used to determine if a species is restricted to the query area.

NatureMap Species Report

Created By Guest user on 05/12/2018

Current Names Only Yes

Core Datasets Only Yes

Data Source Atlas of Australian Birds or Birdata - Birdlife Australia or Carnaby's Cockatoo Observations

Method or Carnaby's Cockatoo Roost Sites or Fauna Survey Returns Database or Quenda

Vertices Community Survey or WA Threatened Fauna Database or Western Australian Museum Bird Database or Western Australian Museum Mammal Database or Western Australian Museum Reptile Database

'By Line'

31° 30' 35" S, 115° 38' 59" E 31° 34' 33" S, 115° 40' 14" E

	Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
1.	24260	<i>Acanthiza apicalis</i> (Broad-tailed Thornbill, Inland Thornbill)			
2.	24261	<i>Acanthiza chrysothroa</i> (Yellow-rumped Thornbill)			
3.	24262	<i>Acanthiza inornata</i> (Western Thornbill)			
4.	24560	<i>Acanthorhynchus superciliosus</i> (Western Spinebill)			
5.	25535	<i>Accipiter cirrocephalus</i> (Collared Sparrowhawk)			
6.	25536	<i>Accipiter fasciatus</i> (Brown Goshawk)			
7.		<i>Acercella falcipes</i>			
8.	42368	<i>Acritoscincus trilineatus</i> (Western Three-lined Skink)			
9.	25755	<i>Acrocephalus australis</i> (Australian Reed Warbler)			
10.	24831	<i>Acrocephalus australis</i> subsp. <i>gouldi</i> (Australian Reed Warbler)			
11.	25544	<i>Aegotheles cristatus</i> (Australian Owllet-nightjar)			
12.	24310	<i>Anas castanea</i> (Chestnut Teal)			
13.	24312	<i>Anas gracilis</i> (Grey Teal)			
14.	24313	<i>Anas platyrhynchos</i> (Mallard)			
15.	24315	<i>Anas rhynchotis</i> (Australasian Shoveler)			
16.	24316	<i>Anas superciliosa</i> (Pacific Black Duck)			
17.	47414	<i>Anhinga novaehollandiae</i> (Australasian Darter)			
18.	24506	<i>Anous tenuirostris</i> subsp. <i>melanops</i> (Australian Lesser Noddy)		T	
19.	24561	<i>Anthochaera carunculata</i> (Red Wattlebird)			
20.	24562	<i>Anthochaera lunulata</i> (Western Little Wattlebird)			
21.	24599	<i>Anthus australis</i> subsp. <i>australis</i> (Australian Pipit)			
22.	24991	<i>Aprasia repens</i> (Sand-plain Worm-lizard)			
23.	25554	<i>Apus pacificus</i> (Fork-tailed Swift, Pacific Swift)		IA	
24.	24285	<i>Aquila audax</i> (Wedge-tailed Eagle)			
25.	24208	<i>Arctocephalus forsteri</i> (New Zealand Fur Seal, long-nosed fur-seal)		S	
26.	41324	<i>Ardea modesta</i> (great egret, white egret)			
27.	24341	<i>Ardea pacifica</i> (White-necked Heron)			
28.	25566	<i>Artamus cinereus</i> (Black-faced Woodswallow)			
29.	24353	<i>Artamus cyanopterus</i> (Dusky Woodswallow)			
30.	24356	<i>Artamus personatus</i> (Masked Woodswallow)			
31.	33971	<i>Austroconops mcmillani</i> (McMillan's biting midge (Swan Coastal Plain), biting midge (southwest))		P2	
32.	24318	<i>Aythya australis</i> (Hardhead)			
33.		<i>Barnardius zonarius</i>			
34.	24162	<i>Bettongia penicillata</i> subsp. <i>ogilbyi</i> (Woylie, Brush-tailed Bettong)		T	
35.	24319	<i>Biziura lobata</i> (Musk Duck)			
36.	42381	<i>Brachyurophis semifasciatus</i> (Southern Shovel-nosed Snake)			
37.	25714	<i>Cacatua pastinator</i> (Western Long-billed Corella)			
38.	25715	<i>Cacatua roseicapilla</i> (Galah)			
39.	25716	<i>Cacatua sanguinea</i> (Little Corella)			
40.	24729	<i>Cacatua tenuirostris</i> (Eastern Long-billed Corella)	Y		
41.	25598	<i>Cacomantis flabelliformis</i> (Fan-tailed Cuckoo)			
42.	42307	<i>Cacomantis pallidus</i> (Pallid Cuckoo)			
43.	24788	<i>Calidris ruficollis</i> (Red-necked Stint)		IA	
44.	24734	<i>Calyptorhynchus latirostris</i> (Carnaby's Cockatoo, White-tailed Short-billed Black Cockatoo)		T	
45.	48400	<i>Calyptorhynchus</i> sp. (white-tailed black cockatoo)		T	
46.	24254	<i>Camelus dromedarius</i> (Dromedary, Camel)	Y		

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
47.	25335 <i>Caretta caretta</i> (Loggerhead Turtle)		T	
48.	24086 <i>Cercartetus concinnus</i> (Western Pygmy-possum, Mundarda)			
49.	24186 <i>Chalinolobus gouldii</i> (Gould's Wattled Bat)			
50.	24187 <i>Chalinolobus morio</i> (Chocolate Wattled Bat)			
51.	24377 <i>Charadrius ruficapillus</i> (Red-capped Plover)			
52.	25336 <i>Chelonia mydas</i> (Green Turtle)		T	
53.	24321 <i>Chenonetta jubata</i> (Australian Wood Duck, Wood Duck)			
54.	47909 <i>Cheramoeca leucosterna</i> (White-backed Swallow)			
55.	<i>Cherax quinquecarinatus</i>			
56.	24980 <i>Christinus marmoratus</i> (Marbled Gecko)			
57.	<i>Chroicocephalus novaehollandiae</i>			
58.	24288 <i>Circus approximans</i> (Swamp Harrier)			
59.	24289 <i>Circus assimilis</i> (Spotted Harrier)			
60.	24774 <i>Cladorhynchus leucocephalus</i> (Banded Stilt)			
61.	25675 <i>Colluricincla harmonica</i> (Grey Shrike-thrush)			
62.	24399 <i>Columba livia</i> (Domestic Pigeon)	Y		
63.	25568 <i>Coracina novaehollandiae</i> (Black-faced Cuckoo-shrike)			
64.	25592 <i>Corvus coronoides</i> (Australian Raven)			
65.	24671 <i>Coturnix pectoralis</i> (Stubble Quail)			
66.	24420 <i>Cracticus nigrogularis</i> (Pied Butcherbird)			
67.	25595 <i>Cracticus tibicen</i> (Australian Magpie)			
68.	25596 <i>Cracticus torquatus</i> (Grey Butcherbird)			
69.	24918 <i>Crenadactylus ocellatus</i> subsp. <i>ocellatus</i> (Clawless Gecko)			
70.	30893 <i>Cryptoblepharus buchananii</i>			
71.	25020 <i>Cryptoblepharus plagiocephalus</i>			
72.	30899 <i>Ctenophorus adelaidensis</i> (Southern Heath Dragon, Western Heath Dragon)			
73.	25027 <i>Ctenotus australis</i>			
74.	25039 <i>Ctenotus fallens</i>			
75.	25087 <i>Cyclodomorphus celatus</i> (Western Slender Blue-tongue)			
76.	24322 <i>Cygnus atratus</i> (Black Swan)			
77.	30901 <i>Dacelo novaeguineae</i> (Laughing Kookaburra)	Y		
78.	<i>Daphnia carinata</i>			
79.	25673 <i>Daphoenositta chrysoptera</i> (Varied Sittella)			
80.	24092 <i>Dasyurus geoffroii</i> (Chuditch, Western Quoll)		T	
81.	30906 <i>Delma concinna</i> (Javelin Legless Lizard)			
82.	30905 <i>Delma concinna</i> subsp. <i>concinna</i> (Javelin Legless Lizard)			
83.	25766 <i>Delma fraseri</i> (Fraser's Legless Lizard)			
84.	24999 <i>Delma grayii</i>			
85.	25296 <i>Demansia psammophis</i> subsp. <i>reticulata</i> (Yellow-faced Whipsnake)			
86.	25607 <i>Dicaeum hirundinaceum</i> (Mistletoebird)			
87.	24470 <i>Dromaius novaehollandiae</i> (Emu)			
88.	25251 <i>Echiopsis curta</i> (Bardick)			
89.	25096 <i>Egernia kingii</i> (King's Skink)			
90.	25100 <i>Egernia napoleonis</i>			
91.	<i>Egretta garzetta</i>			
92.	<i>Egretta novaehollandiae</i>			
93.	<i>Elanus axillaris</i>			
94.	24290 <i>Elanus caeruleus</i> subsp. <i>axillaris</i> (Australian Black-shouldered Kite)			
95.	47937 <i>Euseyornis melanops</i> (Black-fronted Dotterel)			
96.	<i>Eolophus roseicapillus</i>			
97.	24652 <i>Eopsaltria georgiana</i> (White-breasted Robin)			
98.	24567 <i>Epthianura albifrons</i> (White-fronted Chat)			
99.	24379 <i>Erythronyx cinctus</i> (Red-kneed Dotterel)			
100.	25621 <i>Falco berigora</i> (Brown Falcon)			
101.	24471 <i>Falco berigora</i> subsp. <i>berigora</i> (Brown Falcon)			
102.	25622 <i>Falco cenchroides</i> (Australian Kestrel, Nankeen Kestrel)			
103.	25623 <i>Falco longipennis</i> (Australian Hobby)			
104.	25624 <i>Falco peregrinus</i> (Peregrine Falcon)		S	
105.	25727 <i>Fulica atra</i> (Eurasian Coot)			
106.	25729 <i>Gallinula tenebrosa</i> (Dusky Moorhen)			
107.	25530 <i>Gerygone fusca</i> (Western Gerygone)			
108.	24271 <i>Gerygone fusca</i> subsp. <i>fusca</i> (Western Gerygone)			
109.	47962 <i>Glyciphila melanops</i> (Tawny-crowned Honeyeater)			
110.	24443 <i>Grallina cyanoleuca</i> (Magpie-lark)			
111.	24295 <i>Haliastur sphenurus</i> (Whistling Kite)			
112.	24689 <i>Halobaena caerulea</i> (Blue Petrel)			
113.	25410 <i>Heleioporus eyrei</i> (Moaning Frog)			
114.	25412 <i>Heleioporus psammophilus</i> (Sand Frog)			
115.	25119 <i>Hemiergis quadrilineata</i>			
116.	47965 <i>Hieraetus morphnoides</i> (Little Eagle)			

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117.	25734 <i>Himantopus himantopus</i> (Black-winged Stilt)			
118.	24491 <i>Hirundo neoxena</i> (Welcome Swallow)			
119.	48582 <i>Hurleya</i> sp. (WAM C23193) (Crystal Cave Crangonyctoid, cave shrimp)		T	Y
120.	24215 <i>Hydromys chrysogaster</i> (Water-rat, Rakali)		P4	
121.	43384 <i>Hydrophis platurus</i> (Yellow-bellied Seasnake)			
122.	48587 <i>Hydroprogne caspia</i> (Caspian Tern)		IA	
123.	48588 <i>Isoodon fusciventer</i> (Quenda, southwestern brown bandicoot)		P4	
124.	24367 <i>Lalage tricolor</i> (White-winged Triller)			
125.	25638 <i>Larus pacificus</i> (Pacific Gull)			
126.	25128 <i>Lerista christinae</i>			
127.	25131 <i>Lerista distinguenda</i>			
128.	25133 <i>Lerista elegans</i>			
129.	25148 <i>Lerista lineopunctulata</i>			
130.	25165 <i>Lerista praepedita</i>			
131.	25005 <i>Lialis burtonis</i>			
132.	25661 <i>Lichmera indistincta</i> (Brown Honeyeater)			
133.	24582 <i>Lichmera indistincta</i> subsp. <i>indistincta</i> (Brown Honeyeater)			
134.	25415 <i>Limnodynastes dorsalis</i> (Western Banjo Frog)			
135.	25378 <i>Litoria adelaidensis</i> (Slender Tree Frog)			
136.	25388 <i>Litoria moorei</i> (Motorbike Frog)			
137.	24690 <i>Macronectes giganteus</i> (Southern Giant Petrel)		IA	
138.	24132 <i>Macropus fuliginosus</i> (Western Grey Kangaroo)			
139.	24326 <i>Malacorhynchus membranaceus</i> (Pink-eared Duck)			
140.	25651 <i>Malurus lamberti</i> (Variegated Fairy-wren)			
141.	24544 <i>Malurus lamberti</i> subsp. <i>assimilis</i> (Variegated Fairy-wren)			
142.	25652 <i>Malurus leucopterus</i> (White-winged Fairy-wren)			
143.	24549 <i>Malurus leucopterus</i> subsp. <i>leuconotus</i> (White-winged Fairy-wren)			
144.	25654 <i>Malurus splendens</i> (Splendid Fairy-wren)			
145.	24583 <i>Manorina flavigula</i> (Yellow-throated Miner)			
146.	25758 <i>Megalurus gramineus</i> (Little Grassbird)			
147.	24838 <i>Megalurus gramineus</i> subsp. <i>gramineus</i> (Little Grassbird)			
148.	25184 <i>Menetia greyii</i>			
149.	24598 <i>Merops ornatus</i> (Rainbow Bee-eater)			
150.	24076 <i>Mesoplodon bowdoini</i> (Andrew's Beaked Whale)			
151.	<i>Microcarbo melanoleucos</i>			
152.	25494 <i>Morelia spilota</i> (Carpet Python)			
153.	25240 <i>Morelia spilota</i> subsp. <i>imbricata</i> (Carpet Python)			
154.	25191 <i>Morethia lineocellata</i>			
155.	25192 <i>Morethia obscura</i>			
156.	24223 <i>Mus musculus</i> (House Mouse)	Y		
157.	24042 <i>Mustela putorius</i> (European Polecat, Ferret)	Y		
158.	25420 <i>Myobatrachus gouldii</i> (Turtle Frog)			
159.	25249 <i>Neelaps calonotos</i> (Black-striped Snake, black-striped burrowing snake)		P3	
160.	24738 <i>Neophema elegans</i> (Elegant Parrot)			
161.	24210 <i>Neophoca cinerea</i> (Australian Sea-lion)		T	
162.	25252 <i>Notechis scutatus</i> (Tiger Snake)			
163.	25564 <i>Nycticorax caledonicus</i> (Rufous Night Heron)			
164.	24407 <i>Ocyphaps lophotes</i> (Crested Pigeon)			
165.	24085 <i>Oryctolagus cuniculus</i> (Rabbit)	Y		
166.	24328 <i>Oxyura australis</i> (Blue-billed Duck)		P4	
167.	25680 <i>Pachycephala rufiventris</i> (Rufous Whistler)			
168.	24692 <i>Pachyptila belcheri</i> (Slender-billed Prion)			
169.	24693 <i>Pachyptila desolata</i> (Antarctic Prion)			
170.	24696 <i>Pachyptila turtur</i> (Fairy Prion)			
171.	48591 <i>Pandion cristatus</i> (Osprey, Eastern Osprey)		IA	
172.	25253 <i>Parasuta gouldii</i>			
173.	25681 <i>Pardalotus punctatus</i> (Spotted Pardalote)			
174.	25682 <i>Pardalotus striatus</i> (Striated Pardalote)			
175.	24630 <i>Pardalotus striatus</i> subsp. <i>westraliensis</i> (Striated Pardalote)			
176.	24648 <i>Pelecanus conspicillatus</i> (Australian Pelican)			
177.	48060 <i>Petrochelidon ariel</i> (Fairy Martin)			
178.	48061 <i>Petrochelidon nigricans</i> (Tree Martin)			
179.	48066 <i>Petroica boodang</i> (Scarlet Robin)			
180.	25697 <i>Phalacrocorax carbo</i> (Great Cormorant)			
181.	24666 <i>Phalacrocorax melanoleucos</i> subsp. <i>melanoleucos</i> (Little Pied Cormorant)			
182.	24667 <i>Phalacrocorax sulcirostris</i> (Little Black Cormorant)			
183.	25699 <i>Phalacrocorax varius</i> (Pied Cormorant)			
184.	24409 <i>Phaps chalcoptera</i> (Common Bronzewing)			
185.	25587 <i>Phaps elegans</i> (Brush Bronzewing)			
186.	48071 <i>Phylidonyris niger</i> (White-cheeked Honeyeater)			

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187.	24596 <i>Phylidonyris novaehollandiae</i> (New Holland Honeyeater)			
188.	24841 <i>Platalea flavipes</i> (Yellow-billed Spoonbill)			
189.	25721 <i>Platycercus zonarius</i> (Australian Ringneck, Ring-necked Parrot)			
190.	25703 <i>Podargus strigoides</i> (Tawny Frogmouth)			
191.	24679 <i>Podargus strigoides</i> subsp. <i>brachypterus</i> (Tawny Frogmouth)			
192.	25704 <i>Podiceps cristatus</i> (Great Crested Grebe)			
193.	25510 <i>Pogona minor</i> (Dwarf Bearded Dragon)			
194.	24907 <i>Pogona minor</i> subsp. <i>minor</i> (Dwarf Bearded Dragon)			
195.	24681 <i>Poliiocephalus poliocephalus</i> (Hoary-headed Grebe)			
196.	25731 <i>Porphyrio porphyrio</i> (Purple Swamphen)			
197.	24771 <i>Porzana tabuensis</i> (Spotless Crake)			
198.	25511 <i>Pseudonaja affinis</i> (Dugite)			
199.	25259 <i>Pseudonaja affinis</i> subsp. <i>affinis</i> (Dugite)			
200.	24702 <i>Pterodroma brevirostris</i> (Kerguelen Petrel)			
201.	<i>Purpureicephalus spurius</i>			
202.	24243 <i>Rattus fuscipes</i> (Western Bush Rat)			
203.	24245 <i>Rattus rattus</i> (Black Rat)	Y		
204.	24776 <i>Recurvirostra novaehollandiae</i> (Red-necked Avocet)			
205.	48096 <i>Rhipidura albiscapa</i> (Grey Fantail)			
206.	25614 <i>Rhipidura leucophrys</i> (Willie Wagtail)			
207.	24454 <i>Rhipidura leucophrys</i> subsp. <i>leucophrys</i> (Willie Wagtail)			
208.	25534 <i>Sericornis frontalis</i> (White-browed Scrubwren)			
209.	25266 <i>Simoselaps bertholdi</i> (Jan's Banded Snake)			
210.	30948 <i>Smicromis brevirostris</i> (Weebill)			
211.	24108 <i>Sminthopsis crassicaudata</i> (Fat-tailed Dunnart)			
212.	24111 <i>Sminthopsis gilberti</i> (Gilbert's Dunnart)			
213.	24522 <i>Sterna bergii</i> (Crested Tern)			
214.	25589 <i>Streptopelia chinensis</i> (Spotted Turtle-Dove)	Y		
215.	25590 <i>Streptopelia senegalensis</i> (Laughing Turtle-Dove)	Y		
216.	25518 <i>Strophurus spinigerus</i>			
217.	24942 <i>Strophurus spinigerus</i> subsp. <i>spinigerus</i>			
218.	33992 <i>Synemon gratiosa</i> (Graceful Sunmoth)		P4	
219.	25705 <i>Tachybaptus novaehollandiae</i> (Australasian Grebe, Black-throated Grebe)			
220.	24207 <i>Tachyglossus aculeatus</i> (Short-beaked Echidna)			
221.	24331 <i>Tadorna tadornoides</i> (Australian Shelduck, Mountain Duck)			
222.	24167 <i>Tarsipes rostratus</i> (Honey Possum, Noalbungger)			
223.	48597 <i>Thalasseus bergii</i> (Crested Tern)		IA	
224.	24845 <i>Threskiornis spinicollis</i> (Straw-necked Ibis)			
225.	25203 <i>Tiliqua occipitalis</i> (Western Bluetongue)			
226.	25519 <i>Tiliqua rugosa</i>			
227.	25204 <i>Tiliqua rugosa</i> subsp. <i>aspera</i>			
228.	25207 <i>Tiliqua rugosa</i> subsp. <i>rugosa</i>			
229.	25549 <i>Todiramphus sanctus</i> (Sacred Kingfisher)			
230.	48141 <i>Tribonyx ventralis</i> (Black-tailed Native-hen)			
231.	25723 <i>Trichoglossus haematodus</i> (Rainbow Lorikeet)			
232.	24851 <i>Turnix velox</i> (Little Button-quail)			
233.	24069 <i>Tursiops truncatus</i> (Bottlenose Dolphin)			
234.	24855 <i>Tyto novaehollandiae</i> subsp. <i>novaehollandiae</i> (Masked Owl (southwest))		P3	
235.	25577 <i>Vanellus miles</i> (Masked Lapwing)			
236.	25218 <i>Varanus gouldii</i> (Bungarra or Sand Monitor)			
237.	24206 <i>Vespadelus regulus</i> (Southern Forest Bat)			
238.	24040 <i>Vulpes vulpes</i> (Red Fox)	Y		
239.	34113 <i>Westralunio carteri</i> (Carter's Freshwater Mussel)		T	
240.	25765 <i>Zosterops lateralis</i> (Grey-breasted White-eye, Silvereye)			

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Appendix D – Flora data

Flora species list

Quadrat data

Conservation significant flora records

TEC/PEC analysis

Flora likelihood of occurrence

Flora species list

Family	Taxon	Status
Agavaceae	<i>Agave americana</i>	*
Aizoaceae	<i>Carpobrotus edulis</i>	*
Aizoaceae	<i>Carpobrotus virescens</i>	
Amaranthaceae	<i>Ptilotus drummondii</i> var. <i>drummondii</i>	
Amaranthaceae	<i>Ptilotus polystachyus</i>	
Anarthriaceae	<i>Lyginia imberbis</i>	
Apiaceae	<i>Daucus glochidiatus</i>	
Apiaceae	<i>Eryngium pinnatifidum</i>	
Apiaceae	<i>Eryngium</i> sp.	
Apiaceae	<i>Foeniculum vulgare</i>	*
Apiaceae	<i>Trachymene pilosa</i>	
Apocynaceae	<i>Gomphocarpus fruticosus</i>	*DP
Araceae	<i>Zantedeschia aethiopica</i>	*DP
Araliaceae	<i>Hydrocotyle hispidula</i>	
Araliaceae	<i>Trachymene pilosa</i>	
Asparagaceae	<i>Acanthocarpus preissii</i>	
Asparagaceae	<i>Agave americana</i>	*
Asparagaceae	<i>Asparagus asparagoides</i>	*DP + WoNS
Asparagaceae	<i>Lomandra caespitosa</i>	
Asparagaceae	<i>Lomandra maritima</i>	
Asparagaceae	<i>Lomandra preissii</i>	
Asparagaceae	<i>Lomandra</i> sp.	
Asparagaceae	<i>Sowerbaea laxiflora</i>	
Asparagaceae	<i>Thysanotus arenarius</i>	
Asparagaceae	<i>Thysanotus manglesianus</i>	
Asparagaceae	<i>Thysanotus pallida</i>	
Asparagaceae	<i>Thysanotus ?patersonii/manglesianus</i>	
Asparagaceae	<i>Thysanotus</i> sp.	
Asphodelaceae	<i>Trachyandra divaricata</i>	*
Asteraceae	<i>Arctotheca calendula</i>	*
Asteraceae	<i>Brachyscome iberidifolia</i>	
Asteraceae	<i>Conyza bonariensis</i>	*
Asteraceae	<i>Helichrysum luteoalbum</i>	*
Asteraceae	<i>Hypochaeris glabra</i>	*
Asteraceae	<i>Lagenophora huegelii</i>	
Asteraceae	<i>Leptorhynchos scaber</i>	
Asteraceae	<i>Milotia tenuifolia</i> var. <i>tenuifolia</i>	
Asteraceae	<i>Olearia axillaris</i>	
Asteraceae	<i>Olearia rudis</i>	
Asteraceae	<i>Osteospermum ecklonis</i>	*
Asteraceae	<i>Podolepis lessonii</i>	
Asteraceae	<i>Podotheca gnaphalioides</i>	
Asteraceae	<i>Quinetia urvillei</i>	
Asteraceae	<i>Rhodanthe citrina</i>	

Family	Taxon	Status
Asteraceae	<i>Siloxerus humifusus</i>	
Asteraceae	<i>Sonchus oleraceus</i>	*
Asteraceae	<i>Ursinia anthemoides</i>	*
Asteraceae	<i>Waitzia suaveolens</i> var. <i>suaveolens</i>	
Boraginaceae	<i>Echium plantagineum</i>	*DP
Brassicaceae	<i>Brassica tournefortii</i>	*
Brassicaceae	<i>Heliophila pusilla</i>	*
Brassicaceae	<i>Raphanus raphanistrum</i>	*
Cactaceae	<i>Opuntia stricta</i>	*DP + WoNS
Campanulaceae	<i>Isotoma hypocrateriformis</i>	
Campanulaceae	<i>Wahlenbergia capensis</i>	*
Caryophyllaceae	Caryophyllaceae sp.	
Caryophyllaceae	<i>Cerastium glomeratum</i>	*
Caryophyllaceae	<i>Minuartia mediterranea</i>	*
Caryophyllaceae	<i>Petrorhagia dubia</i>	*
Caryophyllaceae	<i>Silene gallica</i>	*
Caryophyllaceae	<i>Silene nocturna</i>	*
Casuarinaceae	<i>Allocasuarina fraseriana</i>	
Casuarinaceae	<i>Allocasuarina humilis</i>	
Celastraceae	<i>Tripterococcus brunonis</i>	
Chenopodiaceae	<i>Rhagodia baccata</i>	
Colchicaceae	<i>Burchardia congesta</i>	
Convolvulaceae	<i>Cuscuta planiflora</i>	*
Crassulaceae	<i>Crassula alata</i>	*
Crassulaceae	<i>Crassula colorata</i> var. <i>acuminata</i>	
Crassulaceae	<i>Crassula decumbens</i> var. <i>decumbens</i>	
Crassulaceae	<i>Crassula glomerata</i>	*
Cucurbitaceae	<i>Cucumis myriocarpus</i>	*
Cyperaceae	<i>Isolepis marginata</i>	
Cyperaceae	<i>Lepidosperma ?calcicola</i>	
Cyperaceae	<i>Lepidosperma ?pubisquameum</i>	
Cyperaceae	<i>Lepidosperma calcicola</i>	
Cyperaceae	<i>Lepidosperma</i> sp.	
Cyperaceae	<i>Mesomelaena pseudostygia</i>	
Cyperaceae	<i>Schoenus</i> sp. (sterile)	
Cyperaceae	<i>Tetaria octandra</i>	
Dasypogonaceae	<i>Calectasia narragara</i>	
Dilleniaceae	<i>Hibbertia hypericoides</i>	
Dilleniaceae	<i>Hibbertia racemosa</i>	
Dilleniaceae	<i>Hibbertia spicata</i> subsp. <i>leptotheca</i>	P3
Droseraceae	<i>Drosera erythrorhiza</i>	
Droseraceae	<i>Drosera menziesii</i>	
Droseraceae	<i>Drosera pallida</i>	
Ericaceae	<i>Astroloma ciliatum</i>	
Ericaceae	<i>Conostephium pendulum</i>	
Ericaceae	<i>Conostephium preissii</i>	

Family	Taxon	Status
Ericaceae	<i>Leucopogon ?nutans</i>	
Ericaceae	<i>Leucopogon insularis</i>	
Ericaceae	<i>Leucopogon nutans</i>	
Ericaceae	<i>Leucopogon parviflorus</i>	
Ericaceae	<i>Leucopogon polymorphus</i>	
Ericaceae	<i>Leucopogon propinquus</i>	
Ericaceae	<i>Leucopogon</i> sp. Yanchep (M. Hislop 1986)	P3
Ericaceae	<i>Lysinema pentapetalum</i>	
Euphorbiaceae	<i>Euphorbia peplus</i>	*
Euphorbiaceae	<i>Euphorbia terracina</i>	*
Euphorbiaceae	<i>Ricinus communis</i>	*
Fabaceae	<i>Acacia baileyana</i>	*
Fabaceae	<i>Acacia benthamii</i>	P2
Fabaceae	<i>Acacia cochlearis</i>	
Fabaceae	<i>Acacia cyclops</i>	
Fabaceae	<i>Acacia decurrens</i>	*
Fabaceae	<i>Acacia lasiocarpa</i> var. <i>lasiocarpa</i>	
Fabaceae	<i>Acacia longifolia</i> subsp. <i>longifolia</i>	*
Fabaceae	<i>Acacia longifolia</i> subsp. <i>sophorae</i>	*
Fabaceae	<i>Acacia pulchella</i> var. <i>glaberrima</i>	
Fabaceae	<i>Acacia rostellifera</i>	
Fabaceae	<i>Acacia saligna</i>	
Fabaceae	<i>Acacia truncata</i>	
Fabaceae	<i>Acacia willdenowiana</i>	
Fabaceae	<i>Bossiaea eriocarpa</i>	
Fabaceae	<i>Daviesia decurrens</i>	
Fabaceae	<i>Daviesia divaricata</i> subsp. <i>divaricata</i>	
Fabaceae	<i>Gastrolobium ?capitatum</i>	
Fabaceae	<i>Gastrolobium linearifolium</i>	
Fabaceae	<i>Gompholobium knightianum</i>	
Fabaceae	<i>Gompholobium tomentosum</i>	
Fabaceae	<i>Hardenbergia comptoniana</i>	
Fabaceae	<i>Hovea pungens</i>	
Fabaceae	<i>Hovea trisperma</i>	
Fabaceae	<i>Isotropis cuneifolia</i> subsp. <i>cuneifolia</i>	
Fabaceae	<i>Jacksonia calcicola</i>	
Fabaceae	<i>Jacksonia sternbergiana</i>	
Fabaceae	<i>Kennedia prostrata</i>	
Fabaceae	<i>Lupinus angustifolius</i>	*
Fabaceae	<i>Lupinus cosentinii</i>	*
Fabaceae	<i>Mirbelia spinosa</i>	
Fabaceae	<i>Sphaerolobium medium</i>	
Fabaceae	<i>Templetonia retusa</i>	
Fabaceae	<i>Trifolium arvense</i>	*
Fabaceae	<i>Trifolium campestre</i>	*
Fabaceae	<i>Trifolium dubium</i>	*

Family	Taxon	Status
Fabaceae	<i>Trifolium</i> sp.	*
Fabaceae	<i>Vicia sativa</i>	*
Geraniaceae	<i>Erodium botrys</i>	*
Geraniaceae	<i>Erodium cicutarium</i>	*
Geraniaceae	<i>Geranium molle</i>	*
Geraniaceae	<i>Pelargonium capitatum</i>	*
Goodeniaceae	Goodeniaceae sp.	
Goodeniaceae	<i>Lechenaultia linarioides</i>	(p)
Goodeniaceae	<i>Scaevola canescens</i>	
Goodeniaceae	<i>Scaevola crassifolia</i>	
Goodeniaceae	<i>Scaevola</i> sp.	
Haemodoraceae	<i>Anigozanthos humilis</i>	
Haemodoraceae	<i>Conostylis aculeata</i>	
Haemodoraceae	<i>Conostylis candicans</i> subsp. <i>candicans</i>	
Haemodoraceae	<i>Conostylis setigera</i>	
Haemodoraceae	<i>Conostylis setosa</i>	
Haemodoraceae	<i>Haemodorum laxum</i>	
Haemodoraceae	<i>Haemodorum</i> sp.	
Haemodoraceae	<i>Haemodorum spicatum</i>	
Haloragaceae	<i>Glischrocaryon angustifolium</i>	
Hemerocallidaceae	<i>Corynotheca micrantha</i> var. <i>micrantha</i>	
Hemerocallidaceae	<i>Dianella revoluta</i> var. <i>divaricata</i>	
Hemerocallidaceae	<i>Stypandra glauca</i>	
Hemerocallidaceae	<i>Tricoryne elatior</i>	
Iridaceae	<i>Freesia alba</i> x <i>leichtlinii</i>	*
Iridaceae	<i>Gladiolus caryophyllaceus</i>	*
Iridaceae	<i>Moraea flaccida</i>	*DP
Iridaceae	<i>Orthrosanthus laxus</i> var. <i>laxus</i>	
Iridaceae	<i>Romulea rosea</i>	*
Lamiaceae	<i>Hemiandra pungens</i>	
Lauraceae	<i>Cassytha flava</i>	
Lauraceae	<i>Cassytha racemosa</i> forma <i>racemosa</i>	
Lauraceae	<i>Nuytsia floribunda</i>	
Loganiaceae	<i>Phyllangium</i> sp.	
Montiaceae	<i>Calandrinia liniflora</i>	
Montiaceae	<i>Calandrinia tholiformis</i>	
Myrtaceae	<i>Baeckea</i> sp. Limestone (N. Gibson & M.N. Lyons 1425)	P1
Myrtaceae	<i>Calothamnus lateralis</i>	
Myrtaceae	<i>Calothamnus quadrifidus</i> subsp. <i>quadrifidus</i>	
Myrtaceae	<i>Calothamnus sanguineus</i>	
Myrtaceae	<i>Calytrix ?flavescens</i>	
Myrtaceae	<i>Chamelaucium uncinatum</i>	
Myrtaceae	<i>Corymbia calophylla</i>	
Myrtaceae	<i>Eremaea pauciflora</i>	
Myrtaceae	<i>Eucalyptus camaldulensis</i>	#planted

Family	Taxon	Status
Myrtaceae	<i>Eucalyptus decipiens</i>	
Myrtaceae	<i>Eucalyptus foecunda</i>	
Myrtaceae	<i>Eucalyptus gomphocephala</i>	
Myrtaceae	<i>Eucalyptus marginata</i>	
Myrtaceae	<i>Eucalyptus rudis</i>	
Myrtaceae	<i>Eucalyptus todtiana</i>	
Myrtaceae	<i>Leptospermum spinescens</i>	
Myrtaceae	<i>Melaleuca cardiophylla</i>	
Myrtaceae	<i>Melaleuca huegelii</i>	
Myrtaceae	<i>Melaleuca raphiophylla</i>	
Myrtaceae	<i>Melaleuca</i> sp. Wanneroo (G.J. Keighery 16705)	EN
Myrtaceae	<i>Melaleuca systema</i>	
Orchidaceae	? <i>Pterostylis</i> sp.	
Orchidaceae	<i>Caladenia arenicola</i>	
Orchidaceae	<i>Caladenia flava</i>	
Orchidaceae	<i>Caladenia latifolia</i>	
Orchidaceae	<i>Caladenia longicauda</i> subsp. <i>calcigena</i>	
Orchidaceae	<i>Caladenia</i> sp.	
Orchidaceae	<i>Diuris corymbosa</i>	
Orchidaceae	<i>Elythranthera brunonis</i>	
Orchidaceae	<i>Pterostylis</i> sp. (flo. spent)	
Orchidaceae	<i>Pyrorchis nigricans</i>	
Orobanchaceae	<i>Parentucellia latifolia</i>	*
Oxalidaceae	<i>Oxalis pes-caprae</i>	*
Papaveraceae	<i>Fumaria muralis</i>	*
Phyllanthaceae	<i>Phyllanthus calycinus</i>	
Phyllanthaceae	<i>Poranthera microphylla</i>	
Poaceae	<i>Aira caryophyllea</i>	*
Poaceae	<i>Aira cupaniana</i>	*
Poaceae	<i>Arundo donax</i>	*
Poaceae	<i>Austrostipa compressa</i>	
Poaceae	<i>Austrostipa flavescens</i>	
Poaceae	<i>Avena barbata</i>	*
Poaceae	<i>Briza maxima</i>	*
Poaceae	<i>Briza minor</i>	*
Poaceae	<i>Bromus diandrus</i>	*
Poaceae	<i>Ehrharta calycina</i>	*
Poaceae	<i>Ehrharta longiflora</i>	*
Poaceae	<i>Ehrharta</i> sp.	*
Poaceae	<i>Eragrostis curvula</i>	*
Poaceae	<i>Lagurus ovatus</i>	*
Poaceae	<i>Lolium multiflorum</i>	*
Poaceae	<i>Lolium perenne</i>	*
Poaceae	<i>Lolium rigidum</i>	*
Poaceae	<i>Lolium</i> sp.	*
Poaceae	<i>Neurachne alopecuroidea</i>	

Family	Taxon	Status
Poaceae	<i>Poa poiformis</i>	
Poaceae	Poaceae sp.	
Poaceae	<i>Rytidosperma caespitosum</i>	
Poaceae	<i>Rytidosperma setaceum</i>	
Poaceae	<i>Vulpia myuros forma myuros</i>	*
Polygalaceae	<i>Comesperma confertum</i>	
Polygalaceae	<i>Comesperma</i> sp.	
Primulaceae	<i>Lysimachia arvensis</i>	*
Proteaceae	<i>Banksia attenuata</i>	
Proteaceae	<i>Banksia dallanneyi</i>	
Proteaceae	<i>Banksia grandis</i>	
Proteaceae	<i>Banksia menziesii</i>	
Proteaceae	<i>Banksia sessilis</i>	
Proteaceae	<i>Conospermum triplinervium</i>	
Proteaceae	<i>Grevillea preissii</i> subsp. <i>preissii</i>	
Proteaceae	<i>Grevillea vestita</i> subsp. <i>vestita</i>	
Proteaceae	<i>Hakea costata</i>	
Proteaceae	<i>Hakea lissocarpha</i>	
Proteaceae	<i>Hakea prostrata</i>	
Proteaceae	<i>Hakea ruscifolia</i>	
Proteaceae	<i>Hakea trifurcata</i>	
Proteaceae	<i>Petrophile axillaris</i>	
Proteaceae	<i>Petrophile brevifolia</i>	
Proteaceae	<i>Petrophile linearis</i>	
Proteaceae	<i>Petrophile macrostachya</i>	
Proteaceae	<i>Stirlingia latifolia</i>	
Proteaceae	<i>Synaphea spinulosa</i> subsp. <i>spinulosa</i>	
Ranunculaceae	<i>Clematis linearifolia</i>	
Ranunculaceae	<i>Clematis pubescens</i>	
Restionaceae	<i>Desmocladius flexuosus</i>	
Rhamnaceae	<i>Cryptandra multispina</i>	
Rhamnaceae	<i>Cryptandra mutila</i>	
Rhamnaceae	<i>Cryptandra scoparia</i>	
Rhamnaceae	<i>Spyridium globulosum</i>	
Rhamnaceae	<i>Stenanthemum notiale</i> subsp. <i>chamelum</i>	
Rhamnaceae	<i>Trymalium ledifolium</i> var. <i>ledifolium</i>	
Rubiaceae	<i>Galium murale</i>	*
Rubiaceae	<i>Opercularia echinocephala</i>	
Rubiaceae	<i>Opercularia vaginata</i>	
Rutaceae	<i>Philothea spicata</i>	
Santalaceae	<i>Leptomeria pauciflora</i>	
Santalaceae	<i>Santalum acuminatum</i>	
Sapindaceae	<i>Diplopeltis huegelii</i> subsp. <i>huegelii</i>	
Scrophulaceae	<i>Eremophila glabra</i>	#planted
Solanaceae	<i>Solanum linnaeanum</i>	*DP
Solanaceae	<i>Solanum nigrum</i>	*

Family	Taxon	Status
Stylidiaceae	<i>Levenhookia stipitata</i>	
Stylidiaceae	<i>Stylidium adpressum</i>	
Stylidiaceae	<i>Stylidium androsaceum</i>	
Stylidiaceae	<i>Stylidium brunonianum</i>	
Stylidiaceae	<i>Stylidium calcaratum</i>	
Stylidiaceae	<i>Stylidium maritimum</i>	P3
Stylidiaceae	<i>Stylidium rigidulum</i>	
Stylidiaceae	<i>Stylidium scariosum</i>	
Thymelaeaceae	<i>Pimelea argentea</i>	
Thymelaeaceae	<i>Pimelea calcicola</i>	P3
Thymelaeaceae	<i>Pimelea sulphurea</i>	
Thymelaeaceae	<i>Pimelea sylvestris</i>	
Typhaceae	<i>Typha orientalis</i>	
Verbenaceae	<i>Lantana camara</i>	*DP + WoNS
Violaceae	<i>Hybanthus calycinus</i>	
Xanthorrhoeaceae	<i>Xanthorrhoea gracilis</i>	
Xanthorrhoeaceae	<i>Xanthorrhoea preissii</i>	
Zamiaceae	<i>Macrozamia riedlei</i>	

* Introduced (weed) species

DP	Declared Pest
WoNS	Weeds of National Significance
EN	BC Act listed Threatened species
P1	DBCA Priority 3 species
P2	DBCA Priority 3 species
P3	DBCA Priority 3 species

Species by Vegetation Type

Family	Species	Status	VT01	VT02	VT03	VT04	VT05	VT06	VT07	VT08	VT09	VT10	VT11	VT14	Opp
Agavaceae	<i>Agave americana</i>	*													x
Aizoaceae	<i>Carpobrotus edulis</i>	*	x		x	x			x	x			x		
Aizoaceae	<i>Carpobrotus virescens</i>		x												
Amaranthaceae	<i>Ptilotus drummondii</i> var. <i>drummondii</i>			x											x
Amaranthaceae	<i>Ptilotus polystachyus</i>			x					x						
Anarthriaceae	<i>Lyginia imberbis</i>		x												x
Apiaceae	<i>Daucus glochidiatus</i>			x				x			x				x
Apiaceae	<i>Eryngium pinnatifidum</i>				x										x
Apiaceae	<i>Erynguim</i> sp.				x										
Apiaceae	<i>Foeniculum vulgare</i>	*													x
Apiaceae	<i>Trachymene pilosa</i>										x				x
Apocynaceae	<i>Gomphocarpus fruticosus</i>	*DP													x
Araceae	<i>Zantedeschia aethiopica</i>	*DP													x
Araliaceae	<i>Hydrocotyle hispidula</i>										x				x
Araliaceae	<i>Trachymene pilosa</i>		x	x	x				x	x	x				
Asparagaceae	<i>Acanthocarpus preissii</i>		x	x		x			x			x	x		
Asparagaceae	<i>Agave americana</i>	*													x
Asparagaceae	<i>Asparagus asparagoides</i>	*DP/WoNS		x			x			x	x		x		
Asparagaceae	<i>Lomandra caespitosa</i>		x	x		x		x		x					x
Asparagaceae	<i>Lomandra maritima</i>			x		x				x	x	x	x		x
Asparagaceae	<i>Lomandra preissii</i>							x							x
Asparagaceae	<i>Lomandra</i> sp.		x												
Asparagaceae	<i>Sowerbaea laxiflora</i>		x	x	x	x		x	x	x					
Asparagaceae	<i>Thysanotus arenarius</i>										x				x
Asparagaceae	<i>Thysanotus manglesianus</i>		x						x						x
Asparagaceae	<i>Thysanotus pallida</i>		x							x					

Family	Species	Status	VT01	VT02	VT03	VT04	VT05	VT06	VT07	VT08	VT09	VT10	VT11	VT14	Opp
Asparagaceae	<i>Thysanotus patersonii/maglesianus</i>		x			x				x	x				
Asparagaceae	<i>Thysanotus</i> sp.								x						
Asphodelaceae	<i>Trachyandra divaricata</i>	*										x	x		x
Asteraceae	<i>Arctotheca calendula</i>	*				x									
Asteraceae	<i>Brachyscome iberidifolia</i>														x
Asteraceae	<i>Conyza bonariensis</i>	*													x
Asteraceae	<i>Helichrysum luteoalbum</i>	*								x					
Asteraceae	<i>Hypochaeris glabra</i>	*	x	x	x	x			x	x	x				x
Asteraceae	<i>Lagenophora huegelii</i>		x	x	x			x	x						x
Asteraceae	<i>Leptorhynchus scaber</i>											x			x
Asteraceae	<i>Millotia tenuifolia</i> var. <i>tenuifolia</i>									x					x
Asteraceae	<i>Olearia axillaris</i>								x	x					x
Asteraceae	<i>Olearia rudis</i>														x
Asteraceae	<i>Osteospermum ecklonis</i>	*													x
Asteraceae	<i>Podolepis lessonii</i>		x												x
Asteraceae	<i>Podotheca gnaphalioides</i>		x		x			x	x	x	x				x
Asteraceae	<i>Quinetia urvillei</i>														x
Asteraceae	<i>Rhodanthe citrina</i>									x					x
Asteraceae	<i>Siloxerus humifusus</i>														x
Asteraceae	<i>Sonchus oleraceus</i>	*	x	x	x	x	x	x	x	x	x	x			x
Asteraceae	<i>Ursinia anthemoides</i>	*	x	x	x	x		x	x	x	x				
Asteraceae	<i>Waitzia suaveolens</i> var. <i>suaveolens</i>		x	x						x					x
Boraginaceae	<i>Echium plantagineum</i>	*DP													x
Brassicaceae	<i>Brassica tournefortii</i>	*			x					x	x				
Brassicaceae	<i>Heliophila pusilla</i>	*	x			x			x	x	x				x
Brassicaceae	<i>Raphanus raphanistrum</i>	*								x					x
Cactaceae	<i>Opuntia stricta</i>	*DP/WoNS													x
Campanulaceae	<i>Isotoma hypocrateriformis</i>														x

Family	Species	Status	VT01	VT02	VT03	VT04	VT05	VT06	VT07	VT08	VT09	VT10	VT11	VT14	Opp
Campanulaceae	<i>Wahlenbergia capensis</i>	*		X						X	X				X
Caryophyllaceae	<i>Caryophyllaceae sp.</i>									X					X
Caryophyllaceae	<i>Cerastium glomeratum</i>	*	X			X				X	X				
Caryophyllaceae	<i>Minuartia mediterranea</i>	*													X
Caryophyllaceae	<i>Petrorhagia dubia</i>	*		X		X				X		X			
Caryophyllaceae	<i>Silene gallica</i>	*	X												
Caryophyllaceae	<i>Silene nocturna</i>	*	X												X
Caryophyllaceae	<i>Silene noturna</i>	*	X												
Casuarinaceae	<i>Allocasuarina fraseriana</i>		X	X	X		X	X							
Casuarinaceae	<i>Allocasuarina humilis</i>		X	X	X		X			X					
Casuarinaceae	<i>Allocasuarine humilis</i>									X					
Celastraceae	<i>Tripterococcus brunonis</i>									X					X
Chenopodiaceae	<i>Rhagodia baccata</i>		X		X	X			X		X				
Colchicaceae	<i>Burchardia congesta</i>		X	X	X		X	X	X	X					
Convolvulaceae	<i>Cuscuta planiflora</i>	*	X								X				X
Crassulaceae	<i>Crassula alata</i>	*				X				X					
Crassulaceae	<i>Crassula colorata var. acuminata</i>		X		X				X	X	X				X
Crassulaceae	<i>Crassula decumbens var. decumbens</i>								X	X					X
Crassulaceae	<i>Crassula glomerata</i>	*								X	X	X			X
Cucurbitaceae	<i>Cucumis myriocarpus</i>	*													X
Cyperaceae	<i>Isolepis marginata</i>					X		X		X					X
Cyperaceae	<i>Lepidosperma ?calcicola</i>		X						X	X	X				X
Cyperaceae	<i>Lepidosperma ?pubisquameum</i>						X								
Cyperaceae	<i>Lepidosperma calcicola</i>			X						X		X	X		X
Cyperaceae	<i>Lepidosperma sp.</i>			X		X					X	X			X
Cyperaceae	<i>Mesomalaena pseudostygia</i>		X	X	X	X	X	X	X	X	X		X		
Cyperaceae	<i>Schoenus sp. (sterile)</i>		X												
Cyperaceae	<i>Tetraria octandra</i>								X			X			X

Family	Species	Status	VT01	VT02	VT03	VT04	VT05	VT06	VT07	VT08	VT09	VT10	VT11	VT14	Opp
Dasygongonaceae	<i>Calectasia narragara</i>		x												x
Dilleniaceae	<i>Hibbertia hypericoides</i>		x	x	x	x	x	x	x	x	x		x		x
Dilleniaceae	<i>Hibbertia racemosa</i>											x			x
Dilleniaceae	<i>Hibbertia spicata subsp. leptotheca</i>	P3								x	x				x
Droseraceae	<i>Drosera erythrorhiza</i>		x		x					x					
Droseraceae	<i>Drosera menziesii</i>		x												x
Droseraceae	<i>Drosera pallida</i>		x						x	x	x				x
Ericaceae	<i>Astroloma ciliatum</i>							x							x
Ericaceae	<i>Conostephium pendulum</i>		x		x										x
Ericaceae	<i>Conostephium preissii</i>									x					x
Ericaceae	<i>Leucopogon ?nutans</i>						x	x							
Ericaceae	<i>Leucopogon insularis</i>		x							x					x
Ericaceae	<i>Leucopogon nutans</i>				x	x					x				
Ericaceae	<i>Leucopogon parviflorus</i>					x				x	x		x		x
Ericaceae	<i>Leucopogon polymorphus</i>		x						x	x					x
Ericaceae	<i>Leucopogon propinquus</i>		x	x											x
Ericaceae	<i>Leucopogon</i> sp. Yanchep (M. Hislop 1986)	P3								x					x
Ericaceae	<i>Lysinema pentapetalum</i>									x					x
Euphorbiaceae	<i>Euphorbia peplus</i>	*											x		
Euphorbiaceae	<i>Euphorbia terracina</i>	*	x	x		x	x	x	x	x	x	x	x	x	x
Euphorbiaceae	<i>Ricinus communis</i>	*													x
Fabaceae	<i>Acacia baileyana</i>	*													x
Fabaceae	<i>Acacia benthamii</i>	P2													x
Fabaceae	<i>Acacia cochlearis</i>											x			
Fabaceae	<i>Acacia cyclops</i>					x				x	x				x
Fabaceae	<i>Acacia decurrens</i>	*				x									x
Fabaceae	<i>Acacia lasiocarpa</i> var. <i>lasiocarpa</i>					x				x	x	x			x

Family	Species	Status	VT01	VT02	VT03	VT04	VT05	VT06	VT07	VT08	VT09	VT10	VT11	VT14	Opp
Fabaceae	<i>Acacia longifolia subsp. longifolia</i>	*													X
Fabaceae	<i>Acacia longifolia subsp. sophorae</i>	*													X
Fabaceae	<i>Acacia pulchella var. glaberrima</i>		X	X	X		X	X	X	X	X				X
Fabaceae	<i>Acacia rostellifera</i>												X		
Fabaceae	<i>Acacia saligna</i>			X	X	X		X				X			
Fabaceae	<i>Acacia truncata</i>									X	X				X
Fabaceae	<i>Acacia willdenowiana</i>				X	X									X
Fabaceae	<i>Bossiaea eriocarpa</i>		X	X	X	X		X		X	X				X
Fabaceae	<i>Daviesia decurrens</i>														X
Fabaceae	<i>Daviesia divaricata subsp. divaricata</i>								X						X
Fabaceae	<i>Gastrolobium ?capitatum</i>										X				X
Fabaceae	<i>Gastrolobium linearifolium</i>		X		X					X					X
Fabaceae	<i>Gompholobium knightianum</i>							X							X
Fabaceae	<i>Gompholobium tomentosum</i>		X	X				X	X	X	X				X
Fabaceae	<i>Hardenbergia comptoniana</i>		X	X	X	X		X	X		X	X			
Fabaceae	<i>Hovea pungens</i>														X
Fabaceae	<i>Hovea trisperma</i>		X				X	X		X					X
Fabaceae	<i>Isotropis cuneifolia subsp. cuneifolia</i>														X
Fabaceae	<i>Jacksonia calcicola</i>		X						X	X	X				X
Fabaceae	<i>Jacksonia sternbergiana</i>		X	X						X					
Fabaceae	<i>Kennedia prostrata</i>		X			X					X	X			
Fabaceae	<i>Lupinus angustifolius</i>	*				X				X	X				X
Fabaceae	<i>Lupinus cosentinii</i>	*	X												
Fabaceae	<i>Mirbelia spinosa</i>		X												X
Fabaceae	<i>Sphaerolobium medium</i>									X	X				X
Fabaceae	<i>Templetonia retusa</i>									X	X				
Fabaceae	<i>Trifolium arvense</i>	*										X	X		X
Fabaceae	<i>Trifolium campestre</i>	*	X	X	X	X	X	X	X	X					X

Family	Species	Status	VT01	VT02	VT03	VT04	VT05	VT06	VT07	VT08	VT09	VT10	VT11	VT14	Opp
Fabaceae	<i>Trifolium dubium</i>	*	x	x		x				x	x				x
Fabaceae	<i>Trifolium sp.</i>	*	x												
Fabaceae	<i>Vicia sativa</i>	*				x									x
Geraniaceae	<i>Erodium botrys</i>	*								x					x
Geraniaceae	<i>Erodium cicutarium</i>	*									x				x
Geraniaceae	<i>Geranium molle</i>	*				x									x
Geraniaceae	<i>Pelargonium capitatum</i>	*	x	x	x	x		x		x	x			x	x
Goodeniaceae	<i>Goodeniaceae sp.</i>														x
Goodeniaceae	<i>Lechenaultia linarioides</i>		x			x				x	x				
Goodeniaceae	<i>Scaevola canescens</i>		x	x											x
Goodeniaceae	<i>Scaevola crassifolia</i>														x
Goodeniaceae	<i>Scaevola sp.</i>										x				
Haemodoraceae	<i>Anigozanthos humilis</i>										x				x
Haemodoraceae	<i>Conostylis aculeata</i>		x	x	x	x	x	x	x	x	x	x			x
Haemodoraceae	<i>Conostylis candicans subsp. candicans</i>		x		x	x					x	x			x
Haemodoraceae	<i>Conostylis setigera</i>		x												
Haemodoraceae	<i>Conostylis setosa</i>		x												x
Haemodoraceae	<i>Haemodorum laxum</i>		x												x
Haemodoraceae	<i>Haemodorum sp.</i>		x				x								
Haemodoraceae	<i>Haemodorum spicatum</i>														x
Haloragaceae	<i>Glischrocaryon angustifolium</i>														x
Hemerocallidaceae	<i>Corynotheca micrantha var. micrantha</i>		x	x	x										x
Hemerocallidaceae	<i>Dianella revoluta var. divaricata</i>		x	x		x	x	x	x	x	x				
Hemerocallidaceae	<i>Stypandra glauca</i>														x
Hemerocallidaceae	<i>Tricoryne elatior</i>					x				x	x				
Iridaceae	<i>Freesia alba x leichtlinii</i>	*													x
Iridaceae	<i>Gladiolus caryophyllaceus</i>	*	x	x	x	x			x	x	x				
Iridaceae	<i>Moraea flaccida</i>	*DP	x	x	x	x	x			x	x				

Family	Species	Status	VT01	VT02	VT03	VT04	VT05	VT06	VT07	VT08	VT09	VT10	VT11	VT14	Opp
Iridaceae	<i>Orthrosanthus laxus var. laxus</i>		x		x	x	x	x	x	x					x
Iridaceae	<i>Romulea rosea</i>	*				x	x	x			x	x			
Lamiaceae	<i>Hemiandra pungens</i>									x					x
Lauraceae	<i>Cassytha flava</i>														x
Lauraceae	<i>Cassytha racemosa forma racemosa</i>		x		x		x	x	x	x	x	x			x
Lauraceae	<i>Nuytsia floribunda</i>		x					x							x
Loganiaceae	<i>Phyllangium sp.</i>											x			
Montiaceae	<i>Calandrinia liniflora</i>									x					x
Montiaceae	<i>Calandrinia tholiformis</i>									x	x				x
Myrtaceae	<i>Baeckea sp. Limestone (N. Gibson & M.N. Lyons 1425)</i>	P1								x	x				x
Myrtaceae	<i>Calothamnus lateralis</i>														x
Myrtaceae	<i>Calothamnus quadrifidus subsp. quadrifidus</i>		x			x		x	x	x	x		x		x
Myrtaceae	<i>Calothamnus sanguineus</i>		x							x					
Myrtaceae	<i>Calytrix ?flavescens</i>														x
Myrtaceae	<i>Chamleaucium uncinatum</i>														x
Myrtaceae	<i>Corymbia calophylla</i>					x		x							
Myrtaceae	<i>Eremaea pauciflora</i>		x												x
Myrtaceae	<i>Eucalyptus camaldulensis</i>	#planted													x
Myrtaceae	<i>Eucalyptus decipiens</i>						x								x
Myrtaceae	<i>Eucalyptus foecunda</i>														x
Myrtaceae	<i>Eucalyptus gomphocephala</i>			x		x		x							x
Myrtaceae	<i>Eucalyptus marginata</i>				x			x							x
Myrtaceae	<i>Eucalyptus rudis</i>													x	
Myrtaceae	<i>Eucalyptus todtiana</i>		x												
Myrtaceae	<i>Leptospermum spinescens</i>														x
Myrtaceae	<i>Melaleuca cardiophylla</i>														x
Myrtaceae	<i>Melaleuca huegelii</i>										x				x

Family	Species	Status	VT01	VT02	VT03	VT04	VT05	VT06	VT07	VT08	VT09	VT10	VT11	VT14	Opp
Myrtaceae	<i>Melaleuca raphiophylla</i>													x	
Myrtaceae	<i>Melaleuca sp. Wanneroo</i> (G.J. Keighery 16705)	T													x
Myrtaceae	<i>Melaleuca systema</i>								x	x	x	x	x		x
Orchidaceae	? <i>Pterostylis sp.</i>							x							
Orchidaceae	<i>Caladenia arenicola</i>		x												x
Orchidaceae	<i>Caladenia flava</i>		x		x				x	x	x				x
Orchidaceae	<i>Caladenia latifolia</i>								x						x
Orchidaceae	<i>Caladenia longicauda subsp. calcigena</i>		x							x					
Orchidaceae	<i>Caladenia sp.</i>									x					
Orchidaceae	<i>Diuris corymbosa</i>		x		x				x						
Orchidaceae	<i>Elythranthera brunonis</i>								x						x
Orchidaceae	<i>Pterostylis sp. (flo. spent)</i>				x				x						x
Orchidaceae	<i>Pyrorchis nigricans</i>		x												
Orobanchaceae	<i>Parentucellia latifolia</i>	*													x
Oxalidaceae	<i>Oxalis pes-caprae</i>	*	x			x									
Papaveraceae	<i>Fumaria muralis</i>	*				x									
Phyllanthaceae	<i>Phyllanthus calycinus</i>		x	x	x	x			x	x	x	x			
Phyllanthaceae	<i>Poranthera microphylla</i>			x	x			x			x				x
Pinaceae	<i>Pinus pinaster</i>	*													x
Poaceae	<i>Aira caryophyllea</i>	*	x		x			x		x	x				x
Poaceae	<i>Aira cupaniana</i>	*	x												
Poaceae	<i>Arundo donax</i>	*													x
Poaceae	<i>Austrostipa compressa</i>		x									x			x
Poaceae	<i>Austrostipa flavescens</i>														x
Poaceae	<i>Avena barbata</i>	*	x	x		x	x			x	x	x	x		x
Poaceae	<i>Briza maxima</i>	*	x	x	x	x	x	x	x	x	x				
Poaceae	<i>Briza minor</i>	*	x		x			x		x	x				

Family	Species	Status	VT01	VT02	VT03	VT04	VT05	VT06	VT07	VT08	VT09	VT10	VT11	VT14	Opp
Poaceae	<i>Bromus diandrus</i>	*	x	x					x	x	x	x	x	x	x
Poaceae	<i>Ehrharta calycina</i>	*	x	x	x	x		x	x	x	x		x		x
Poaceae	<i>Ehrharta longiflora</i>	*	x		x	x		x		x	x			x	x
Poaceae	<i>Ehrharta sp.</i>	*	x												
Poaceae	<i>Eragrostis curvula</i>	*				x									x
Poaceae	<i>Lagurus ovatus</i>	*	x				x					x	x		x
Poaceae	<i>Lolium multiflorum</i>	*	x				x								x
Poaceae	<i>Lolium perenne</i>	*								x					x
Poaceae	<i>Lolium rigidum</i>	*	x							x	x				x
Poaceae	<i>Lolium sp.</i>	*	x							x		x	x		
Poaceae	<i>Neurachne alopecuroidea</i>									x					
Poaceae	<i>Poa poiformis</i>										x	x			x
Poaceae	<i>Poaceae sp.</i>				x	x				x	x				x
Poaceae	<i>Rytidosperma caespitosum</i>														x
Poaceae	<i>Rytidosperma setaceum</i>		x									x			x
Poaceae	<i>Vulpia myuros forma myuros</i>	*	x	x		x						x	x		x
Polygalaceae	<i>Comesperma confertum</i>										x				x
Polygalaceae	<i>Comesperma sp.</i>									x					
Primulaceae	<i>Lysimachia arvensis</i>	*	x	x	x	x	x	x	x	x	x	x			
Proteaceae	<i>Banksia attenuata</i>		x	x			x		x	x					
Proteaceae	<i>Banksia dallanneyi</i>		x			x	x		x	x	x		x		x
Proteaceae	<i>Banksia grandis</i>			x		x		x							
Proteaceae	<i>Banksia menziesii</i>		x		x		x		x						
Proteaceae	<i>Banksia sessilis</i>		x			x	x		x	x	x		x		
Proteaceae	<i>Conospermum triplinervium</i>								x						x
Proteaceae	<i>Grevillea preissii subsp. preissii</i>									x	x				x
Proteaceae	<i>Grevillea vestita subsp. vestita</i>			x											x
Proteaceae	<i>Hakea costata</i>								x						x

Family	Species	Status	VT01	VT02	VT03	VT04	VT05	VT06	VT07	VT08	VT09	VT10	VT11	VT14	Opp
Proteaceae	<i>Hakea lissocarpha</i>				x	x		x	x	x	x		x		x
Proteaceae	<i>Hakea prostrata</i>		x				x		x						
Proteaceae	<i>Hakea ruscifolia</i>														x
Proteaceae	<i>Hakea trifurcata</i>		x	x	x				x	x					x
Proteaceae	<i>Petrophile axillaris</i>									x					x
Proteaceae	<i>Petrophile brevifolia</i>		x												x
Proteaceae	<i>Petrophile linearis</i>		x	x	x			x							x
Proteaceae	<i>Petrophile macrostachya</i>		x	x	x		x		x	x					x
Proteaceae	<i>Stirlingia latifolia</i>		x					x							
Proteaceae	<i>Synaphea spinulosa subsp. spinulosa</i>		x												x
Ranunculaceae	<i>Clematis linearifolia</i>								x						
Ranunculaceae	<i>Clematis pubescens</i>					x									x
Restionaceae	<i>Desmocladus flexuosus</i>		x	x	x	x	x	x	x	x	x	x	x		x
Rhamnaceae	<i>Cryptandra multispina</i>									x					
Rhamnaceae	<i>Cryptandra mutila</i>									x	x				x
Rhamnaceae	<i>Cryptandra scoparia</i>														x
Rhamnaceae	<i>Spyridium globulosum</i>		x	x		x	x		x	x	x	x	x		x
Rhamnaceae	<i>Stenanthemum notiale subsp. chamelum</i>		x							x					x
Rhamnaceae	<i>Trymalium ledifolium var. ledifolium</i>		x								x				x
Rubiaceae	<i>Galium murale</i>	*				x					x				x
Rubiaceae	<i>Opercularia echinocephala</i>			x		x				x	x				
Rubiaceae	<i>Opercularia vaginata</i>		x								x				x
Rutaceae	<i>Philothea spicata</i>									x					x
Santalaceae	<i>Leptomeria pauciflora</i>									x					x
Santalaceae	<i>Santalum acuminatum</i>														x
Sapindaceae	<i>Diplopeltis huegelii subsp. huegelii</i>														x
Scrophulaceae	<i>Eremophila glabra</i>	#planted													x
Solanaceae	<i>Solanum linnaeanum</i>	*DP													x

Family	Species	Status	VT01	VT02	VT03	VT04	VT05	VT06	VT07	VT08	VT09	VT10	VT11	VT14	Opp
Solanaceae	<i>Solanum nigrum</i>	*									x				
Stylidiaceae	<i>Levenkookia stipitata</i>		x												x
Stylidiaceae	<i>Stylidium adpressum</i>														x
Stylidiaceae	<i>Stylidium androsaceum</i>				x										x
Stylidiaceae	<i>Stylidium brunonianum</i>														x
Stylidiaceae	<i>Stylidium calcaratum</i>		x					x		x					x
Stylidiaceae	<i>Stylidium maritimum</i>	P3								x	x				x
Stylidiaceae	<i>Stylidium rigidulum</i>														x
Stylidiaceae	<i>Stylidium scariosum</i>									x					x
Thymelaeaceae	<i>Pimelea argentea</i>														x
Thymelaeaceae	<i>Pimelea calcicola</i>	P3								x					x
Thymelaeaceae	<i>Pimelea sulphurea</i>														x
Thymelaeaceae	<i>Pimelea sylvestris</i>														x
Typhaceae	<i>Typha orientalis</i>													x	x
Verbenaceae	<i>Lantana camara</i>	*DP/WoNS													x
Violaceae	<i>Hybanthus calycinus</i>									x	x				x
Xanthorrhoeaceae	<i>Xanthorrhoea gracilis</i>		x	x			x	x		x					
Xanthorrhoeaceae	<i>Xanthorrhoea preissii</i>		x	x	x	x	x	x	x	x	x		x		x
Zamiaceae	<i>Macrozamia riedlei</i>		x	x	x	x	x	x							x
Total			121	61	58	70	37	52	62	120	91	36	27	7	210

Quadrat Data

Q1		
Type: Quadrat	Size: 10 x 10	Date: 17/09/2018
Vegetation Type: <i>Banksia sessilis</i> tall closed shrubland (VT07)		
Landform: Mid slope Slope: Gentle	Drainage: Good	
Soil Colour & Type: Brown Sand		
Vegetation Condition: Excellent		
Disturbances: Minimal		
Fire Age & Intensity: Old >5 years, no damage		
Bare Ground: <2%	Humus/Litter: Moderate	Wood Litter: Moderate



Taxon	Status	% cover	Height (m)
<i>Conospermum triplinervium</i>		<10%	1.7
<i>Dianella revoluta</i> var. <i>divaricata</i>		<2%T	1.6
<i>Acacia pulchella</i> var. <i>glaberrima</i>		<10%	1.5
<i>Calothamnus quadrifidus</i> subsp. <i>quadrifidus</i>		<10%	1.5
<i>Hakea prostrata</i>		30-10%	1.4
<i>Hakea trifurcata</i>		<10%	1.4
<i>Mesomelaena pseudostygia</i>		30-10%	1.3
<i>Conostylis aculeata</i>		<10%	0.6
<i>Gladiolus caryophyllaceus</i>	*	<2%T	0.6

Taxon	Status	% cover	Height (m)
<i>Jacksonia calcicola</i>		<2%N	0.5
<i>Phyllanthus calycinus</i>		<2%T	0.5
<i>Caladenia flava</i>		<2%N	0.4
<i>Gompholobium tomentosum</i>		<2%T	0.4
<i>Banksia sessilis</i>		<10%	0.3
<i>Tetraria octandra</i>		<2%T	0.3
<i>Desmodium flexuosum</i>		<2%T	0.3
<i>Melaleuca systema</i>		30-10%	0.2
<i>Ursinia anthemoides</i>	*	<2%N	0.2
<i>Pterostylis</i> sp. (flo. spent)		<2%T	0.2
<i>Heliophila pusilla</i>	*	<2%N	0.1
<i>Sonchus oleraceus</i>	*	<2%N	0.1
<i>Briza maxima</i>	*	<2%T	0.1
<i>Podrothea gnaphalioides</i>		<2%T	0.1
<i>Drosera pallida</i>		<2%T	cr
<i>Hardenbergia comptoniana</i>		<2%T	cr
<i>Thysanotus manglesianus</i>		<2%T	cr
<i>Thysanotus</i> sp.		<2%T	cr

Q2		
Type: Quadrat	Size: 10 x 10	Date: 17/09/2018
Vegetation Type: <i>Banksia sessilis</i> tall closed shrubland (VT07)		
Landform: Upper slope Slope: Gentle	Drainage: Good	
Soil Colour & Type: Brown Sand		
Vegetation Condition: Excellent		
Disturbances: Weeds		
Fire Age & Intensity: Old >5 years, no damage		
Bare Ground: <2%	Humus/Litter: Moderate	Wood Litter: Moderate



Taxon	Status	% cover	Height (m)
<i>Banksia attenuata</i>		<10%	2.6
<i>Banksia sessilis</i>		70-30%	2.2
<i>Melaleuca systema</i>		30-10%	2
<i>Hakea trifurcata</i>		<10%	1.8
<i>Calothamnus quadrifidus</i> subsp. <i>quadrifidus</i>		70-30%	1.7
<i>Acacia pulchella</i> var. <i>glaberrima</i>		<10%	1.6
<i>Spyridium globulosum</i>		<10%	1.6
<i>Hibbertia hypericoides</i>		30-10%	1.2
<i>Gladiolus caryophyllaceus</i>	*	<2%N	1.2
<i>Diuris corymbosa</i>		<2%N	0.8
<i>Ehrharta calycina</i>	*	<2%N	0.8

Taxon	Status	% cover	Height (m)
<i>Euphorbia terracina</i>	*	<2%T	0.5
<i>Conostylis aculeata</i>		<10%	0.3
<i>Phyllanthus calycinus</i>		<2%T	0.3
<i>Sonchus oleraceus</i>	*	<2%T	0.3
<i>Desmocladius flexuosus</i>		<10%	0.2
<i>Caladenia flava</i>		<2%N	0.2
<i>Bromus diandrus</i>	*	<10%	0.1
<i>Sonchus oleraceus</i>	*	<2%N	0.1
<i>Ursinia anthemoides</i>	*	<2%N	0.1
<i>Briza maxima</i>	*	<2%T	0.1
<i>Hypochaeris glabra</i>	*	<2%N	0
<i>Thysanotus manglesianus</i>		<2%T	0
<i>Drosera pallida</i>		<2%N	cr
<i>Cassytha racemosa</i> forma <i>racemosa</i>		<2%T	cr
<i>Clematis linearifolia</i>		<2%T	cr
<i>Hardenbergia comptoniana</i>		<2%T	cr

Q3		
Type: Quadrat	Size: 10 x 10	Date: 17/09/2018
Vegetation Type: <i>Banksia</i> low woodland (VT01)		
Landform: Plain Slope: Negligible	Drainage: Good	
Soil Colour & Type: Brown Sand		
Vegetation Condition: Excellent		
Disturbances: Minimal, some weeds		
Fire Age & Intensity: Old >5 years, few trees killed		
Bare Ground: 2-5%	Humus/Litter: Sparse	Wood Litter: Moderate



Taxon	Status	% cover	Height (m)
<i>Allocasuarina fraseriana</i>		<10%	6.5
<i>Eucalyptus tottiana</i>		<10%	5
<i>Banksia attenuata</i>		<10%	4
<i>Hakea prostrata</i>		<10%	2
<i>Hakea trifurcata</i>		<10%	2
<i>Acacia pulchella</i> var. <i>glaberrima</i>		30-10%	1.6
<i>Xanthorrhoea preissii</i>		30-10%	1.6
<i>Allocasuarina humilis</i>		30-10%	1.4
<i>Ehrharta calycina</i>	*	<2%T	0.8
<i>Mesomelaena pseudostygia</i>		70-30%	0.8
<i>Gladiolus caryophyllaceus</i>	*	<2%T	0.7

Taxon	Status	% cover	Height (m)
<i>Eremaea pauciflora</i>		<10%	0.6
<i>Petrophile linearis</i>		<2%T	0.6
<i>Burchardia congesta</i>		<2%N	0.5
<i>Gastrolobium linearifolium</i>		<2%T	0.5
<i>Moraea flaccida</i>	*DP	<2%T	0.5
<i>Conostylis aculeata</i>		<10%	0.4
<i>Petrophile macrostachya</i>		<10%	0.4
<i>Synaphea spinulosa</i> subsp. <i>spinulosa</i>		<10%	0.4
<i>Desmocladius flexuosus</i>		<2%T	0.4
<i>Dianella revoluta</i> var. <i>divaricata</i>		<2%T	0.4
<i>Bossiaea eriocarpa</i>		<10%	0.3
<i>Sowerbaea laxiflora</i>		<2%N	0.3
<i>Gompholobium tomentosum</i>		<2%T	0.3
<i>Lomandra caespitosa</i>		<2%T	0.3
<i>Lagenophora huegelii</i>		<2%N	0.2
<i>Ursinia anthemoides</i>	*	<2%N	0.2
<i>Calectasia narragara</i>		<2%T	0.2
<i>Leucopogon propinquus</i>		<2%T	0.2
<i>Lyginia imberbis</i>		<10%	0.1
<i>Briza maxima</i>	*	<2%N	0.1
<i>Heliophila pusilla</i>	*	<2%N	0.1
<i>Lysimachia arvensis</i>	*	<2%N	0.1
<i>Lagenophora huegelii</i>		<2%T	0.1
<i>Scaevola canescens</i>		<2%T	0.1
<i>Trifolium campestre</i>	*	<2%T	0.1
<i>Drosera erythrorhiza</i>		<2%N	0
<i>Hardenbergia comptoniana</i>		<2%T	cr
<i>Thysanotus</i> sp.		<2%T	cr

Q4		
Type: Quadrat	Size: 10 x 10	Date: 17/09/2018
Vegetation Type: Mixed low heathland (VT08)		
Landform: Plain Slope: Negligible	Drainage: Good	
Soil Colour & Type: Brown Sand		
Vegetation Condition: Very Good		
Disturbances: Weeds, tracks nearby		
Fire Age & Intensity: Nil, no damage		
Bare Ground: 2-5%	Humus/Litter: Sparse	Wood Litter: Moderate



Taxon	Status	% cover	Height (m)
<i>Xanthorrhoea preissii</i>		70-30%	2
<i>Hakea trifurcata</i>		<10%	1.6
<i>Acacia lasiocarpa</i> var. <i>lasiocarpa</i>		30-10%	1.1
<i>Raphanus raphanistrum</i>	*	<2%T	1
<i>Melaleuca systema</i>		70-30%	1
<i>Grevillea preissii</i> subsp. <i>preissii</i>		30-10%	0.8
<i>Jacksonia calcicola</i>		<10%	0.6
<i>Mesomelaena pseudostygia</i>		<10%	0.5
<i>Leucopogon parviflorus</i>		<2%T	0.5
<i>Lomandra maritima</i>		<10%	0.4
<i>Ursinia anthemoides</i>	*	<2%N	0.4

Taxon	Status	% cover	Height (m)
<i>Hybanthus calycinus</i>		<2%T	0.4
<i>Bossiaea eriocarpa</i>		<10%	0.3
<i>Conostylis aculeata</i>		<2%T	0.3
<i>Gladiolus caryophyllaceus</i>	*	<2%T	0.3
<i>Banksia dallanneyi</i>		30-10%	0.2
<i>Desmocladius flexuosus</i>		30-10%	0.2
<i>Caladenia flava</i>		<2%T	0.2
<i>Caladenia longicauda</i> subsp. <i>calcigena</i>		<2%T	0.2
<i>Sowerbaea laxiflora</i>		<2%T	0.2
<i>Briza maxima</i>	*	<2%N	0.1
<i>Heliophila pusilla</i>	*	<2%N	0.1
<i>Lysimachia arvensis</i>	*	<2%N	0.1
<i>Drosera erythrorhiza</i>		<2%N	0
<i>Hypochaeris glabra</i>	*	<2%T	0
<i>Thysanotus</i> sp.		<2%T	cr

Q5		
Type: Quadrat	Size: 10 x 10	Date: 18/09/2018
Vegetation Type: Mixed low heathland (VT08)		
Landform: Mid slope Slope: Gentle	Drainage: Good	
Soil Colour & Type: Brown Sand		
Vegetation Condition: Excellent		
Disturbances: Weeds		
Fire Age & Intensity: Nil, no damage		
Bare Ground: 2-5%	Humus/Litter: Sparse	Wood Litter: Moderate



Taxon	Status	% cover	Height (m)
<i>Xanthorrhoea preissii</i>		30-10%	2
<i>Hakea trifurcata</i>		<2%T	1.8
<i>Calothamnus quadrifidus</i> subsp. <i>quadrifidus</i>		100-70%	1.6
<i>Banksia sessilis</i>		<10%	1.6
<i>Gladiolus caryophyllaceus</i>	*	<2%T	1.4
<i>Melaleuca systema</i>		70-30%	1.4
<i>Acacia lasiocarpa</i> var. <i>lasiocarpa</i>		30-10%	1
<i>Hibbertia hypericoides</i>		70-30%	0.9
<i>Dianella revoluta</i> var. <i>divaricata</i>		<2%T	0.8
<i>Mesomelaena pseudostygia</i>		<10%	0.5
<i>Conostylis aculeata</i>		<2%T	0.4

Taxon	Status	% cover	Height (m)
<i>Jacksonia calcicola</i>		<2%T	0.4
<i>Moraea flaccida</i>	*DP	<2%T	0.4
<i>Hovea trisperma</i>		<2%T	0.3
<i>Lomandra maritima</i>		<2%T	0.3
<i>Banksia dallanneyi</i>		<10%	0.2
<i>Desmocladius flexuosus</i>		<10%	0.2
Poaceae sp.		<2%N	0.2
<i>Hybanthus calycinus</i>		<2%T	0.2
<i>Heliophila pusilla</i>	*	<2%N	0.1
<i>Lysimachia arvensis</i>	*	<2%N	0.1
<i>Ursinia anthemoides</i>	*	<2%N	0.1
<i>Drosera erythrorhiza</i>		<2%N	0
<i>Hypochaeris glabra</i>	*	<2%T	0

Q6		
Type: Quadrat	Size: 10 x 10	Date: 18/09/2018
Vegetation Type: Mixed low heathland (VT08)		
Landform: Mid slope Slope: Gentle	Drainage: Good	
Soil Colour & Type: Brown Sand		
Vegetation Condition: Excellent		
Disturbances: weeds, rabbits, minimal		
Fire Age & Intensity: Old >5 years, minor impact		
Bare Ground: 2-5%	Humus/Litter: Sparse	Wood Litter: Sparse



Taxon	Status	% cover	Height (m)
<i>Xanthorrhoea preissii</i>		30-10%	2
<i>Calothamnus quadrifidus</i> subsp. <i>quadrifidus</i>		30-10%	1.5
<i>Acacia pulchella</i> var. <i>glaberrima</i>		<10%	1.4
<i>Melaleuca systema</i>		70-30%	1.4
<i>Allocasuarina humilis</i>		<10%	1.1
<i>Leucopogon polymorphus</i>		30-10%	1
<i>Leucopogon</i> sp. Yanchep	P3	30-10%	1
<i>Gladiolus caryophyllaceus</i>	*	<2%T	0.8
<i>Hibbertia hypericoides</i>		70-30%	0.8
<i>Burchardia congesta</i>		<2%T	0.7
<i>Calothamnus sanguineus</i>		<10%	0.6

Taxon	Status	% cover	Height (m)
<i>Conostylis aculeata</i>		<2%T	0.6
<i>Dianella revoluta</i> var. <i>divaricata</i>		<2%T	0.6
<i>Jacksonia sternbergiana</i>		<2%T	0.6
<i>Mesomelaena pseudostygia</i>		<2%T	0.5
<i>Gompholobium tomentosum</i>		<2%T	0.3
<i>Banksia dallanneyi</i>		<10%	0.2
<i>Desmocladius flexuosus</i>		<10%	0.2
<i>Bossiaea eriocarpa</i>		<2%T	0.2
<i>Gastrolobium linearifolium</i>		<2%T	0.2
<i>Lomandra caespitosa</i>		<2%T	0.2
Caryophyllaceae sp.		<2%N	0.1
<i>Heliophila pusilla</i>	*	<2%N	0.1
<i>Hypochaeris glabra</i>	*	<2%N	0.1
<i>Lysimachia arvensis</i>	*	<2%N	0.1
<i>Rhodanthe citrina</i>		<2%N	0.1
<i>Trachymene pilosa</i>		<2%N	0.1
<i>Aira caryophyllea</i>	*	<2%T	0.1
<i>Caladenia flava</i>		<2%T	0.1
<i>Crassula glomerata</i>	*	<2%T	0.1
<i>Isolepis marginata</i>		<2%T	0.1
<i>Stylidium calcaratum</i>		<2%T	0.1

Q7

Type: Quadrat	Size: 10 x 10	Date: 18/09/2018
Vegetation Type: Mixed low heathland (VT08)		
Landform: Lower slope Slope: Gentle	Drainage: Good	
Soil Colour & Type: Grey Sand		
Vegetation Condition: Good		
Disturbances: Weeds		
Fire Age & Intensity: Old > 5 years, no damage		
Bare Ground: 2-5%	Humus/Litter: Sparse	Wood Litter: Moderate



Taxon	Status	% Cover	Height (m)
<i>Xanthorrhoea preissii</i>		30-10%	2.3
<i>Banksia sessilis</i>		70-30%	2.1
<i>Acacia pulchella</i> var. <i>glaberrima</i>		<10%	1.5
<i>Melaleuca systena</i>		30-10%	1.4
<i>Calothamnus quadrifidus</i> subsp. <i>quadrifidus</i>		<10%	1.4
<i>Hibbertia hypericoides</i>		70-30%	1
<i>Hakea trifurcata</i>		<10%	0.9
<i>Euphorbia terracina</i>	*	<10%	0.8
<i>Mesomelaena pseudostygia</i>		<10%	0.5
<i>Lolium rigidum</i>	*	30-10%	0.4
<i>Moraea flaccida</i>	*DP	<2%T	0.4

Taxon	Status	% Cover	Height (m)
<i>Lepidosperma ?calicicola</i>		<2%T	0.3
<i>Lupinus angustifolius</i>	*	<2%T	0.3
<i>Pelargonium capitatum</i>	*	<2%T	0.3
<i>Desmocladius flexuosus</i>		<2%N	0.2
<i>Erodium botrys</i>	*	<2%N	0.2
<i>Heliophila pusilla</i>	*	<2%N	0.2
<i>Banksia dallanneyi</i>		<2%T	0.2
<i>Carpobrotus edulis</i>	*	<2%T	0.2
<i>Ehrharta calycina</i>	*	<2%T	0.2
<i>Crassula colorata</i> var. <i>acuminata</i>		<2%N	0.1
<i>Crassula decumbens</i> var. <i>decumbens</i>		<2%N	0.1
<i>Hypochoeris glabra</i>	*	<2%N	0.1
<i>Lysimachia arvensis</i>	*	<2%T	0.1
<i>Ursinia anthemoides</i>	*	<2%T	0.1

Q8		
Type: Quadrat	Size: 10 x 10	Date: 18/09/2018
Vegetation Type: <i>Banksia</i> low woodland (VT01)		
Landform: Upper slope Slope: Gentle	Drainage: Good	
Soil Colour & Type: Grey Sand		
Vegetation Condition: Good		
Disturbances: Weeds and surrounding clearing		
Fire Age & Intensity: Old >5 years, minor impact		
Bare Ground: 2-5%	Humus/Litter: Sparse	Wood Litter: Moderate



Taxon	Status	% Cover	Height (m)
<i>Banksia attenuata</i>		30-10%	3
<i>Banksia sessilis</i>		<10%	2
<i>Calothamnus quadrifidus</i> subsp. <i>quadrifidus</i>		70-30%	2
<i>Acacia pulchella</i> var. <i>glaberrima</i>		30-10%	1.8
<i>Xanthorrhoea preissii</i>		<10%	1.6
<i>Hibbertia hypericoides</i>		100-70%	1.2
<i>Allocasuarina humilis</i>		<10%	1.2
<i>Euphorbia terracina</i>	*	<2%T	1.1
<i>Mesomelaena pseudostygia</i>		<10%	1
<i>Dianella revoluta</i> var. <i>divaricata</i>		<2%N	1
<i>Ehrharta calycina</i>	*	<2%N	1

Taxon	Status	% Cover	Height (m)
<i>Burchardia congesta</i>		<2%T	1
<i>Gladiolus caryophyllaceus</i>	*	<2%N	0.9
<i>Avena barbata</i>	*	<2%N	0.8
<i>Ehrharta longiflora</i>	*	<2%N	0.5
<i>Lepidosperma ?calicicola</i>		<2%T	0.5
<i>Sonchus oleraceus</i>	*	<2%T	0.5
<i>Conostylis aculeata</i>		<10%	0.4
<i>Lolium rigidum</i>	*	<10%	0.3
<i>Trymalium ledifolium</i> var. <i>ledifolium</i>		<2%N	0.3
<i>Ursinia anthemoides</i>	*	<2%N	0.2
<i>Briza maxima</i>	*	<2%T	0.2
<i>Lysimachia arvensis</i>	*	<10%	0.1
<i>Trifolium campestre</i>	*	<2%N	0.1
<i>Carpobrotus edulis</i>	*	<2%T	0.1
<i>Desmocladius flexuosus</i>		<2%T	0.1
<i>Oxalis pes-caprae</i>	*	<2%T	0.1
<i>Cassytha racemosa</i> forma <i>racemosa</i>		<2%N	cr
<i>Thysanotus manglesianus</i>		<2%N	cr
<i>Drosera pallida</i>		<2%T	cr

Q9		
Type: Quadrat	Size: 10 x 10	Date: 15/10/2018
Vegetation Type: <i>Melaleuca huegelii</i> / <i>M. systema</i> mid shrubland (VT09)		
Landform: Ridge	Drainage: Good	
Slope: Gentle		
Soil Colour & Type: Grey sand over limestone 31-70%		
Vegetation Condition: Degraded		
Disturbances: Weeds fire rubbish and rabbits		
Fire Age & Intensity: Moderate		
Bare Ground: 2-10%	Humus/Litter: Sparse	Wood Litter: Moderate



Taxon	Status	% Cover	Height (m)
<i>Melaleuca huegelii</i>		70-30%	2
<i>Leucopogon parviflorus</i>		<10%	1
<i>Melaleuca systema</i>		30-10%	0.7
<i>Scaevola</i> sp.		30-10%	0.5
<i>Ehrharta calycina</i>	*	<10%	0.5
<i>Hibbertia hypericoides</i>		<10%	0.5
<i>Lolium rigidum</i>	*	30-10%	0.4
<i>Sonchus oleraceus</i>	*	<2%T	0.4
<i>Templetonia retusa</i>		<2%T	0.4
<i>Opercularia vaginata</i>		30-10%	0.3

Taxon	Status	% Cover	Height (m)
<i>Acacia pulchella</i> var. <i>glaberrima</i>		<10%	0.3
<i>Anigozanthos humilis</i>		<2%T	0.3
<i>Gompholobium tomentosum</i>		<2%T	0.3
<i>Solanum nigrum</i>	*	<2%T	0.3
<i>Desmodium flexuosum</i>		30-10%	0.2
<i>Lepidosperma ?calcicola</i>		30-10%	0.2
<i>Podotheca gnaphalioides</i>		<10%	0.2
<i>Banksia dallanneyi</i>		<2%T	0.2
<i>Banksia sessilis</i>		<2%T	0.2
<i>Lupinus angustifolius</i>	*	<2%T	0.2
<i>Pelargonium capitatum</i>	*	<2%T	0.2
<i>Bromus diandrus</i>	*	70-30%	0.2
<i>Lysimachia arvensis</i>	*	<2%N	0.1
<i>Trachymene pilosa</i>		<2%N	0.1
<i>Trifolium dubium</i>	*	<2%N	0.1
<i>Crassula glomerata</i>	*	<2%T	0.1
<i>Drosera pallida</i>		<2%N	cr

Q10		
Type: Quadrat	Size: 10 x 10	Date: 15/10/2018
Vegetation Type: <i>Banksia</i> low woodland (VT01)		
Landform: Plain Slope: Negligible	Drainage: Good	
Soil Colour & Type: Grey Sand		
Vegetation Condition: Good		
Disturbances: Weeds, adjacent clearing		
Fire Age & Intensity: Old >5 years, minor impact		
Bare Ground: 5-10%	Humus/Litter: Sparse	Wood Litter: Moderate



Taxon	Status	% Cover	Height (m)
<i>Nuytsia floribunda</i>		<10%	4.5
<i>Banksia attenuata</i>		<10%	4
<i>Banksia menziesii</i>		<2%T	2.5
<i>Jacksonia sternbergiana</i>		<2%T	2.2
<i>Allocasuarina humilis</i>		<10%	2
<i>Acacia pulchella</i> var. <i>glaberrima</i>		<2%T	1.6
<i>Calothamnus quadrifidus</i> subsp. <i>quadrifidus</i>		<10%	1.4
<i>Petrophile macrostachya</i>		<10%	1
<i>Ehrharta calycina</i>	*	<2%N	1
<i>Xanthorrhoea preissii</i>		<2%T	1
<i>Hibbertia hypericoides</i>		<10%	1

Taxon	Status	% Cover	Height (m)
<i>Gladiolus caryophyllaceus</i>	*	<2%T	0.7
<i>Mesomelaena pseudostygia</i>		<10%	0.7
<i>Briza maxima</i>	*	<2%T	0.5
<i>Conostylis candicans</i> subsp. <i>candicans</i>		<2%T	0.4
<i>Burchardia congesta</i>		<2%N	0.3
<i>Diuris corymbosa</i>		<2%N	0.3
<i>Desmocladus flexuosus</i>		<2%T	0.3
<i>Gompholobium tomentosum</i>		<2%T	0.3
<i>Ehrharta longiflora</i>	*	<2%N	0.2
<i>Silene nocturna</i>	*	<2%N	0.2
<i>Ursinia anthemoides</i>	*	<2%N	0.2
<i>Sonchus oleraceus</i>	*	<2%T	0.2
<i>Aira caryophyllea</i>	*	<2%N	0.1
<i>Hypochaeris glabra</i>	*	<2%N	0.1
<i>Lysimachia arvensis</i>	*	<2%N	0.1
<i>Trachymene pilosa</i>		<2%N	0.1
<i>Aira caryophyllea</i>	*	<2%T	0.1
<i>Conostylis setigera</i>		<2%T	0.1
<i>Podotheca gnaphalioides</i>		<2%T	0.1
<i>Stylidium calcaratum</i>		<2%T	0.1
<i>Trifolium dubium</i>	*	<2%T	0.1
<i>Thysanotus manglesianus</i>		<2%T	cr

Q11

Type: Quadrat	Size: 10 x 10	Date: 15/10/2018
Vegetation Type: Jarrah tall woodland (VT03)		
Landform: Plain Slope: Gentle	Drainage: Good	
Soil Colour & Type: Grey Sand		
Vegetation Condition: Good		
Disturbances: Weeds and rubbish		
Fire Age & Intensity: Old, no damage		
Bare Ground: 2-10%	Humus/Litter: Plentiful	Wood Litter: Moderate



Q12		
Type: Quadrat	Size: 10 x 10	Date: 16/10/2018
Vegetation Type: Tuart/Banksia open woodland (VT02)		
Landform: Upper slope Slope: Gentle	Drainage: Good	
Soil Colour & Type: Brown Sand		
Vegetation Condition: Degraded		
Disturbances: Weeds		
Fire Age & Intensity: Old >5 years, minor impact		
Bare Ground: <2%	Humus/Litter: Plentiful	Wood Litter: Moderate

Q13		
Type: Quadrat	Size: 10 x 10	Date: 16/10/2018
Vegetation Type: Tuart/Banksia open woodland (VT02)		
Landform: Upper slope Slope: Gentle	Drainage: Good	
Soil Colour & Type: Grey Sand		
Vegetation Condition: Good		
Disturbances: Weeds		
Fire Age & Intensity: Old >5 years, minor impact		
Bare Ground: <2%	Humus/Litter: Moderate	Wood Litter: Moderate

Q14

Type: Quadrat	Size: 10 x 10	Date: 17/10/2018
Vegetation Type: <i>Melaleuca huegelii</i> / <i>M. systema</i> mid shrubland (VT09)		
Landform: Outcrop Slope: Gentle	Drainage: Good	
Soil Colour & Type: Brown Sand		
Vegetation Condition: Very Good		
Disturbances: Weeds		
Fire Age & Intensity: Old >5 years, no damage		
Bare Ground: <2%	Humus/Litter: Sparse	Wood Litter: Sparse



Q15**Type:** Quadrat**Size:** 10 x 10**Date:** 17/10/2018**Vegetation Type:** Mixed low heathland (VT08)**Landform:** Outcrop**Drainage:** Good**Slope:** Gentle**Soil Colour & Type:** Brown Sand**Vegetation Condition:** Very Good**Disturbances:** Weeds**Fire Age & Intensity:** Old, no damage**Bare Ground:** 2-10%**Humus/Litter:** Sparse**Wood Litter:** Moderate

Q16**Type:** Quadrat**Size:** 10 x 10**Date:** 5/11/2018**Vegetation Type:** *Banksia* low woodland (VT01)**Landform:** Plain**Drainage:** Good**Slope:** Gentle**Soil Colour & Type:** Brown Sand**Vegetation Condition:** Good**Disturbances:** Fire, weeds**Fire Age & Intensity:** Moderate 1-5 years, few trees killed**Bare Ground:** 2-10%**Humus/Litter:** Moderate**Wood Litter:** Moderate

Q17

Type: Quadrat	Size: 10 x 10	Date: 5/11/2018
Vegetation Type: <i>Banksia</i> low woodland (VT01)		
Landform: Plain Slope: Gentle	Drainage: Good	
Soil Colour & Type: Grey sand		
Vegetation Condition: Very Good		
Disturbances: weeds		
Fire Age & Intensity: Old, minor impact		
Bare Ground: 2-10%	Humus/Litter: Moderate	Wood Litter: Moderate



Q18

Type: Quadrat	Size: 10 x 10	Date: 17/09/2018
Vegetation Type: <i>Banksia</i> low woodland (VT01)		
Landform: Swale Slope: Gentle	Drainage: Good	
Soil Colour & Type: Yellow/grey Sand		
Vegetation Condition: Very Good		
Disturbances: Weeds		
Fire Age & Intensity: Old >5 years, minor impact		
Bare Ground: 2-10%	Humus/Litter: Sparse	Wood Litter: Sparse



Q19

Type: Quadrat	Size: 10 x 10	Date: 18/09/2018
Vegetation Type: <i>Banksia</i> low woodland (VT01)		
Landform: Upper slope Slope: Gentle	Drainage: Good	
Soil Colour & Type: Yellow/brown Sand		
Vegetation Condition: Very Good		
Disturbances: Weeds, rubbish		
Fire Age & Intensity: Old > 5 years, no damage		
Bare Ground: 2-10%	Humus/Litter: Sparse	Wood Litter: Sparse



Q20		
Type: Quadrat	Size: 10 x 10	Date: 18/09/2018
Vegetation Type: <i>Banksia sessilis</i> tall closed shrubland (VT07)		
Landform: Plain Slope: Negligible	Drainage: Good	
Soil Colour & Type: Brown Sand, occasional limestone 5%		
Vegetation Condition: Good		
Disturbances: Weeds and rubbish		
Fire Age & Intensity: Nil, no damage		
Bare Ground: 2-10%	Humus/Litter: Sparse	Wood Litter: Sparse



Q21		
Type: Quadrat	Size: 10 x 10	Date: 18/09/2018
Vegetation Type: Tuart tall woodland (VT04)		
Landform: Plain Slope: Negligible	Drainage: Good	
Soil Colour & Type: Brown Sand		
Vegetation Condition: Good		
Disturbances: Rubbish, weeds		
Fire Age & Intensity: Old >5 year, minor impact		
Bare Ground: 2-10%	Humus/Litter: Sparse	Wood Litter: Sparse



Q22

Type: Quadrat	Size: 10 x 10	Date: 18/09/2018
Vegetation Type: Tuart Woodland		
Landform: Plain Slope: Negligible	Drainage: Good	
Soil Colour & Type: Brown Sand		
Vegetation Condition: Good		
Disturbances: Rubbish, weeds		
Fire Age & Intensity: Old > 5 years, minor impact		
Bare Ground: 2-10%	Humus/Litter: Sparse	Wood Litter: Sparse



Q23

Type: Quadrat	Size: 10 x 10	Date: 18/09/2018
Vegetation Type: <i>Melaleuca huegelii</i> / <i>M. systema</i> mid shrubland (VT09)		
Landform: Plain Slope: Negligible	Drainage: Good	
Soil Colour & Type: Brown Soil		
Vegetation Condition: Very Good		
Disturbances: Weeds		
Fire Age & Intensity: Nil, no damage		
Bare Ground: 2-10%	Humus/Litter: Sparse	Wood Litter: Sparse



Q24

Type: Quadrat	Size: 10 x 10	Date: 19/09/2018
Vegetation Type: Jarrah tall woodland (VT03)		
Landform: Plain Slope: Negligible	Drainage: Good	
Soil Colour & Type: Brown Sand		
Vegetation Condition: Very Good		
Disturbances: Weeds		
Fire Age & Intensity: Old > 5 years, few trees killed		
Bare Ground: 2-10%	Humus/Litter: Sparse	Wood Litter: Moderate



Q25		
Type: Quadrat	Size: 10 x 10	Date: 19/09/2018
Vegetation Type: Jarrah tall woodland (VT03)		
Landform: Plain Slope: Negligible	Drainage: Good	
Soil Colour & Type: Brown Sand		
Vegetation Condition: Very Good		
Disturbances: Weeds		
Fire Age & Intensity: Old > 5 years, minor impact		
Bare Ground: 2-10%	Humus/Litter: Moderate	Wood Litter: Moderate



Q26

Type: Quadrat	Size: 10 x 10	Date: 19/09/2018
Vegetation Type: <i>Melaleuca huegelii</i> / <i>M. systema</i> mid shrubland (VT09)		
Landform: Hill crest Slope: Gentle	Drainage: Good	
Soil Colour & Type: Brown Sand		
Vegetation Condition: Very Good		
Disturbances: Weeds		
Fire Age & Intensity: Old >5 years, no damage		
Bare Ground: 2-10%	Humus/Litter: Sparse	Wood Litter: Sparse



Q27

Type: Quadrat	Size: 10 x 10	Date: 19/09/2018
Vegetation Type: <i>Melaleuca huegelii</i> / <i>M. systema</i> mid shrubland (VT09)		
Landform: Hill crest Slope: Gentle	Drainage: Good	
Soil Colour & Type: Brown Sand, 30% limestone		
Vegetation Condition: Very Good		
Disturbances: Weeds		
Fire Age & Intensity: Nil, no damage		
Bare Ground: 2-10%	Humus/Litter: Sparse	Wood Litter: Sparse



Q28

Type: Quadrat	Size: 10 x 10	Date: 19/09/2018
Vegetation Type: Mixed low heathland (VT08)		
Landform: Hill crest Slope: Gentle	Drainage: Good	
Soil Colour & Type: Brown Sand		
Vegetation Condition: Very Good		
Disturbances: Weeds		
Fire Age & Intensity: Nil, no damage		
Bare Ground: 2-10%	Humus/Litter: Sparse	Wood Litter: Sparse



Q29

Type: Quadrat	Size: 10 x 10	Date: 25/09/2018
Vegetation Type: Mixed low heathland (VT08)		
Landform: Hill crest Slope: Gentle	Drainage: Good	
Soil Colour & Type: Brown Sand with 50% limestone		
Vegetation Condition: Very Good		
Disturbances: Weeds		
Fire Age & Intensity: Old > 5 years, no damage		
Bare Ground: 2-10%	Humus/Litter: Sparse	Wood Litter: Sparse



Q30		
Type: Quadrat	Size: 10 x 10	Date: 25/09/2018
Vegetation Type: Mixed low heathland (VT08)		
Landform: Hill crest Slope: Gentle	Drainage: Good	
Soil Colour & Type: Brown Sand		
Vegetation Condition: Very Good		
Disturbances: Weeds		
Fire Age & Intensity: Nil, no damage		
Bare Ground: 2-10%	Humus/Litter: Sparse	Wood Litter: Sparse



Q31		
Type: Quadrat	Size: 10 x 10	Date: 25/09/2018
Vegetation Type: <i>Banksia</i> low woodland (VT01)		
Landform: Plain Slope: Negligible	Drainage: Good	
Soil Colour & Type: Grey Loamy Sand		
Vegetation Condition: Good		
Disturbances: Weeds and tracks		
Fire Age & Intensity: Old >5 years, no damage		
Bare Ground: 2-10%	Humus/Litter: Moderate	Wood Litter: Sparse



Q32

Type: Quadrat	Size: 10 x 10	Date: 26/09/2018
Vegetation Type: <i>Banksia</i> low woodland (VT01)		
Landform: Plain Slope: Negligible	Drainage: Good	
Soil Colour & Type: Brown Sand		
Vegetation Condition: Good		
Disturbances: Weeds, rubbish, tracks		
Fire Age & Intensity: Old > 5 years, minor impact		
Bare Ground: 2-10%	Humus/Litter: Sparse	Wood Litter: Sparse



Q33

Type: Quadrat	Size: 10 x 10	Date: 26/09/2018
Vegetation Type: Mixed low heathland (VT08)		
Landform: Outcrop Slope: Gentle	Drainage: Good	
Soil Colour & Type: Brown Sand with 20% limestone		
Vegetation Condition: Very Good		
Disturbances: Weeds		
Fire Age & Intensity: Nil, no damage		
Bare Ground: 2-10%	Humus/Litter: Sparse	Wood Litter: Sparse



Q34		
Type: Quadrat	Size: 10 x 10	Date: 26/09/2018
Vegetation Type: Tuart tall woodland (VT04)		
Landform: Mid slope Slope: Gentle	Drainage: Good	
Soil Colour & Type: Yellow/brown Sand		
Vegetation Condition: Degraded		
Disturbances: Weeds		
Fire Age & Intensity: Old >5 years, minor impact		
Bare Ground: 2-10%	Humus/Litter: Sparse	Wood Litter: Moderate

No photo due to a technical error

Q35

Type: Quadrat

Size: 10 x 10

Date: 15/10/2018

Vegetation Type: Tuart/Banksia open woodland (VT02)

Landform: Upper slope

Drainage: Good

Slope: Gentle

Soil Colour & Type: Brown Sand

Vegetation Condition: Good

Disturbances: Weeds

Fire Age & Intensity: Old >5 years, minor impact

Bare Ground: 2-10%

Humus/Litter: Moderate

Wood Litter: Moderate



Q36		
Type: Quadrat	Size: 10 x 10	Date: 15/10/2018
Vegetation Type: Jarrah/Marri tall woodland (VT06)		
Landform: Plain Slope: Negligible	Drainage: Good	
Soil Colour & Type: Brown Sand		
Vegetation Condition: Very good		
Disturbances: Weeds		
Fire Age & Intensity: Old > 5 years, minor impact		
Bare Ground: 5-10%	Humus/Litter: Moderate	Wood Litter: Moderate



Q37

Type: Quadrat	Size: 10 x 10	Date: 16/10/2018
Vegetation Type: <i>Melaleuca huegelii</i> / <i>M. systema</i> mid shrubland (VT09)		
Landform: Outcrop Slope: Gentle	Drainage: Good	
Soil Colour & Type: Brown Sand with limestone		
Vegetation Condition: Very Good		
Disturbances: Weeds and power line track		
Fire Age & Intensity: Nil, no damage		
Bare Ground: 2-10%	Humus/Litter: Sparse	Wood Litter: Sparse



Q38

Type: Quadrat	Size: 10 x 10	Date: 17/10/2018
Vegetation Type: Lomandra low forbland (VT10)		
Landform: Upper slope Slope: Gentle	Drainage: Good	
Soil Colour & Type: Brown Sand		
Vegetation Condition: Good		
Disturbances: Weeds		
Fire Age & Intensity: Nil, no damage		
Bare Ground: 10-15%	Humus/Litter: Sparse	Wood Litter: Sparse



Q39

Type: Quadrat

Size: 10 x 10

Date: 17/10/2018

Vegetation Type: Jarrah/Marri tall woodland (VT06)

Landform: Lower slope

Drainage: Good

Slope: Gentle

Soil Colour & Type: Brown Sand

Vegetation Condition: Good

Disturbances: Weeds

Fire Age & Intensity: Old > 5 years, minor impact

Bare Ground: 2-10%

Humus/Litter: Plentiful

Wood Litter: Moderate



Q40		
Type: Quadrat	Size: 10 x 10	Date: 5/11/2018
Vegetation Type: <i>Eucalyptus decipiens</i> tall woodland (VT05)		
Landform: Plain Slope: Negligible	Drainage: Good	
Soil Colour & Type: Brown Sand		
Vegetation Condition: Good		
Disturbances: Weeds, tracks and rubbish dumped nearby, potential dieback		
Fire Age & Intensity: Old > 5 years, no damage		
Bare Ground: <2%	Humus/Litter: >70%	Wood Litter: Moderate



Q41		
Type: Quadrat	Size: 10 x 10	Date: 5/11/2018
Vegetation Type: Lomandra low forbland (VT10)		
Landform: Upper slope Slope: Moderate	Drainage: Good	
Soil Colour & Type: Grey Sand		
Vegetation Condition: Good		
Disturbances: Weeds		
Fire Age & Intensity: Nil, no damage		
Bare Ground: 10-15%	Humus/Litter: Sparse	Wood Litter: Negligible



Q42		
Type: Quadrat	Size: 10 x 10	Date: 5/11/2018
Vegetation Type: Lomandra low forbland (VT10)		
Landform: Upper slope Slope: Moderate	Drainage: Good	
Soil Colour & Type: Grey Sand		
Vegetation Condition: Degraded		
Disturbances: Weeds		
Fire Age & Intensity: Nil, no damage		
Bare Ground: 2-10%	Humus/Litter: Negligible	Wood Litter: Negligible



Q43

Type: Quadrat	Size: 10 x 10	Date: 17/10/2018
Vegetation Type: Mixed low heathland (VT08)		
Landform: Plain Slope: Negligible	Drainage: Good	
Soil Colour & Type: Yellow Sand with limestone		
Vegetation Condition: Very Good		
Disturbances: weeds		
Fire Age & Intensity: Nil, no damage		
Bare Ground: 2-10%	Humus/Litter: Sparse	Wood Litter: Negligible



Q44

Type: Quadrat	Size: 10 x 10	Date: 17/10/2018
Vegetation Type: <i>Acacia</i> closed shrubland (VT11)		
Landform: Pain Slope: Negligible	Drainage: Good	
Soil Colour & Type: Brown Sand		
Vegetation Condition: Degraded		
Disturbances: Weeds		
Fire Age & Intensity: Nil, no damage		
Bare Ground: 2-10%	Humus/Litter: Sparse	Wood Litter: Sparse



RELEVÉ Data

R1		
Type: Relevé	Date: 26/09/2018	
Vegetation Type: Tuart tall woodland (VT04)		
Landform: Plain Slope: Negligible	Drainage: Good	
Soil Colour & Type: Grey Sand		
Vegetation Condition: Degraded		
Disturbances: Weeds		
Fire Age & Intensity: Old > 5 years, minor impact		
Bare Ground: 2-10%	Humus/Litter: Sparse	Wood Litter: Sparse



R2		
Type: Relevé	Date: 15/10/2018	
Vegetation Type: Jarrah/Marri tall woodland (VT06)		
Landform: Plain Slope: Negligible	Drainage: Good	
Soil Colour & Type: Brown Sand		
Vegetation Condition: Good		
Disturbances: Weeds		
Fire Age & Intensity: Old >5 years, minor impact		
Bare Ground: 2-10%	Humus/Litter: Moderate	Wood Litter: Sparse



R3**Type:** Releve**Date:** 15/10/2018**Vegetation Type:** *Eucalyptus/Melaleuca* tall isolated clumps of trees (VT14)**Landform:** Depression**Drainage:** Seasonally wet**Slope:** Gentle**Soil Colour & Type:** Brown sand**Vegetation Condition:** Degraded**Disturbances:** weeds and clearing**Fire Age & Intensity:** Old minor impact**Bare Ground:** 2-10%**Humus/Litter:** sparse**Wood Litter:** sparse

R4		
Type: Relevé	Date: 15/10/2018	
Vegetation Type: Scattered natives over weeds (VT12)		
Landform: Plain Slope: Negligible	Drainage: Good	
Soil Colour & Type: Brown Sand		
Vegetation Condition: Degraded		
Disturbances: Weeds		
Fire Age & Intensity: Old > 5 years, minor impact		
Bare Ground: 2-10%	Humus/Litter: Sparse	Wood Litter: Moderate



R5		
Type: Relevé	Date: 17/09/2018	
Vegetation Type: Scattered natives over weeds (VT12)		
Landform: Lower slope Slope: Gentle	Drainage: Good	
Soil Colour & Type: Brown sand		
Vegetation Condition: Degraded		
Disturbances: Weeds		
Fire Age & Intensity: Old minor impact		
Bare Ground: 10-15%	Humus/Litter: sparse	Wood Litter: sparse



R6		
Type: Relevé	Date: 17/10/2018	
Vegetation Type: Tuart tall woodland (VT04)		
Landform: Plain Slope: Negligible	Drainage: Good	
Soil Colour & Type: Brown sand		
Vegetation Condition: Degraded		
Disturbances: weeds		
Fire Age & Intensity:		
Bare Ground: 2-10%	Humus/Litter: Moderate	Wood Litter: Moderate



R7		
Type: Relevé	Date: 11/12/2018	
Vegetation Type: Transition from VT12 to VT07		
Landform: Mid slope Slope: Gentle	Drainage: Good	
Soil Colour & Type: Brown Sand		
Vegetation Condition: Good to Degraded		
Disturbances: Weeds		
Fire Age & Intensity: Old > 5 years		
Bare Ground: 2-10%	Humus/Litter: Sparse	Wood Litter: Sparse



Conservation Significant Vegetation Photographs

Banksia Woodlands of the Swan Coastal Plain TEC



Melaleuca huegelii - *Melaleuca systema* shrublands on limestone ridges TEC



Banksia dominated woodlands of the Swan Coastal Plain IBRA region PEC



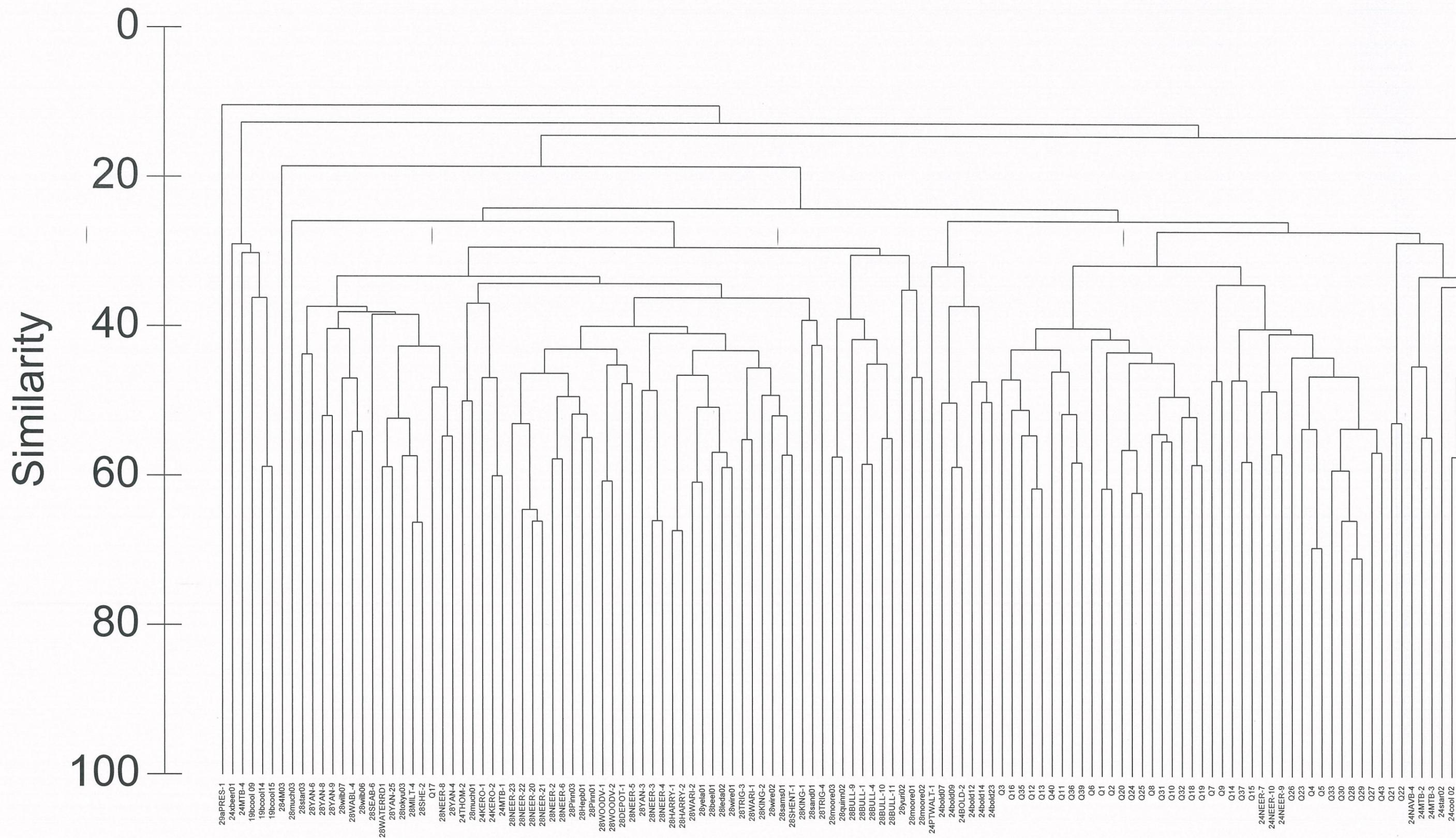
Northern Spearwood shrublands and woodlands PEC



Tuart (*Eucalyptus gomphocephala*) woodlands of the Swan Coastal Plain

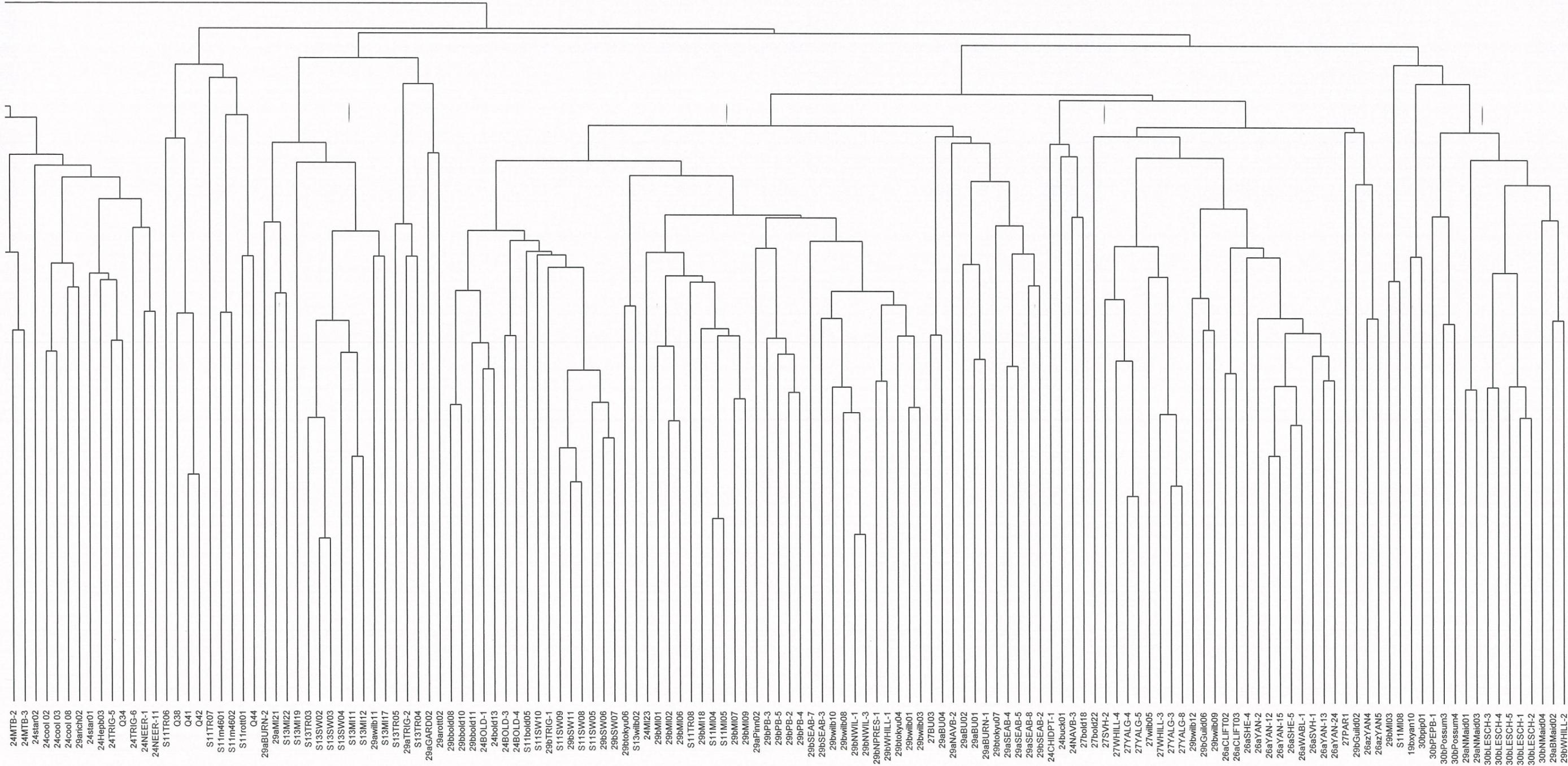


GHD and S



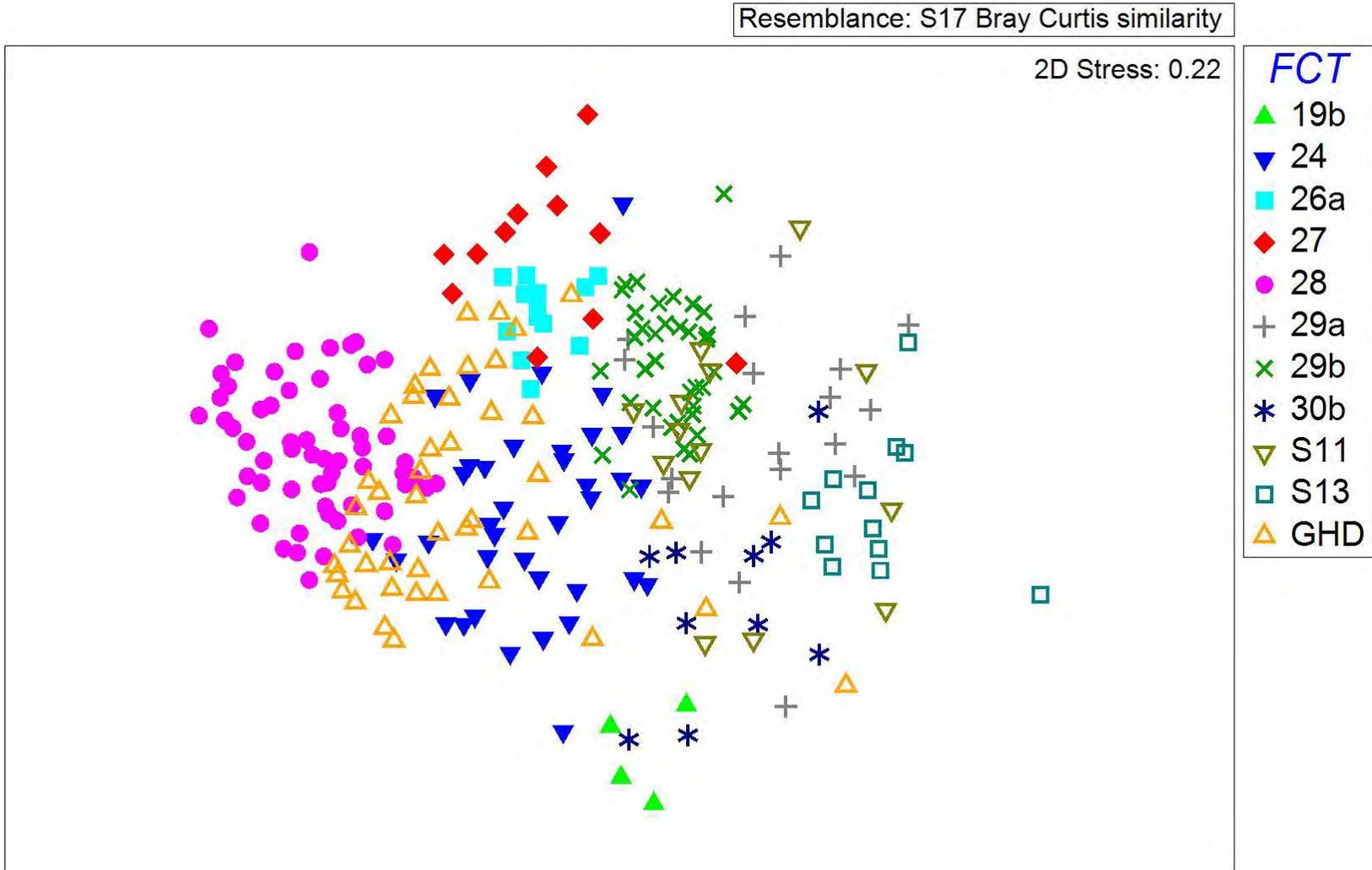
SWA dataset

Resemblance: S17 Bray Curtis similarity

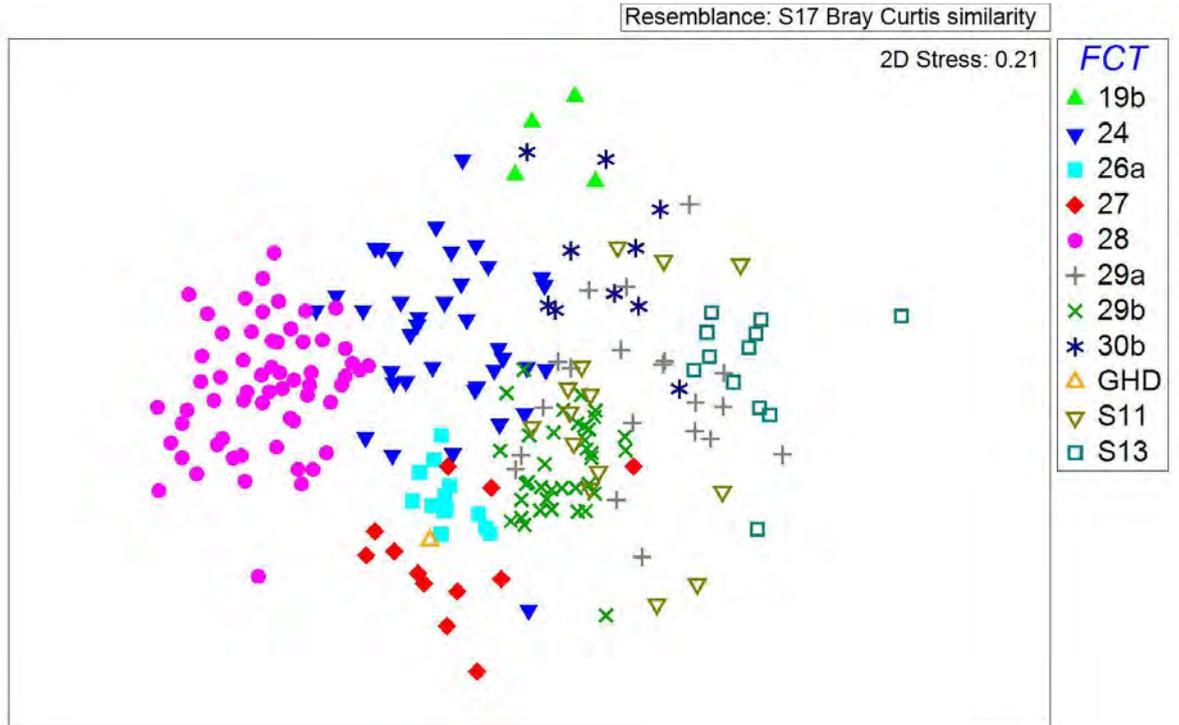


Quadrats

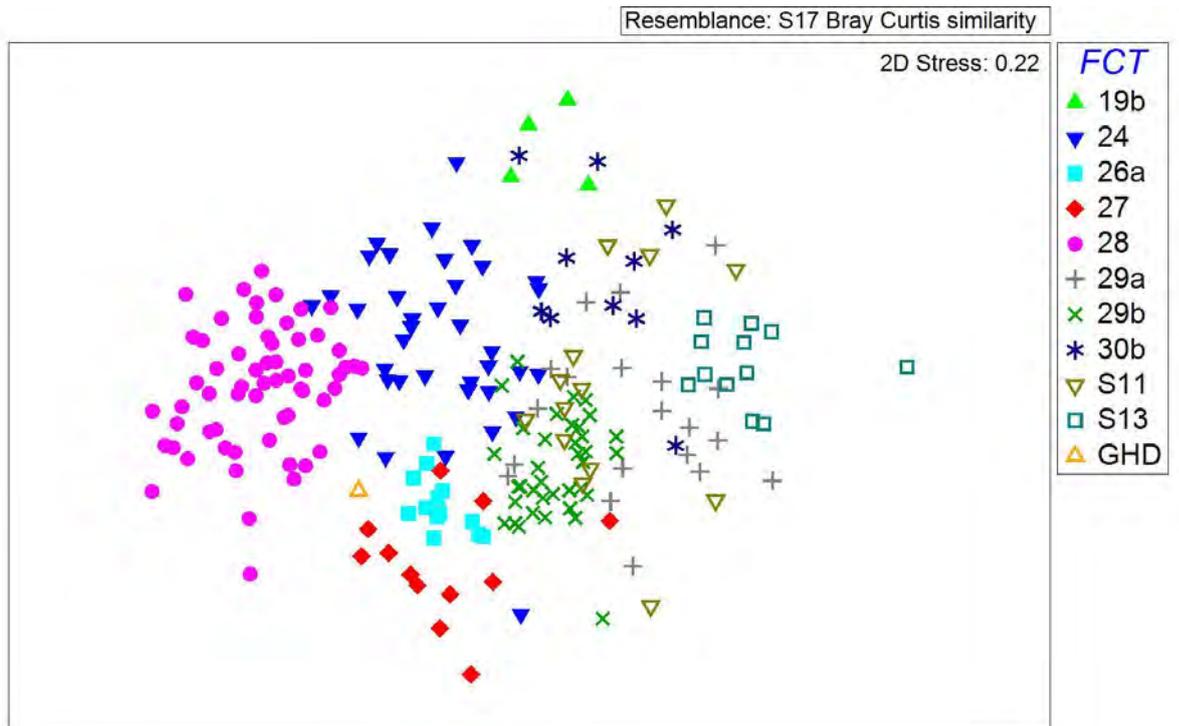
FCT analysis MDS



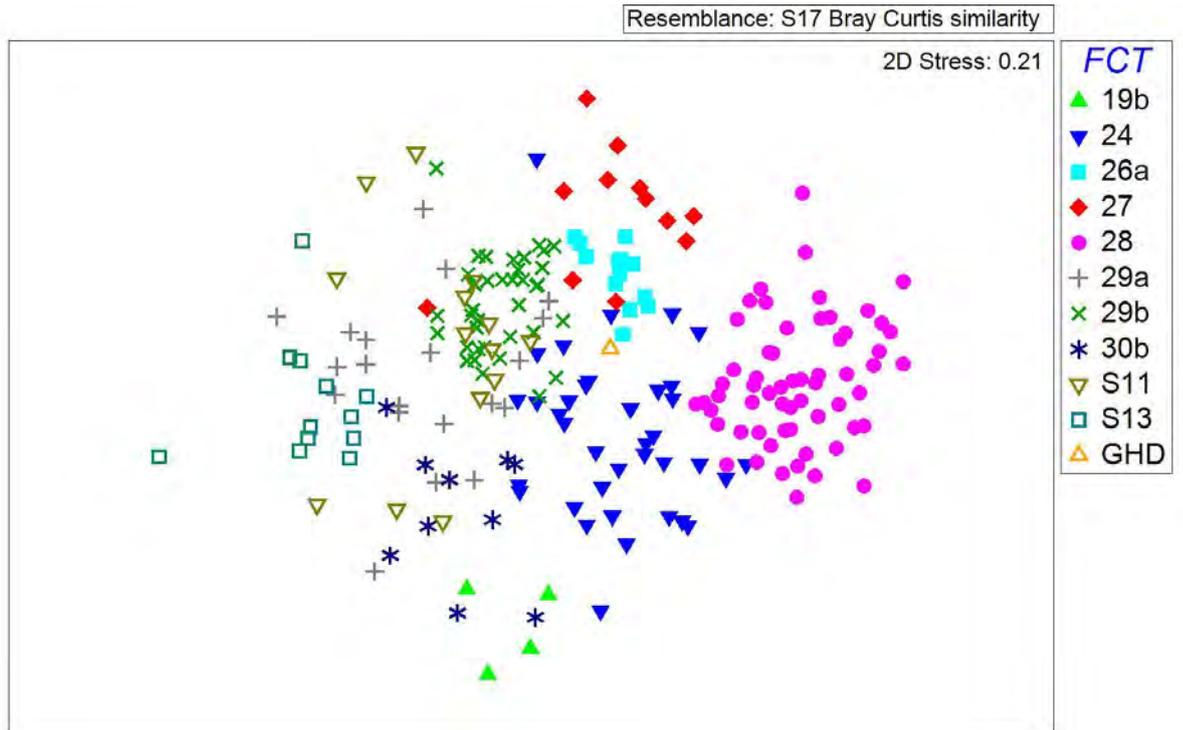
SSI analysis Q27



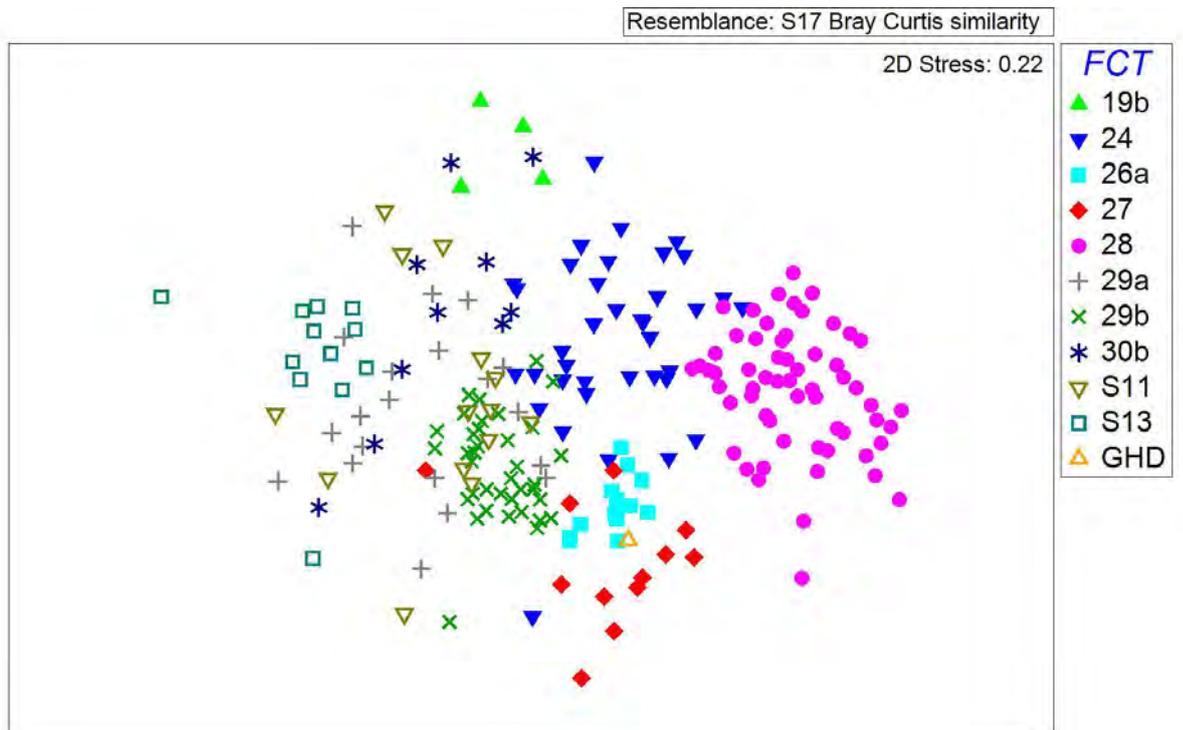
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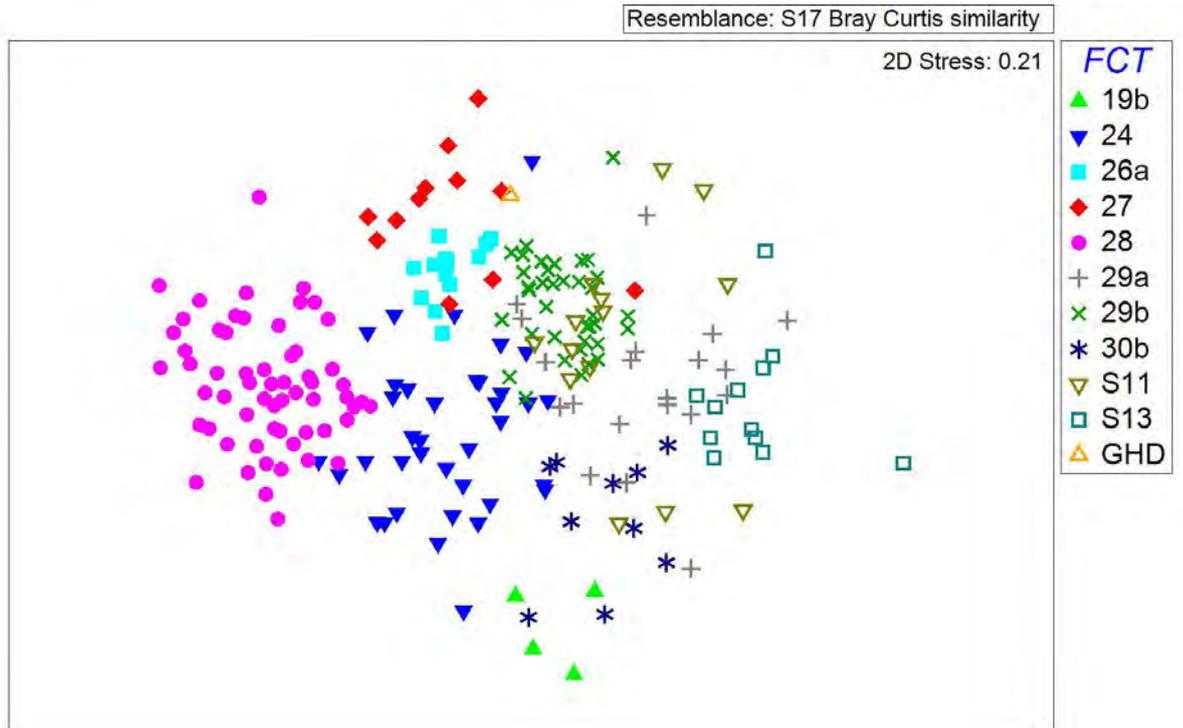
SSI analysis Q37



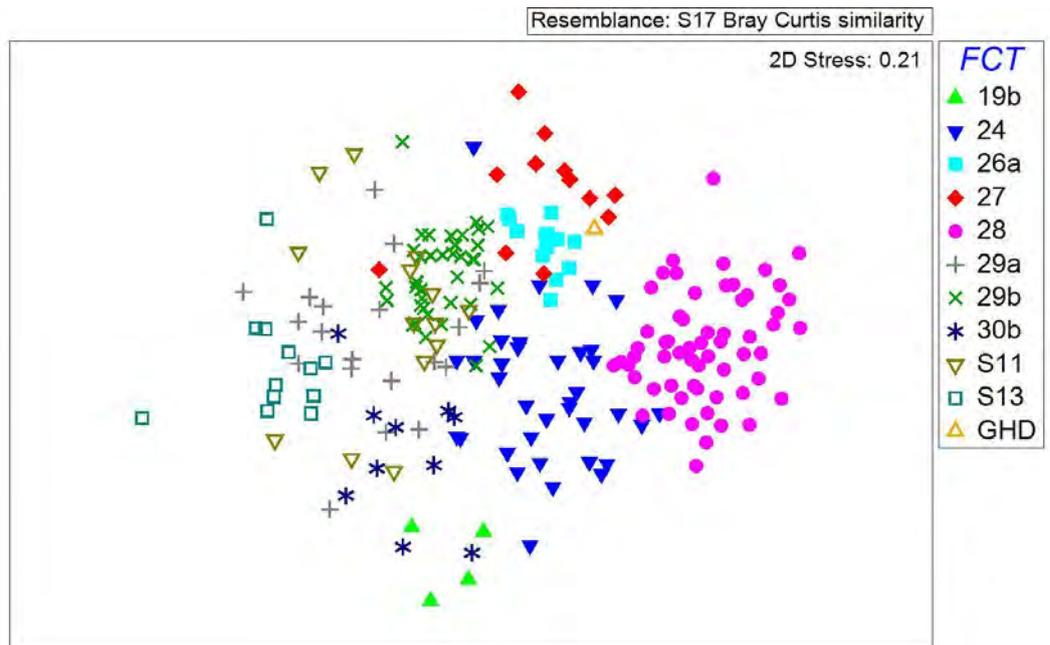
SSI analysis Q9



SSI analysis Q14



SSI analysis Q26



Flora likelihood of occurrence assessment of conservation significant flora identified in the desktop assessment as potentially occurring within the study area.

Taxa	Common Name	Status		Source			Description and habitat requirements	Likelihood of occurrence within the survey area	Likelihood of occurrence within the extended survey area
		State	Federal	NM	WAHerb/TPFL	PMST			
<i>Acacia benthamii</i>		P2		x			Shrub, ca 1 m high. Flowers yellow in August to September. Occurs in sand, typically on limestone breakaways.	Known – species recorded within the survey area.	Known – species recorded within the extended survey area.
<i>Andersonia gracilis</i>	Slender Andersonia	VU	EN			x	Slender erect or open straggly shrub, 0.1-0.5(-1) m high. Flowers white-pink-purple from September to November. Occurs in white/grey sand, sandy clay, gravelly loam in winter-wet areas, near swamps.	Highly Unlikely – the closest known record is over 50 km north of the survey area. Survey area does not contain optimal habitat for this species.	Highly Unlikely
<i>Anigozanthos viridis</i> subsp. <i>terraspectans</i>	Dwarf Green kangaroo Paw	VU	VU			x	Rhizomatous, perennial, herb, 0.05-0.85 m high. Flowers green/yellow-green, August to October. Occurs in sand, loam, clay in winter-wet areas.	Highly Unlikely - the closest known record is over 50 km north of the survey area. Survey area does not contain optimal habitat for this species.	Highly Unlikely

Taxa	Common Name	Status		Source			Description and habitat requirements	Likelihood of occurrence within the survey area	Likelihood of occurrence within the extended survey area
		State	Federal	NM	WAHerb/TPFL	PMST			
<i>Baeckea</i> sp. Limestone (N. Gibson & M.N, Lyons 1425)		P1		x	x		Compact shrub 1.2 (1.6) high. Flowers pink, pale-pink to white (potentially September-December). Grey sand, yellow sand with limestone outcropping. On hills.	Known – species recorded within the survey area.	Known – species recorded within the extended survey area.
<i>Calectasia cyanea</i>	Blue Tinsel Lily	CR	CR	x			Rhizomatous, clump forming, woody perennial, herb, 0.1-0.6 m high, to 0.3 m wide. Flowers blue/purple, June to October. Occurs in white, grey or yellow sand, gravel.	Highly Unlikely – Only known from a location 10 km south of Albany with records elsewhere considered to be incorrectly identified.	Highly Unlikely
<i>Conostylis bracteata</i>		P3		x	x		Rhizomatous, tufted or shortly proliferous perennial, grass-like or herb, 0.2-0.45 m high. Flowers yellow, August to September. Occurs in sand, limestone on consolidated sand dunes.	Possible – suitable habitat was found within the survey area.	Possible – suitable habitat present.

Taxa	Common Name	Status		Source			Description and habitat requirements	Likelihood of occurrence within the survey area	Likelihood of occurrence within the extended survey area
		State	Federal	NM	WAHerb/TPFL	PMST			
<i>Conostylis pauciflora</i> subsp. <i>euryrhipis</i>		P4		x	x		Rhizomatous, stoloniferous perennial, grass-like or herb, 0.06-0.18 m high. Flowers yellow August to October. White, grey or yellow sand on consolidated dunes.	Possible – suitable habitat was found within the survey area.	Possible – suitable habitat present.
<i>Diuris micrantha</i>	Dwarf Bee-orchid	VU	VU			x	Tuberous, perennial, herb, 0.3-0.6 m high. Flowers yellow and brown in September to October. Occurs in brown loamy clay in winter-wet swamps, in shallow water.	Highly Unlikely – The closest record on the Swan Coastal Plain is over 50 km south of the survey area. The survey area does not contain optimal habitat.	Highly Unlikely
<i>Diuris purdiei</i>	Purdie's Donkey-orchid	EN	EN			x	Tuberous, perennial, herb, 0.15-0.35 m high. Flowers yellow in September to October. Occurs in grey-black sand, moist. Winter-wet swamps.	Highly Unlikely – The nearest record on the Swan Coastal Plain is over 50 km south of the survey area. The survey area does not contain optimal habitat.	Highly Unlikely
<i>Drakaea elastica</i>	Glossy-leafed Hammer Orchid	CR	EN			x	Tuberous, perennial, herb, 0.12-0.3 m high. Flowers red and green and yellow in October to November. Occurs white or grey sand.	Highly Unlikely - The nearest record on the Swan Coastal Plain is over 25 km north of the survey area. The survey area	Highly Unlikely

Taxa	Common Name	Status		Source			Description and habitat requirements	Likelihood of occurrence within the survey area	Likelihood of occurrence within the extended survey area
		State	Federal	NM	WAHerb/TPFL	PMST			
							Low-lying situations adjoining winter-wet swamps.	does not contain optimal habitat.	
<i>Drakaea micrantha</i>	Dwarf hammer-orchid	EN	VU			x	Tuberous, perennial, herb, 0.15-0.3 m high. Flowers red and yellow, September to October. White-grey sand.	Unlikely – the closest known records are over 50 km south of the survey area.	Unlikely
<i>Eleocharis keigheryi</i>	Keighery's Eleocharis	VU	VU			x	Rhizomatous, clumped perennial, grass-like or herb (sedge), to 0.4 m high. Flowers green, August to November. Clay, sandy loam. Emergent in freshwater: creeks, claypans.	Unlikely – the survey area does not contain optimal habitat for this species. The closest known records are over 25 km east of the survey area.	Unlikely
<i>Eucalyptus argutifolia</i>	Wabbling Hill Mallee	VU	VU		x	x	(Mallee), 1.5-4 m high, bark smooth. Flowers white, March to April. Shallow soils over limestone. Slopes or gullies of limestone ridges, outcrops.	Unlikely – while suitable habitat was found within the survey area, this species is distinctive and would not likely to have been overlooked within the survey area given the survey intensity.	Possible – suitable habitat is present however none were recorded during targeted searches.
<i>Fabronia hampeana</i>		P2		x	x		Moss, white. Has been recorded growing on	Possible – suitable habitat present within the survey area. The	Possible – suitable habitat present.

Taxa	Common Name	Status		Source			Description and habitat requirements	Likelihood of occurrence within the survey area	Likelihood of occurrence within the extended survey area
		State	Federal	NM	WAHerb/TPFL	PMST			
							the trunk of <i>Macrozamia</i> .	closest known records are located with 3 to 5 km south and south-west of the survey area. The collection of non-vascular flora species was outside of the scope of the survey.	
<i>Hibbertia spicata</i> subsp. <i>leptotheca</i>		P3		x	x		Erect or spreading shrub, 0.2-0.5 m high. Flowers yellow, July to October. Occurs on sand near-coastal limestone ridges, outcrops and cliffs.	Known – species recorded within the survey area.	Known – species recorded within the extended survey area.
<i>Jacksonia gracillima</i>		P3		x	x		Perennial tufted herb (1.5 m tall) with narrow leaves 10-40 cm long, with orange and red flowers (October). Grey sand and brown sand/sandy-loam, mid slope with exposed limestone and near damplands.	Unlikely - there is no suitable habitat present within the survey area.	Unlikely - there is suitable habitat within the extended survey area associated with Lake Nowergup however given the degraded nature of the vegetation it is considered unlikely to occur.

Taxa	Common Name	Status		Source			Description and habitat requirements	Likelihood of occurrence within the survey area	Likelihood of occurrence within the extended survey area
		State	Federal	NM	WAHerb/TPFL	PMST			
<i>Jacksonia sericea</i>	Waldjumi	P4		x	x		Low spreading shrub, to 0.6 m high. Flowers orange, usually December or January to February. Calcareous and sandy soils.	Likely – suitable habitat is present throughout the survey area and extended survey area. GHD (2014) recorded this species within the survey area. During the current survey a number of <i>Jacksonia</i> specimens were collected and were formally identified as <i>Jacksonia calcicola</i> . <i>Jacksonia</i> was a common component of the understorey throughout the survey area and extended survey area.	Likely – suitable habitat present. <i>Jacksonia</i> was a common component of the understorey throughout the survey area.
<i>Lepidosperma rostratum</i>	Beaked Lepidosperma	EN	EN			x	Rhizomatous, tufted perennial, gras-like or herb (sedge), 0.5 m high. Flowers brown. Peaty sand, clay.	Highly Unlikely – The nearest records on the Swan Coastal Plain are over 50 km from the survey area. The survey area does not contain optimal habitat for this species.	Highly Unlikely

Taxa	Common Name	Status		Source			Description and habitat requirements	Likelihood of occurrence within the survey area	Likelihood of occurrence within the extended survey area
		State	Federal	NM	WAHerb/TPFL	PMST			
<i>Leucopogon</i> sp. Yanchep (M. Hislop 1986)		P3		x	x		Erect shrub, 0/15-1 m high, to 0.6 m wide. Flowers white/pink, April to June or September. Light grey-yellow sand, brown loam, limestone, laterite, granite. Coastal plain, breakaways, valley slopes, low hills.	Known - species recorded within the survey area.	Known – species recorded within the extended survey area.
<i>Leucopogon maritimus</i>		P1			x		Low spreading shrub up to 40 cm tall. Flowers white in April-May and August. Pale yellow to white-grey sand, upper slopes of coastal dunes, limestone.	Possible – suitable habitat present. The closest known record is located approximately 3 km north of the survey area.	Possible – suitable habitat present.
<i>Marianthus paralius</i>		EN	EN			x	Almost prostrate, eventually scandent, woody shrub. Flowers red in September to November. White sand over limestone. Low coastal cliffs.	Unlikely – no suitable habitat present.	Unlikely – no suitable habitat present.
<i>Melaleuca</i> sp. Wanneroo (G.J. Keighery 16705)		EN		x	x		Erect shrub up to 3 m. Flowers yellow flowering around October to December. On fine sand to sandy	Unlikely – The survey area was thoroughly searched and no individuals were identified.	Known – species recorded within the extended survey area.

Taxa	Common Name	Status		Source			Description and habitat requirements	Likelihood of occurrence within the survey area	Likelihood of occurrence within the extended survey area
		State	Federal	NM	WAHerb/TPFL	PMST			
							loam and brown loamy sand. Limestone ridges and outcropping.		
<i>Pimelea calcicola</i>		P3		x	x		Erect to spreading shrub, 0.2-1 m high. Flowers pink, September to November. Sand. Coastal limestone ridges.	Known – species recorded within the survey area and extended survey area.	Known – species recorded within the extended survey area.
<i>Sarcozona bicarinata</i>		P3		x	x		Shrub, ca 0.1 m high. Flowers white, August. White sand.	Possible – suitable habitat present within the survey area.	Possible – suitable habitat present within the survey area.
<i>Stylidium maritimum</i>		P3		x	x		Caespitose perennial, herb, 0.3-0.7 m high, leaves tufted, linear to narrowly oblanceolate. Membranous scale leaves present at base of mature leaves. Scape glandular throughout. Inflorescence paniculate. Flowers white/purple, September to November. Sand over limestone. Dune slopes and flats. Coastal heath and	Known – species recorded within the survey area.	Known – species recorded within the extended survey area.

Taxa	Common Name	Status		Source			Description and habitat requirements	Likelihood of occurrence within the survey area	Likelihood of occurrence within the extended survey area
		State	Federal	NM	WAHerb/TPFL	PMST			
							shrubland, open Banksia woodland.		
<i>Tetraria</i> sp. Chandala (G.J. Keighery 17055)		P2		x	x		Slender erect sedge. Flowers brown. Mound spring, edge of swamp, black peaty sand.	Highly Unlikely – The survey area does not contain optimal habitat for this species.	Highly Unlikely -



Threatened and Priority Flora Report Form

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TAXON: <u>Melaleuca sp. Wanneroo</u>		TPFL Pop. No.: _____	
OBSERVATION DATE: <u>5/11/2018</u>		CONSERVATION STATUS: <u>En</u> <input checked="" type="checkbox"/> New population <input checked="" type="checkbox"/>	
OBSERVER/S: <u>Angela Benkovic and Erin Lynch</u>		PHONE: <u>62228361</u>	
ROLE: <u>Botanist</u>		ORGANISATION: <u>GHD</u>	

DESCRIPTION OF LOCATION (Provide at least nearest town/named locality, and the distance and direction to that place):
Neerabup National Park between Hester Ave to Romeo Rd

Reserve No.: R27575

DBC DISTRICT: <u>Swan Coastal</u>		LGA: <u>City of Wanneroo</u>		Land manager present: <input type="checkbox"/>	
DATUM:		COORDINATES: (If UTM coords provided, Zone is also required)		METHOD USED:	
GDA94 / MGA94 <input checked="" type="checkbox"/>		DecDegrees <input checked="" type="checkbox"/> DegMinSec <input type="checkbox"/> UTM's <input checked="" type="checkbox"/>		GPS <input checked="" type="checkbox"/> Differential GPS <input type="checkbox"/> Map <input type="checkbox"/>	
AGD84 / AMG84 <input type="checkbox"/>		Lat / Northing: <u>See attached data</u>		No. satellites: _____ Map used: _____	
WGS84 <input type="checkbox"/>		Long / Easting: _____		Boundary polygon captured: <input type="checkbox"/> Map scale: _____	
Unknown <input type="checkbox"/>		ZONE: _____			
LAND TENURE:					
Nature reserve <input type="checkbox"/>		Timber reserve <input type="checkbox"/>		Private property <input type="checkbox"/>	
National park <input checked="" type="checkbox"/>		State forest <input type="checkbox"/>		Pastoral lease <input type="checkbox"/>	
Conservation park <input type="checkbox"/>		Water reserve <input type="checkbox"/>		UCL <input type="checkbox"/> SLK/Pole _____ to _____	
				Rail reserve <input type="checkbox"/> Shire road reserve <input type="checkbox"/>	
				MRWA road reserve <input type="checkbox"/> Other Crown reserve <input type="checkbox"/>	
				Specify other: _____	

AREA ASSESSMENT: Edge survey <input type="checkbox"/> Partial survey <input type="checkbox"/> Full survey <input checked="" type="checkbox"/>		Area observed (m²): <u>1046 ha</u>	
EFFORT: Time spent surveying (minutes): <u>28 days</u>		No. of minutes spent / 100 m ² : _____	
POP'N COUNT ACCURACY: Actual <input checked="" type="checkbox"/> Extrapolation <input type="checkbox"/> Estimate <input checked="" type="checkbox"/>		Count method: _____	
<small>(Refer to field manual for list)</small>			
WHAT COUNTED:		Plants <input checked="" type="checkbox"/> Clumps <input type="checkbox"/> Clonal stems <input type="checkbox"/>	
TOTAL POP'N STRUCTURE:			
	Mature:	Juveniles:	Seedlings:
Alive	<u>3</u>		
Dead			
		Totals:	
		Area of pop (m²): <u>490</u>	
<small>Note: Pls record count as numbers (not percentages) for database.</small>			
QUADRATS PRESENT:		No. _____ Size _____ Data attached <input type="checkbox"/> Total area of quadrats (m ²): _____	
Summary Quad. Totals: Alive			
REPRODUCTIVE STATE:		Clonal <input type="checkbox"/> Vegetative <input type="checkbox"/> Flowerbud <input checked="" type="checkbox"/> Flower <input checked="" type="checkbox"/>	
Immature fruit <input type="checkbox"/> Fruit <input type="checkbox"/> Dehisced fruit <input type="checkbox"/>		Percentage in flower: <u>100%</u>	

CONDITION OF PLANTS: Healthy Moderate Poor Senescent

COMMENT: _____

THREATS - type, agent and supporting information:	Current impact (N-E)	Potential Impact (L-E)	Potential Threat Onset (S-L)
Eg clearing, too frequent fire, weed, disease. Refer to field manual for list of threats & agents. Specify agent where relevant. Rate current and potential threat impact: N=Nil, L=Low, M=Medium, H=High, E=Extreme Estimate time to potential impact: S=Short (<12mths), M=Medium (<5yrs), L=Long (5yrs+)			
•	n	n	L
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•	---	---	---



Threatened and Priority Flora Report Form

HABITAT INFORMATION:

LANDFORM:	ROCK TYPE:	LOOSE ROCK:	SOIL TYPE:	SOIL COLOUR:	DRAINAGE:
Crest <input type="checkbox"/>	Granite <input type="checkbox"/>	(on soil surface; eg gravel, quartz fields)	Sand <input checked="" type="checkbox"/>	Red <input type="checkbox"/>	Well drained <input checked="" type="checkbox"/>
Hill <input type="checkbox"/>	Dolerite <input type="checkbox"/>		Sandy loam <input type="checkbox"/>	Brown <input type="checkbox"/>	Seasonally inundated <input type="checkbox"/>
Ridge <input type="checkbox"/>	Laterite <input type="checkbox"/>		Loam <input type="checkbox"/>	Yellow <input type="checkbox"/>	Permanently inundated <input type="checkbox"/>
Outcrop <input checked="" type="checkbox"/>	Ironstone <input type="checkbox"/>	0-10% <input checked="" type="checkbox"/>	Clay loam <input type="checkbox"/>	White <input type="checkbox"/>	Tidal <input type="checkbox"/>
Slope <input type="checkbox"/>	Limestone <input checked="" type="checkbox"/>	10-30% <input checked="" type="checkbox"/>	Light clay <input type="checkbox"/>	Grey <input checked="" type="checkbox"/>	
Flat <input type="checkbox"/>	Quartz <input type="checkbox"/>	30-50% <input type="checkbox"/>	Peat <input type="checkbox"/>	Black <input type="checkbox"/>	
Open depression <input type="checkbox"/>	Specify other: _____	50-100% <input type="checkbox"/>	Specify other: _____	Specify other: _____	
Drainage line <input type="checkbox"/>					
Closed depression <input type="checkbox"/>					
Wetland <input type="checkbox"/>					
	Specific Landform Element:				
	(Refer to field manual for additional values)				
CONDITION OF SOIL:	Dry <input type="checkbox"/>	Moist <input type="checkbox"/>	Waterlogged <input type="checkbox"/>	Inundated <input type="checkbox"/>	

VEGETATION CLASSIFICATION*:

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

1. Tall closed shrubland Melaleuca systema and Banksia sessilis
2. sparse herbland Desmocladus flexuosus and Lomandra maritima.
3. _____
4. _____

ASSOCIATED SPECIES:

Other (non-dominant) spp _____

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

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

COMMENT:

FIRE HISTORY: Last Fire: Season/Month: _____ Year: 5<10yrs Fire Intensity: High Medium Low No signs of fire

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

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

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

DRF PERMIT/ LICENCE No: SL012366 Note if only observing plants (i.e. no specimens or plant material is taken) then no permit/licence is required. For further information on permit and licencing requirements see the Threatened Flora and Wildlife Licensing pages on DBCA's website. Any actions carried out under licence/permit should be recorded above in the OTHER COMMENTS section.

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

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

COPY SENT TO: Regional Office District Office Other: _____

Submitter of Record: Angela Benkovic Role: Botanist Signed: Benkovic Date: 05/03/2019

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

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

Record entered by:

Sheet No.:

Record Entered in Database



Threatened and Priority Flora Report Form

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

TAXON: <u>Baeckea sp. Limestone</u>		TPFL Pop. No.: _____	
OBSERVATION DATE: <u>15/10/18 & 11/12/18</u>		CONSERVATION STATUS: <u>P1</u> New population <input checked="" type="checkbox"/>	
OBSERVER/S: <u>Angela Benkovic and Erin Lynch</u>		PHONE: <u>62228361</u>	
ROLE: <u>Botanist</u>		ORGANISATION: <u>GHD</u>	

DESCRIPTION OF LOCATION (Provide at least nearest town/named locality, and the distance and direction to that place):
Neerabup National Park and railway line. Within the proposed Mitchell Fwy extension corridor from Hester Ave to Romeo Rd

Reserve No.: R 27575

DBC DISTRICT: <u>Swan Coastal</u>		LGA: <u>City of Wanneroo</u>		Land manager present: <input type="checkbox"/>	
DATUM:		COORDINATES: (If UTM coords provided, Zone is also required)		METHOD USED:	
GDA94 / MGA94 <input checked="" type="checkbox"/>		DecDegrees <input checked="" type="checkbox"/> DegMinSec <input type="checkbox"/> UTM <input type="checkbox"/>		GPS <input checked="" type="checkbox"/> Differential GPS <input type="checkbox"/> Map <input type="checkbox"/>	
AGD84 / AMG84 <input type="checkbox"/>		Lat / Northing: <u>See attached data</u>		No. satellites: _____ Map used: _____	
WGS84 <input type="checkbox"/>		Long / Easting: _____		Boundary polygon captured: <input type="checkbox"/> Map scale: _____	
Unknown <input type="checkbox"/>		ZONE: _____			
LAND TENURE:					
Nature reserve <input type="checkbox"/>		Timber reserve <input type="checkbox"/>		Private property <input type="checkbox"/>	
National park <input checked="" type="checkbox"/>		State forest <input type="checkbox"/>		Pastoral lease <input type="checkbox"/>	
Conservation park <input type="checkbox"/>		Water reserve <input type="checkbox"/>		UCL <input type="checkbox"/> SLK/Pole _____ to _____	
				Rail reserve <input type="checkbox"/> Shire road reserve <input type="checkbox"/>	
				MRWA road reserve <input checked="" type="checkbox"/> Other Crown reserve <input type="checkbox"/>	
				Specify other: _____	

AREA ASSESSMENT: Edge survey <input type="checkbox"/> Partial survey <input type="checkbox"/> Full survey <input checked="" type="checkbox"/>		Area observed (m ²): <u>1046 ha</u>	
EFFORT: Time spent surveying (minutes): <u>28 days</u>		No. of minutes spent / 100 m ² : _____	
POP'N COUNT ACCURACY: Actual <input checked="" type="checkbox"/> Extrapolation <input type="checkbox"/> Estimate <input type="checkbox"/>		Count method: _____	
(Refer to field manual for list)			
WHAT COUNTED:		Plants <input type="checkbox"/> Clumps <input type="checkbox"/> Clonal stems <input type="checkbox"/>	
TOTAL POP'N STRUCTURE:			
	Mature:	Juveniles:	Seedlings:
Alive	<u>437</u>		
Dead			
		Area of pop (m ²): _____	
Note: Pls record count as numbers (not percentages) for database.			
QUADRATS PRESENT:		No. _____ Size _____ Data attached <input type="checkbox"/> Total area of quadrats (m ²): _____	
Summary Quad. Totals: Alive		436	
REPRODUCTIVE STATE:		Clonal <input type="checkbox"/> Vegetative <input type="checkbox"/> Flowerbud <input type="checkbox"/> Flower <input checked="" type="checkbox"/>	
		Immature fruit <input type="checkbox"/> Fruit <input type="checkbox"/> Dehisced fruit <input type="checkbox"/> Percentage in flower: <u>100%</u>	
CONDITION OF PLANTS: Healthy <input checked="" type="checkbox"/> Moderate <input type="checkbox"/> Poor <input type="checkbox"/> Senescent <input type="checkbox"/>			
COMMENT: _____			

THREATS - type, agent and supporting information:	Current impact (N-E)	Potential Impact (L-E)	Potential Threat Onset (S-L)
Eg clearing, too frequent fire, weed, disease. Refer to field manual for list of threats & agents. Specify agent where relevant. Rate current and potential threat impact: N=Nil, L=Low, M=Medium, H=High, E=Extreme Estimate time to potential impact: S=Short (<12mths), M=Medium (<5yrs), L=Long (5yrs+)			
• Clearing by MRWA for the Mitchell fwy extension from Hester Ave to Romeo Rd within Road reserve	L	L	M
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•	---	---	---



Threatened and Priority Flora Report Form

HABITAT INFORMATION:

LANDFORM:	ROCK TYPE:	LOOSE ROCK:	SOIL TYPE:	SOIL COLOUR:	DRAINAGE:
Crest <input type="checkbox"/>	Granite <input type="checkbox"/>	(on soil surface; eg gravel, quartz fields)	Sand <input checked="" type="checkbox"/>	Red <input type="checkbox"/>	Well drained <input checked="" type="checkbox"/>
Hill <input type="checkbox"/>	Dolerite <input type="checkbox"/>		Sandy loam <input type="checkbox"/>	Brown <input type="checkbox"/>	Seasonally inundated <input type="checkbox"/>
Ridge <input type="checkbox"/>	Laterite <input type="checkbox"/>	0-10% <input type="checkbox"/>	Loam <input type="checkbox"/>	Yellow <input type="checkbox"/>	Permanently inundated <input type="checkbox"/>
Outcrop <input checked="" type="checkbox"/>	Ironstone <input type="checkbox"/>	10-30% <input checked="" type="checkbox"/>	Clay loam <input type="checkbox"/>	White <input type="checkbox"/>	Tidal <input type="checkbox"/>
Slope <input type="checkbox"/>	Limestone <input checked="" type="checkbox"/>	30-50% <input type="checkbox"/>	Light clay <input type="checkbox"/>	Grey <input checked="" type="checkbox"/>	
Flat <input type="checkbox"/>	Quartz <input type="checkbox"/>	50-100% <input type="checkbox"/>	Peat <input type="checkbox"/>	Black <input type="checkbox"/>	
Open depression <input type="checkbox"/>	Specify other: _____		Specify other: _____	Specify other: _____	
Drainage line <input type="checkbox"/>					
Closed depression <input type="checkbox"/>					
Wetland <input type="checkbox"/>					
CONDITION OF SOIL:	Dry <input checked="" type="checkbox"/>	Moist <input type="checkbox"/>	Waterlogged <input type="checkbox"/>	Inundated <input type="checkbox"/>	

VEGETATION CLASSIFICATION*:

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

1. Low heath of mixed species dominated by Melaleuca systema, Calothamnus quadrifidus subsp. quadrifidus, Acacia lasiocarpa var. lasiocarpa
2. mixed dense understorey (dominated by Desmodcladus flexuosus, Mesomelaena pseudostygia and Lomandra maritima
- 3.
- 4.

ASSOCIATED SPECIES:

Other (non-dominant) spp _____

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

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

COMMENT:

FIRE HISTORY: Last Fire: Season/Month: _____ Year: 5>10yrs _____ Fire Intensity: High Medium Low No signs of fire

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

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

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

DRF PERMIT/ LICENCE No: SL012366 Note if only observing plants (i.e. no specimens or plant material is taken) then no permit/licence is required. For further information on permit and licensing requirements see the Threatened Flora and Wildlife Licensing pages on DBCA's website. Any actions carried out under licence/permit should be recorded above in the OTHER COMMENTS section.

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

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

COPY SENT TO: Regional Office District Office Other: _____

Submitter of Record: Angela Benkovic Role: Botanist Signed: [Signature] Date: 05/03/2019



Threatened and Priority Flora Report Form

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TAXON: <u>Acacia benthami</u>	TPFL Pop. No.: _____
OBSERVATION DATE: <u>25/09/2018</u>	CONSERVATION STATUS: <u>P2</u> <input checked="" type="checkbox"/> New population
OBSERVER/S: <u>Angela Benkovic and Erin Lynch</u>	PHONE: <u>62228361</u>
ROLE: <u>Botanist</u>	ORGANISATION: <u>GHD</u>

DESCRIPTION OF LOCATION (Provide at least nearest town/named locality, and the distance and direction to that place): Between Neerabup National Park and railway line. Within the proposed Mitchell Fwy extension corridor from Hester Ave to Romeo Rd

Reserve No.: _____

DBC DISTRICT: Swan Coastal **LGA:** City of Wanneroo Land manager present:

DATUM: GDA94 / MGA94 AGD84 / AMG84 WGS84 Unknown

COORDINATES: (If UTM coords provided, Zone is also required)
 DecDegrees DegMinSec UTM **Lat / Northing:** See attached data
Long / Easting: _____

ZONE: _____

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

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

AREA ASSESSMENT: Edge survey Partial survey Full survey Area observed (m²): 1046 ha

EFFORT: Time spent surveying (minutes): 28 days No. of minutes spent / 100 m²: _____

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

WHAT COUNTED: Plants Clumps Clonal stems

TOTAL POP'N STRUCTURE:	Mature:	Juveniles:	Seedlings:	Totals:	Area of pop (m ²): <u>1.1 ha</u> Note: Pls record count as numbers (not percentages) for database.
Alive	<u>17</u>				
Dead	<u>2</u>				

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

Summary Quad. Totals: Alive

			<u>20</u>
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REPRODUCTIVE STATE: Clonal Vegetative Flowerbud Flower
 Immature fruit Fruit Dehisced fruit Percentage in flower: 100%

CONDITION OF PLANTS: Healthy Moderate Poor Senescent

COMMENT: protected by chicken wire fencing

THREATS - type, agent and supporting information:	Current impact (N-E)	Potential Impact (L-E)	Potential Threat Onset (S-L)
Eg clearing, too frequent fire, weed, disease. Refer to field manual for list of threats & agents. Specify agent where relevant. Rate current and potential threat impact: N=Nil, L=Low, M=Medium, H=High, E=Extreme Estimate time to potential impact: S=Short (<12mths), M=Medium (<5yrs), L=Long (5yrs+)			
• Clearing by MRWA for the Mitchell fwy extension from Hester Ave to Romeo Rd	L	L	M
•	---	---	---
•	---	---	---



Threatened and Priority Flora Report Form

HABITAT INFORMATION:

LANDFORM:	ROCK TYPE:	LOOSE ROCK:	SOIL TYPE:	SOIL COLOUR:	DRAINAGE:
Crest <input type="checkbox"/>	Granite <input type="checkbox"/>	(on soil surface; eg gravel, quartz fields)	Sand <input checked="" type="checkbox"/>	Red <input type="checkbox"/>	Well drained <input checked="" type="checkbox"/>
Hill <input type="checkbox"/>	Dolerite <input type="checkbox"/>		Sandy loam <input type="checkbox"/>	Brown <input type="checkbox"/>	Seasonally inundated <input type="checkbox"/>
Ridge <input type="checkbox"/>	Laterite <input type="checkbox"/>	0-10% <input checked="" type="checkbox"/>	Loam <input type="checkbox"/>	Yellow <input type="checkbox"/>	Permanently inundated <input type="checkbox"/>
Outcrop <input type="checkbox"/>	Ironstone <input type="checkbox"/>	10-30% <input type="checkbox"/>	Clay loam <input type="checkbox"/>	White <input type="checkbox"/>	Tidal <input type="checkbox"/>
Slope <input type="checkbox"/>	Limestone <input checked="" type="checkbox"/>	30-50% <input type="checkbox"/>	Light clay <input type="checkbox"/>	Grey <input checked="" type="checkbox"/>	
Flat <input checked="" type="checkbox"/>	Quartz <input type="checkbox"/>	50-100% <input type="checkbox"/>	Peat <input type="checkbox"/>	Black <input type="checkbox"/>	
Open depression <input type="checkbox"/>	Specify other: _____		Specify other: _____	Specify other: _____	
Drainage line <input type="checkbox"/>					
Closed depression <input type="checkbox"/>					
Wetland <input type="checkbox"/>					
	Specific Landform Element:				
	(Refer to field manual for additional values)				
CONDITION OF SOIL:	Dry <input checked="" type="checkbox"/>	Moist <input type="checkbox"/>	Waterlogged <input type="checkbox"/>	Inundated <input type="checkbox"/>	

VEGETATION CLASSIFICATION*:

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

1. _____
2. Banksia woodland B. attenuata and B. menziesii
3. Sparse shrubland Hakea spp. and Xanthorrhoea preissii
4. isolated cheath shrub Hibbertia hypericoides

ASSOCIATED SPECIES:

Other (non-dominant) spp _____

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

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

COMMENT: Partial clearing (historically)

FIRE HISTORY: Last Fire: Season/Month: _____ Year: _____ Fire Intensity: High Medium Low No signs of fire
 _____>5yrs_____

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

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

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

DRF PERMIT/ LICENCE No: SL012366 Note if only observing plants (i.e. no specimens or plant material is taken) then no permit/licence is required. For further information on permit and licencing requirements see the Threatened Flora and Wildlife Licensing pages on DBCA's website. Any actions carried out under licence/permit should be recorded above in the OTHER COMMENTS section.

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

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

COPY SENT TO: Regional Office District Office Other: _____

Submitter of Record: Angela Benkovic Role: Botanist Signed:  Date: 5/3/2019

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

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

Record entered by: _____

Sheet No.: _____

Record Entered in Database



Threatened and Priority Flora Report Form

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

TAXON: <u>Stylidium maritimum</u>	TPFL Pop. No.: _____
OBSERVATION DATE: <u>18/09/18 - 18/12/18</u>	CONSERVATION STATUS: <u>P3</u> New population <input checked="" type="checkbox"/>
OBSERVER/S: <u>Angela Benkovic and Erin Lynch</u>	PHONE: <u>62228361</u>
ROLE: <u>Botanist</u>	ORGANISATION: <u>GHD</u>

DESCRIPTION OF LOCATION (Provide at least nearest town/named locality, and the distance and direction to that place):
Neerabup National Park and railway line. Within the proposed Mitchell Fwy extension corridor from Hester Ave to Romeo Rd

Reserve No.: R27575

DBC DISTRICT: <u>Swan Coastal</u>	LGA: <u>City of Wanneroo</u>	Land manager present: <input type="checkbox"/>
DATUM: GDA94 / MGA94 <input checked="" type="checkbox"/> AGD84 / AMG84 <input type="checkbox"/> WGS84 <input type="checkbox"/> Unknown <input type="checkbox"/>	COORDINATES: (If UTM coords provided, Zone is also required) DecDegrees <input checked="" type="checkbox"/> DegMinSec <input type="checkbox"/> UTM's <input checked="" type="checkbox"/> Lat / Northing: <u>See attached data</u> Long / Easting: _____ ZONE: _____	METHOD USED: GPS <input checked="" type="checkbox"/> Differential GPS <input type="checkbox"/> Map <input type="checkbox"/> No. satellites: _____ Map used: _____ Boundary polygon captured: <input type="checkbox"/> Map scale: _____
LAND TENURE:		
Nature reserve <input type="checkbox"/>	Timber reserve <input type="checkbox"/>	Private property <input type="checkbox"/>
National park <input checked="" type="checkbox"/>	State forest <input type="checkbox"/>	Pastoral lease <input type="checkbox"/>
Conservation park <input type="checkbox"/>	Water reserve <input type="checkbox"/>	UCL <input type="checkbox"/> SLK/Pole _____ to _____
		Rail reserve <input type="checkbox"/> Shire road reserve <input type="checkbox"/>
		MRWA road reserve <input checked="" type="checkbox"/> Other Crown reserve <input type="checkbox"/>
		Specify other: _____

AREA ASSESSMENT: Edge survey <input type="checkbox"/> Partial survey <input type="checkbox"/> Full survey <input checked="" type="checkbox"/>	Area observed (m ²): <u>1046 ha</u>															
EFFORT: Time spent surveying (minutes): <u>28 days</u>	No. of minutes spent / 100 m ² : _____															
POP'N COUNT ACCURACY: Actual <input checked="" type="checkbox"/> Extrapolation <input type="checkbox"/> Estimate <input checked="" type="checkbox"/>	Count method: _____ (Refer to field manual for list)															
WHAT COUNTED: Plants <input checked="" type="checkbox"/> Clumps <input type="checkbox"/> Clonal stems <input type="checkbox"/>																
TOTAL POP'N STRUCTURE:																
<table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th>Mature:</th> <th>Juveniles:</th> <th>Seedlings:</th> <th>Totals:</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">Alive</td> <td style="text-align: center;">1235 +</td> <td></td> <td></td> <td></td> </tr> <tr> <td style="text-align: center;">Dead</td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>		Mature:	Juveniles:	Seedlings:	Totals:	Alive	1235 +				Dead					Area of pop (m ²): _____ Note: Pls record count as numbers (not percentages) for database.
	Mature:	Juveniles:	Seedlings:	Totals:												
Alive	1235 +															
Dead																
QUADRATS PRESENT: No. _____ Size _____ Data attached <input type="checkbox"/>	Total area of quadrats (m ²): _____															
Summary Quad. Totals: Alive																
REPRODUCTIVE STATE: Clonal <input type="checkbox"/> Vegetative <input type="checkbox"/> Flowerbud <input checked="" type="checkbox"/> Flower <input checked="" type="checkbox"/>																
Immature fruit <input type="checkbox"/> Fruit <input checked="" type="checkbox"/> Dehisced fruit <input type="checkbox"/> Percentage in flower: _____%																

CONDITION OF PLANTS: Healthy Moderate Poor Senescent

COMMENT: _____

THREATS - type, agent and supporting information:	Current impact (N-E)	Potential Impact (L-E)	Potential Threat Onset (S-L)
Eg clearing, too frequent fire, weed, disease. Refer to field manual for list of threats & agents. Specify agent where relevant. Rate current and potential threat impact: N=Nil, L=Low, M=Medium, H=High, E=Extreme Estimate time to potential impact: S=Short (<12mths), M=Medium (<5yrs), L=Long (5yrs+)			
• Clearing by MRWA for the Mitchell fwy extension from Hester Ave to Romeo Rd within Road reserve	L	L	M
•	---	---	---
•	---	---	---



Threatened and Priority Flora Report Form

Version 1.3 August 2017

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

TAXON: <u>Pimelea calcicola</u>	TPFL Pop. No.: _____
OBSERVATION DATE: <u>18/09/18 - 18/12/18</u>	CONSERVATION STATUS: <u>P3</u> New population <input checked="" type="checkbox"/>
OBSERVER/S: <u>Angela Benkovic and Erin Lynch</u>	PHONE: <u>62228361</u>
ROLE: <u>Botanist</u>	ORGANISATION: <u>GHD</u>

DESCRIPTION OF LOCATION (Provide at least nearest town/named locality, and the distance and direction to that place):
Neerabup National Park and railway line. Within the proposed Mitchell Fwy extension corridor from Hester Ave to Romeo Rd

Reserve No.: R27575

DBC DISTRICT: <u>Swan Coastal</u>	LGA: <u>City of Wanneroo</u>	Land manager present: <input type="checkbox"/>
DATUM: GDA94 / MGA94 <input checked="" type="checkbox"/> AGD84 / AMG84 <input type="checkbox"/> WGS84 <input type="checkbox"/> Unknown <input type="checkbox"/>	COORDINATES: (If UTM coords provided, Zone is also required) DecDegrees <input checked="" type="checkbox"/> DegMinSec <input type="checkbox"/> UTM's <input checked="" type="checkbox"/> Lat / Northing: <u>See attached data</u> Long / Easting: _____ ZONE: _____	METHOD USED: GPS <input type="checkbox"/> Differential GPS <input type="checkbox"/> Map <input type="checkbox"/> No. satellites: _____ Map used: _____ Boundary polygon captured: <input type="checkbox"/> Map scale: _____
LAND TENURE:		
Nature reserve <input type="checkbox"/>	Timber reserve <input type="checkbox"/>	Private property <input type="checkbox"/>
National park <input checked="" type="checkbox"/>	State forest <input type="checkbox"/>	Pastoral lease <input type="checkbox"/>
Conservation park <input type="checkbox"/>	Water reserve <input type="checkbox"/>	UCL <input type="checkbox"/> SLK/Pole _____ to _____
		Rail reserve <input type="checkbox"/> Shire road reserve <input type="checkbox"/>
		MRWA road reserve <input checked="" type="checkbox"/> Other Crown reserve <input type="checkbox"/>
		Specify other: _____

AREA ASSESSMENT: Edge survey Partial survey Full survey Area observed (m²): 1046 ha

EFFORT: Time spent surveying (minutes): 28 days No. of minutes spent / 100 m²: _____

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

WHAT COUNTED: Plants Clumps Clonal stems

TOTAL POP'N STRUCTURE:	Mature:	Juveniles:	Seedlings:	Totals:
Alive	192			
Dead				

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

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

Summary Quad. Totals: Alive

--	--	--	--

REPRODUCTIVE STATE: Clonal Vegetative Flowerbud Flower
Immature fruit Fruit Dehisced fruit Percentage in flower: 90%

CONDITION OF PLANTS: Healthy Moderate Poor Senescent

COMMENT: _____

THREATS - type, agent and supporting information:	Current impact (N-E)	Potential Impact (L-E)	Potential Threat Onset (S-L)
Eg clearing, too frequent fire, weed, disease. Refer to field manual for list of threats & agents. Specify agent where relevant. Rate current and potential threat impact: N=Nil, L=Low, M=Medium, H=High, E=Extreme Estimate time to potential impact: S=Short (<12mths), M=Medium (<5yrs), L=Long (5yrs+)			
• Clearing by MRWA for the Mitchell fwy extension from Hester Ave to Romeo Rd within Road reserve	L	L	M
•	---	---	---
•	---	---	---



Threatened and Priority Flora Report Form

HABITAT INFORMATION:

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

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

CONDITION OF SOIL: Dry Moist Waterlogged Inundated

VEGETATION CLASSIFICATION*:

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

1. Low heath of mixed species dominated by Melaleuca systema, Calothamnus quadrifidus subsp. quadrifidus, Acacia lasiocarpa var. lasiocarpa

2. mixed dense understorey (dominated by Desmodium flexuosum, Mesomelaena pseudostygia and Lomandra maritima).

3.

4.

ASSOCIATED SPECIES:

Other (non-dominant) spp _____

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

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

COMMENT: _____

FIRE HISTORY: Last Fire: Season/Month: _____ Year: 5>10yrs__ Fire Intensity: High Medium Low No signs of fire

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

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

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

DRF PERMIT/ LICENCE No: SL012366 Note if only observing plants (i.e. no specimens or plant material is taken) then no permit/licence is required. For further information on permit and licensing requirements see the Threatened Flora and Wildlife Licensing pages on DBCA's website. Any actions carried out under licence/permit should be recorded above in the OTHER COMMENTS section.

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

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

COPY SENT TO: Regional Office District Office Other: _____

Submitter of Record: Angela Benkovic Role: Botanist Signed: Benkovic Date: 05/03/2019



Threatened and Priority Flora Report Form

Version 1.3 August 2017

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

TAXON: <u>Leucopogon sp. Yanchep</u>		TPFL Pop. No.: _____	
OBSERVATION DATE: <u>18/09/18 - 18/12/18</u>		CONSERVATION STATUS: <u>P3</u> New population <input checked="" type="checkbox"/>	
OBSERVER/S: <u>Angela Benkovic and Erin Lynch</u>		PHONE: <u>62228361</u>	
ROLE: <u>Botanist</u>		ORGANISATION: <u>GHD</u>	

DESCRIPTION OF LOCATION (Provide at least nearest town/named locality, and the distance and direction to that place):
Between Neerabup National Park and railway line. Within the proposed Mitchell Fwy extension corridor from Hester Ave to Romeo road

Reserve No.: R27575

DBC DISTRICT: <u>Swan Coastal</u>		LGA: <u>City of Wanneroo</u>		Land manager present: <input type="checkbox"/>	
DATUM:		COORDINATES: (If UTM coords provided, Zone is also required)		METHOD USED:	
GDA94 / MGA94 <input checked="" type="checkbox"/> AGD84 / AMG84 <input type="checkbox"/> WGS84 <input type="checkbox"/> Unknown <input type="checkbox"/>		DecDegrees <input type="checkbox"/> DegMinSec <input type="checkbox"/> UTM's <input checked="" type="checkbox"/> Lat / Northing: <u>See attached data</u> Long / Easting: _____ ZONE: _____		GPS <input type="checkbox"/> Differential GPS <input type="checkbox"/> Map <input type="checkbox"/> No. satellites: _____ Map used: _____ Boundary polygon captured: <input type="checkbox"/> Map scale: _____	
LAND TENURE:					
Nature reserve <input type="checkbox"/>		Timber reserve <input type="checkbox"/>		Private property <input type="checkbox"/>	
National park <input checked="" type="checkbox"/>		State forest <input type="checkbox"/>		Pastoral lease <input type="checkbox"/>	
Conservation park <input type="checkbox"/>		Water reserve <input type="checkbox"/>		UCL <input type="checkbox"/> SLK/Pole _____ to _____	
				Rail reserve <input type="checkbox"/> Shire road reserve <input type="checkbox"/>	
				MRWA road reserve <input checked="" type="checkbox"/> Other Crown reserve <input type="checkbox"/>	
				Specify other: _____	

AREA ASSESSMENT: Edge survey Partial survey Full survey Area observed (m²): 1046 ha

EFFORT: Time spent surveying (minutes): 28 days No. of minutes spent / 100 m²: _____

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

WHAT COUNTED: Plants Clumps Clonal stems

TOTAL POP'N STRUCTURE:	Mature:	Juveniles:	Seedlings:	Totals:	Area of pop (m²): _____ <small>Note: Pls record count as numbers (not percentages) for database.</small>
	Alive	1756 +			
	Dead				

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

Summary Quad. Totals: Alive

REPRODUCTIVE STATE:	Clonal <input type="checkbox"/>	Vegetative <input type="checkbox"/>	Flowerbud <input type="checkbox"/>	Flower <input checked="" type="checkbox"/>
	Immature fruit <input type="checkbox"/>	Fruit <input checked="" type="checkbox"/>	Dehisced fruit <input type="checkbox"/>	Percentage in flower: <u>5%</u>

CONDITION OF PLANTS: Healthy Moderate Poor Senescent

COMMENT: _____

THREATS - type, agent and supporting information: <small>Eg clearing, too frequent fire, weed, disease. Refer to field manual for list of threats & agents. Specify agent where relevant. Rate current and potential threat impact: N=Nil, L=Low, M=Medium, H=High, E=Extreme Estimate time to potential impact: S=Short (<12mths), M=Medium (<5yrs), L=Long (5yrs+)</small>	Current impact (N-E)	Potential Impact (L-E)	Potential Threat Onset (S-L)
• Clearing by MRWA for the Mitchell fwy extension from Hester Ave to Romeo Rd within Road reserve	L	L	M
• _____	_____	_____	_____
• _____	_____	_____	_____



Threatened and Priority Flora Report Form

HABITAT INFORMATION:

LANDFORM:	ROCK TYPE:	LOOSE ROCK:	SOIL TYPE:	SOIL COLOUR:	DRAINAGE:
Crest <input type="checkbox"/>	Granite <input type="checkbox"/>	(on soil surface; eg gravel, quartz fields)	Sand <input checked="" type="checkbox"/>	Red <input type="checkbox"/>	Well drained <input checked="" type="checkbox"/>
Hill <input type="checkbox"/>	Dolerite <input type="checkbox"/>		Sandy loam <input type="checkbox"/>	Brown <input type="checkbox"/>	Seasonally inundated <input type="checkbox"/>
Ridge <input type="checkbox"/>	Laterite <input type="checkbox"/>		Loam <input type="checkbox"/>	Yellow <input type="checkbox"/>	Permanently inundated <input type="checkbox"/>
Outcrop <input checked="" type="checkbox"/>	Ironstone <input type="checkbox"/>	0-10% <input type="checkbox"/>	Clay loam <input type="checkbox"/>	White <input type="checkbox"/>	Tidal <input type="checkbox"/>
Slope <input type="checkbox"/>	Limestone <input checked="" type="checkbox"/>	10-30% <input checked="" type="checkbox"/>	Light clay <input type="checkbox"/>	Grey <input checked="" type="checkbox"/>	
Flat <input type="checkbox"/>	Quartz <input type="checkbox"/>	30-50% <input type="checkbox"/>	Peat <input type="checkbox"/>	Black <input type="checkbox"/>	
Open depression <input type="checkbox"/>	Specify other: _____	50-100% <input type="checkbox"/>	Specify other: _____	Specify other: _____	
Drainage line <input type="checkbox"/>					
Closed depression <input type="checkbox"/>					
Wetland <input type="checkbox"/>					
CONDITION OF SOIL:	Dry <input checked="" type="checkbox"/>	Moist <input type="checkbox"/>	Waterlogged <input type="checkbox"/>	Inundated <input type="checkbox"/>	

VEGETATION CLASSIFICATION*:

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

1. Low heath of mixed species dominated by Melaleuca systema, Calothamnus quadrifidus subsp. quadrifidus, Acacia lasiocarpa var. lasiocarpa
2. mixed dense understorey (dominated by Desmocladius flexuosus, Mesomelaena pseudostygia and Lomandra maritima).
- 3.
- 4.

ASSOCIATED SPECIES:

Hakea trifurcata and H. lissocarpa

Other (non-dominant) spp _____

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

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

COMMENT:

FIRE HISTORY: Last Fire: Season/Month: ___ Year: _5>10yrs___ Fire Intensity: High Medium Low No signs of fire

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

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

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

DRF PERMIT/ LICENCE No: SL012366 Note if only observing plants (i.e. no specimens or plant material is taken) then no permit/licence is required. For further information on permit and licencing requirements see the Threatened Flora and Wildlife Licensing pages on DBCA's website. Any actions carried out under licence/permit should be recorded above in the OTHER COMMENTS section.

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

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

COPY SENT TO: Regional Office District Office Other: _____

Submitter of Record: Angela Benkovic Role: Botanist Signed: Benkovic Date: 05/03/2019



Threatened and Priority Flora Report Form

Version 1.3 August 2017

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TAXON: <u>Hibbertia spicata subsp. lepotheca</u>	TPFL Pop. No.: _____
OBSERVATION DATE: <u>18/09/18 - 18/12/18</u>	CONSERVATION STATUS: <u>P3</u> New population <input checked="" type="checkbox"/>
OBSERVER/S: <u>Angela Benkovic and Erin Lynch</u>	PHONE: <u>62228361</u>
ROLE: <u>Botanist</u>	ORGANISATION: <u>GHD</u>

DESCRIPTION OF LOCATION (Provide at least nearest town/named locality, and the distance and direction to that place):
Neerabup National Park and railway line. Within the proposed Mitchell Fwy extension corridor from Hester Ave to Romeo Rd

Reserve No.: R27575

DBC DISTRICT: <u>Swan Coastal</u>	LGA: <u>City of Wanneroo</u>	Land manager present: <input type="checkbox"/>
DATUM: GDA94 / MGA94 <input checked="" type="checkbox"/> AGD84 / AMG84 <input type="checkbox"/> WGS84 <input type="checkbox"/> Unknown <input type="checkbox"/>	COORDINATES: (If UTM coords provided, Zone is also required) DecDegrees <input type="checkbox"/> DegMinSec <input type="checkbox"/> UTM <input checked="" type="checkbox"/> Lat / Northing: <u>See attached data</u> Long / Easting: _____ ZONE: _____	METHOD USED: GPS <input checked="" type="checkbox"/> Differential GPS <input type="checkbox"/> Map <input type="checkbox"/> No. satellites: _____ Map used: _____ Boundary polygon captured: <input type="checkbox"/> Map scale: _____
LAND TENURE:		
Nature reserve <input type="checkbox"/>	Timber reserve <input type="checkbox"/>	Private property <input type="checkbox"/>
National park <input checked="" type="checkbox"/>	State forest <input type="checkbox"/>	Pastoral lease <input type="checkbox"/>
Conservation park <input type="checkbox"/>	Water reserve <input type="checkbox"/>	UCL <input type="checkbox"/> SLK/Pole _____ to _____
		Rail reserve <input type="checkbox"/> Shire road reserve <input type="checkbox"/> MRWA road reserve <input checked="" type="checkbox"/> Other Crown reserve <input type="checkbox"/> Specify other: _____

AREA ASSESSMENT: Edge survey Partial survey Full survey Area observed (m²): 1046 ha

EFFORT: Time spent surveying (minutes): 28 days No. of minutes spent / 100 m²: _____

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

WHAT COUNTED: Plants Clumps Clonal stems

TOTAL POP'N STRUCTURE:	Mature:	Juveniles:	Seedlings:	Totals:
Alive	214			
Dead				

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

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

Summary Quad. Totals: Alive _____

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

CONDITION OF PLANTS: Healthy Moderate Poor Senescent

COMMENT: _____

THREATS - type, agent and supporting information:	Current impact (N-E)	Potential Impact (L-E)	Potential Threat Onset (S-L)
Eg clearing, too frequent fire, weed, disease. Refer to field manual for list of threats & agents. Specify agent where relevant. Rate current and potential threat impact: N=Nil, L=Low, M=Medium, H=High, E=Extreme Estimate time to potential impact: S=Short (<12mths), M=Medium (<5yrs), L=Long (5yrs+)			
• Clearing by MRWA for the Mitchell fwy extension from Hester Ave to Romeo Rd within Road reserve	L	L	M
•	---	---	---
•	---	---	---

Please return completed form to **Species And Communities Branch DBCA**,
 Locked Bag 104, BENTLEY DELIVERY CENTRE WA 6983 OR email to: flora.data@dbca.wa.gov.au
RECORDS: Please forward to **Flora Administrative Officer**, Species and Communities Branch.
 Record entered by: _____ Sheet No.: _____ Record Entered in Database



Threatened and Priority Flora Report Form

HABITAT INFORMATION:

LANDFORM:	ROCK TYPE:	LOOSE ROCK:	SOIL TYPE:	SOIL COLOUR:	DRAINAGE:
Crest <input type="checkbox"/>	Granite <input type="checkbox"/>	(on soil surface; eg gravel, quartz fields)	Sand <input checked="" type="checkbox"/>	Red <input type="checkbox"/>	Well drained <input checked="" type="checkbox"/>
Hill <input type="checkbox"/>	Dolerite <input type="checkbox"/>		Sandy loam <input type="checkbox"/>	Brown <input type="checkbox"/>	Seasonally inundated <input type="checkbox"/>
Ridge <input type="checkbox"/>	Laterite <input type="checkbox"/>	0-10% <input type="checkbox"/>	Loam <input type="checkbox"/>	Yellow <input type="checkbox"/>	Permanently inundated <input type="checkbox"/>
Outcrop <input checked="" type="checkbox"/>	Ironstone <input type="checkbox"/>	10-30% <input checked="" type="checkbox"/>	Clay loam <input type="checkbox"/>	White <input type="checkbox"/>	Tidal <input type="checkbox"/>
Slope <input type="checkbox"/>	Limestone <input checked="" type="checkbox"/>	30-50% <input type="checkbox"/>	Light clay <input type="checkbox"/>	Grey <input checked="" type="checkbox"/>	
Flat <input type="checkbox"/>	Quartz <input type="checkbox"/>	50-100% <input type="checkbox"/>	Peat <input type="checkbox"/>	Black <input type="checkbox"/>	
Open depression <input type="checkbox"/>	Specify other: _____		Specify other: _____	Specify other: _____	
Drainage line <input type="checkbox"/>					
Closed depression <input type="checkbox"/>					
Wetland <input type="checkbox"/>					
	Specific Landform Element:				
	(Refer to field manual for additional values)				
CONDITION OF SOIL:	Dry <input checked="" type="checkbox"/>	Moist <input type="checkbox"/>	Waterlogged <input type="checkbox"/>	Inundated <input type="checkbox"/>	

VEGETATION CLASSIFICATION*:

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

1. Mid shrubland of Melaleuca huegelii, M. systema and Grevillea preissii subsp. preissii
2. open understorey of Desmocladus flexuosus, Banksia dallanneyi and Styliidium maritimum

3.

4.

ASSOCIATED SPECIES:

Calothamnus quadrifidus subsp. quadrifidus, Acacia lasiocarpa var. lasiocarpa

Mesomelaena pseudostygia and Lomandra maritima

Other (non-dominant) spp

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

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

COMMENT:

FIRE HISTORY: Last Fire: Season/Month: ___ Year: 5>10yrs ___ **Fire Intensity:** High Medium Low No signs of fire

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

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

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

DRF PERMIT/ LICENCE No: SL012366 Note if only observing plants (i.e. no specimens or plant material is taken) then no permit/licence is required. For further information on permit and licensing requirements see the Threatened Flora and Wildlife Licensing pages on DBCA's website. Any actions carried out under licence/permit should be recorded above in the OTHER COMMENTS section.

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

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

COPY SENT TO: Regional Office District Office Other: _____

Submitter of Record: Angela Benkovic Role: Botanist Signed: [Signature] Date: 05/03/2019

Appendix E – Fauna data

Fauna species list

Trapping results

Camera trap results

Black Cockatoo habitat assessment data

Black Cockatoo Tree monitoring data

Fauna likelihood of occurrence

Fauna list for previous and this survey

Family	Taxon	Common Name	Listing	CALM 1993	Maryan pers comm. 1996- 2004	DPaW 2013	GHD 2014a	GHD 2014b	MRIA 2018	This Survey	
				Level 2	Level 1	Level 2	Level 1	Level 2	Level 2	Level 2	Extended survey area
Birds											
Acanthizidae	<i>Acanthiza apicalis</i>	Inland Thornbill		X						X	X
Acanthizidae	<i>Acanthiza chrysorrhoa</i>	Yellow-rumped Thornbill		X			X	X	X	X	X
Acanthizidae	<i>Acanthiza inornata</i>	Western Thornbill		X				X		X	
Acanthizidae	<i>Gerygone fusca</i>	Western Gerygone		X		X	X	X	X	X	X
Acanthizidae	<i>Smicromis brevirostris</i>	Weebill		X		X	X	X	X	X	X
Acanthizidae	<i>Sericornis frontalis</i>	White-browed Scrubwren		X				X	X	X	
Accipitridae	<i>Accipiter cirrocephalus</i>	Collared Sparrowhawk		X						X	X
Accipitridae	<i>Accipiter fasciatus</i>	Brown Goshawk					X	X	X	X	X
Accipitridae	<i>Aquila audax</i>	Wedge-tailed Eagle						X	X		X
Accipitridae	<i>Circus approximans</i>	Swamp Harrier								X	X
Accipitridae	<i>Hieraaetus morphnoides</i>	Little Eagle		X						X	
Accipitridae	<i>Haliastur sphenurus</i>	Whistling Kite					X	X		X	
Accipitridae	<i>Elanus axillaris</i>	Black-shouldered Kite					X		X	X	
Acrocephalidae	<i>Acrocephalus australis</i>	Australian Reed-warbler									X
Anatidae	<i>Biziura lobata</i>	Musk duck									X
Anatidae	<i>Cygnus atratus</i>	Black Swan									X
Anatidae	<i>Tadorna tadornoides</i>	Australian Shelduck									X
Anatidae	<i>Anas superciliosa</i>	Pacific Black Duck									X
Aegothelidae	<i>Aegotheles cristatus</i>	Australian Owlet-nightjar						X			

Family	Taxon	Common Name	Listing	CALM	Maryan	DPaW	GHD	GHD	MRIA	This Survey	
				1993	pers	2013	2014a	2014b	2018	Level	Extended
				Level	comm.	Level	Level	Level	Level	2	survey
				2	1996-	2	1	2	2		area
					2004						
					Level						
					1						
Artamidae	<i>Artamus cinereus</i>	Black-faced Woodswallow							X	X	
Artamidae	<i>Artamus personatus</i>	Masked Woodswallow					X				
Artamidae	<i>Cracticus tibicen dorsalis</i>	Australian Magpie		X		X	X	X	X	X	X
Artamidae	<i>Cracticus nigrogularis</i>	Pied Butcherbird					X				
Artamidae	<i>Cracticus torquatus</i>	Grey Butcherbird		X			X	X	X	X	X
Artamidae	<i>Strepera versicolor</i>	Grey Currawong						X			
Cacatuidae	<i>Cacatua pastinator butleri</i>	Western Corella					X			X	X
Cacatuidae	<i>Cacatua sanguinea</i>	Little Corella					X	X	X	X	
Cacatuidae	<i>Cacatua tenuirostris</i>	Eastern Long-billed Corella	int						X		
Cacatuidae	<i>Calyptorhynchus banksii naso</i>	Forrest Red-tailed Black-Cockatoo	Vu, Vu						X	X	X
Cacatuidae	<i>Calyptorhynchus latirostris</i>	Carnaby's Black Cockatoo	En, En	X		X	X	X	X	X	X
Cacatuidae	<i>Eolophus roseicapilla</i>	Galah		X		X	X	X	X	X	X
Campephagidae	<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike		X		X	X	X	X	X	X
Campephagidae	<i>Lalage sueurii</i>	White-winged Triller						X		X	
Casuariidae	<i>Dromaius novaehollandiae</i>	Emu				X	X	X	X	X	X
Columbidae	<i>Columbia livia</i>	Feral Pigeon	int				X	X	X	X	
Columbidae	<i>Ocyphaps lophotes</i>	Crested Pigeon					X	X	X	X	
Columbidae	<i>Phaps chalcoptera</i>	Common Bronzewing		X		X	X	X	X	X	X
Columbidae	<i>Streptopelia senegalensis</i>	Laughing Dove	int	X			X			X	
Columbidae	<i>Streptopelia chinensis</i>	Spotted Dove	int				X			X	
Corvidae	<i>Corvus coronoides perplexus</i>	Australian Raven		X		X	X	X	X	X	X
Cuculidae	<i>Cacomantis flabelliformis</i>	Fan-tailed Cuckoo		X			X	X			

Family	Taxon	Common Name	Listing	CALM	Maryan	DPaW	GHD	GHD	MRIA	This Survey	
				1993	pers	2013	2014a	2014b	2018	Level	Extended
				Level	comm.	Level	Level	Level	Level	2	survey
				2	1996-	2	1	2	2		area
					2004						
					Level						
				1	1						
Cuculidae	<i>Cacomantis pallidus</i>	Pallid Cuckoo							X	X	
Cuculidae	<i>Chalcites lucidus</i>	Shining Bronze-cuckoo		X						X	
Cuculidae	<i>Chalcites osculans</i>	Black-eared Cuckoo				X					
Cuculidae	<i>Chrysococcyx basalis</i>	Horsefield's Bronze Cuckoo						X		X	
Eurostopodidae	<i>Eurostopodus argus</i>	Spotted Nightjar						X			
Falconidae	<i>Falco cenchroides</i>	Nankeen Kestrel					X		X	X	X
Falconidae	<i>Falco longipennis</i>	Hobby Falcon						X	X	X	X
Falconidae	<i>Falco peregrinus</i>	Peregrine Falcon	OS						X	X	X
Falconidae	<i>Falco berigora</i>	Brown Falcon								X	
Halcyonidae	<i>Dacelo novaeguineae</i>	Laughing Kookaburra	int	X			X	X	X	X	X
Halcyonidae	<i>Todiramphus sanctus</i>	Sacred Kingfisher		X				X			
Hirundinidae	<i>Hirundo neoxena</i>	Welcome Swallow		X			X	X		X	X
Hirundinidae	<i>Petrochelidon nigricans</i>	Tree Martin					X	X	X	X	X
Hirundinidae	<i>Cheramoeca leucosterna</i>	White-backed swallow									X
Maluridae	<i>Malurus splendens</i>	Splendid Fairy-wren		X		X	X	X	X	X	X
Maluridae	<i>Malurus leucopterus</i>	White-winged Fairy-wren							X	X	
Meliphagidae	<i>Acanthorhynchus superciliosus</i>	Western Spinebill		X						X	
Meliphagidae	<i>Anthochaera carunculata</i>	Red Wattlebird		X			X	X	X	X	X
Meliphagidae	<i>Anthochaera lunulata</i>	Western Little Wattlebird		X				X	X	X	
Meliphagidae	<i>Lichenostomus virescens</i>	Singing Honeyeater		X		X	X	X	X	X	X
Meliphagidae	<i>Lichmera indistincta</i>	Brown Honeyeater		X		X	X	X	X	X	X
Meliphagidae	<i>Melithreptus brevirostris</i>	Brown-headed Honeyeater						X		X	

Family	Taxon	Common Name	Listing	CALM 1993	Maryan pers comm. 1996- 2004	DPaW 2013	GHD 2014a	GHD 2014b	MRIA 2018	This Survey	
				Level 2	Level 1	Level 2	Level 1	Level 2	Level 2	Level 2	Level 2
Meliphagidae	<i>Phylidonyris niger</i>	White-cheeked Honeyeater					X	X	X	X	X
Meliphagidae	<i>Phylidonyris novaehollandiae</i>	New Holland Honeyeater		X			X		X	X	X
Meropidae	<i>Merops ornatus</i>	Rainbow bee-eater		X		X		X		X	X
Monarchidae	<i>Grallina cyanoleuca</i>	Magpie-lark					X	X	X	X	X
Motacillidae	<i>Anthus novaeseelandiae</i>	Richards Pipit					X			X	
Nectariniidae	<i>Dicaeum hirundinaceum</i>	Mistletoebird						X	X	X	
Neositidae	<i>Daphoenositta chrysoptera</i>	Varied Sittella		X				X	X	X	X
Pachycephalidae	<i>Colluricincla harmonica</i>	Grey Shrike-thrush		X		X	X	X	X	X	X
Pachycephalidae	<i>Pachycephala pectoralis</i>	Golden Whistler		X			X	X	X	X	X
Pachycephalidae	<i>Pachycephala rufiventris</i>	Rufous Whistler		X			X	X	X	X	X
Pardalotidae	<i>Pardalotus punctatus</i>	Spotted Pardalote		X							
Pardalotidae	<i>Pardalotus striatus</i>	Striated Pardalote		X		X	X	X	x	X	X
Pelicanidae	<i>Pelecanus conspicillatus</i>	Australian Pelican									X
Petroicidae	<i>Eopsaltria georgiana</i>	White-breasted Robin		X							
Petroicidae	<i>Eopsaltria griseogularis</i>	Western Yellow Robin						X			
Petroicidae	<i>Petroica boodang</i>	Scarlet Robin		X		X	X	X	X	X	X
Petroicidae	<i>Microeca fascinans</i>	Jacky Winter					X	X	X	X	X
Phasianidae	<i>Coturnix ypsilophora</i>	Brown Quail						X		X	X
Podargidae	<i>Podargus strigoides</i>	Tawny Frogmouth					X	X		X	
Psittacidae	<i>Barnadius zonarius</i>	Australian Ringneck		X		X	X	X	X	X	X
Psittacidae	<i>Glossopsitta porphyrocephala</i>	Purple-crowned Lorikeet						X		X	
Psittacidae	<i>Neophema elegans</i>	Elegant Parrot		X					X	X	X

Family	Taxon	Common Name	Listing	CALM	Maryan	DPaW	GHD	GHD	MRIA	This Survey	
				1993	pers	2013	2014a	2014b	2018	Level	Extended
				Level	comm.	Level	Level	Level	Level	2	survey
				2	1996-	2	1	2	2		area
					2004						
					Level						
				1	1						
Psittacidae	<i>Purpureicephalus spurius</i>	Red-capped Parrot		X			X	X	X	X	X
Psittacidae	<i>Trichoglossus haematodus</i>	Rainbow Lorikeet	int				X	X	X	X	X
Rallidae	<i>Fulica atra</i>	Eurasian Coot									X
Rallidae	<i>Porphyrio porphyrio</i>	Purple Swamphen									X
Rhipiduridae	<i>Rhipidura leucophrys</i>	Willie Wagtail					X	X	X	X	X
Rhipiduridae	<i>Rhipidura albiscapa</i>	Grey Fantail		X		X	X	X	X	X	X
Strigidae	<i>Ninox novaeseelandiae</i>	Boobook Owl		X				X	X	X	
Threskiornithidae	<i>Threskiornis molucca</i>	Australian White Ibis							X		X
Threskiornithidae	<i>Threskiornis spinicollis</i>	Straw-necked ibis								X	X
Tytonidae	<i>Tyto javanica</i>	Barn Owl						X		X	
Timaliidae	<i>Zosterops lateralis</i>	Silvereye		X			X	X		X	
Turnicidae	<i>Turnix velox</i>	Little Button Quail				X					
Turnicidae	<i>Turnix varius</i>	Painted button-quail								X	
Reptiles											
Agamidae	<i>Pogona minor minor</i>	Western Bearded Dragon		X	X	X	X	X		X	X
Boidae	<i>Morelia spilota imbricata</i>	Carpet Python			X		X	X			
Carphodactylidae	<i>Underwoodisaurus milii</i>	Thick-tailed Gecko							X		
Chelidae	<i>Chelodina colliei</i>	Oblong snake-necked Turtle			X						X
Diplodactylidae	<i>Crenadactylus ocellatus</i>	Clawless Gecko							X		
Diplodactylidae	<i>Strophurus spinigerus</i>	Soft Spiny-tailed Gecko			X	X		X		X	
Elapidae	<i>Brachyuropsis semifasciatus</i>	Southern Shovel-nosed Snake			X			X		X	
Elapidae	<i>Demansia psammophis</i>	Reticulated Whip Snake			X	X				X	

Family	Taxon	Common Name	Listing	CALM	Maryan	DPaW	GHD	GHD	MRIA	This Survey	
				1993	pers	2013	2014a	2014b	2018	Level	Extended
				Level	comm.	Level	Level	Level	Level	2	survey
				2	1996-	2	1	2	2		area
					2004						
					Level						
					1						
Elapidae	<i>Parasuta gouldii</i>	Gould's Hooded Snake			X					X	
Elapidae	<i>Parasuta nigriceps</i>	Mallee Black-backed Snake			X						
Elapidae	<i>Peudonaja affinis</i>	Dugite		X	X			X	X	X	X
Elapidae	<i>Pseudechis australis</i>	Mulga Snake									X
Elapidae	<i>Neelaps bimaculatus</i>	Black-napped Snake			X		X		X	X	
Elapidae	<i>Neelaps calonotus</i>	Western Black-Striped Snake	P3		X						
Elapidae	<i>Simoselaps bertholdi</i>	Jan's Banded Snake			X	X		X	X	X	X
Elapidae	<i>Echiopsis curta</i>	Bardick Snake			X					X	
Gekkonidae	<i>Christinus marmoratus</i>	Marbled Gecko			X			X	X	X	X
Pygopodidae	<i>Aprasia repens</i>	Sand-plain Worm Lizard		X	X			X	X		
Pygopodidae	<i>Delma fraseri</i>	Frasier's Legless Lizard		X	X					X	X
Pygopodidae	<i>Delma grayi</i>	Side-barred Delma			X					X	X
Pygopodidae	<i>Delma concinna</i>	Javelin legless lizard			X					X	
Pygopodidae	<i>Lialis burtonis</i>	Burton's Legless Lizard		X	X	X		X	X	X	X
Pygopodidae	<i>Pletholax gracilis</i>	Keeled legless Lizard			X						
Pygopodidae	<i>Pygopus lepidopodus</i>	Common Scalyfoot			X	X				X	
Scincidae	<i>Cryptoblephorus buchananii</i>	Buchanan's Snake-eyed Skink		X	X	X	X	X	X	X	X
Scincidae	<i>Ctenotus australis</i>	West Coast Longtail Ctenotus				X		X		X	
Scincidae	<i>Ctenotus fallens</i>	West Coast Ctenotus		X	X	X		X	X	X	X
Scincidae	<i>Cyclodomorphus celatus</i>	Western Slender Blue-tongue			X		X		X	X	X
Scincidae	<i>Egernia napoleonis</i>	Napoleon Skink		X	X					X	
Scincidae	<i>Egernia kingii</i>	King Skink			X					X	

Family	Taxon	Common Name	Listing	CALM	Maryan	DPaW	GHD	GHD	MRIA	This Survey	
				1993	pers	2013	2014a	2014b	2018	Level	Extended
				Level	comm.	Level	Level	Level	Level	2	survey
				2	1996-	2	1	2	2		area
					2004						
					Level						
					1						
Scincidae	<i>Hemiergis quadrilineata</i>	Two-toed Earless Skink		X	X	X	X	X	X	X	X
Scincidae	<i>Lerista distinguenda</i>	South-west Four-toed Lerista				X		X	X		
Scincidae	<i>Lerista elegans</i>	West Coast Four-toed Skink		X	X	X		X	X	X	X
Scincidae	<i>Lerista lineopunctulata</i>	Line-spotted Robust Slider			X						X
Scincidae	<i>Lerista praepedita</i>	West Coast Worm Slider		X	X	X		X	X	X	X
Scincidae	<i>Menetia greyii</i>	Common Dwarf Skink		X	X	X		X	X	X	X
Scincidae	<i>Morethia lineocellata</i>	Pale-flecked Snake-eyed Skink				X		X		X	X
Scincidae	<i>Morethia obscura</i>	Shrubland Snake-eyed Skink		X		X		X	X	X	X
Scincidae	<i>Tiliqua occipitalis</i>	Western Bluetongue			X			X	X	X	
Scincidae	<i>Tiliqua rugosa</i>	Bobtail		X	X	X	X	X	X	X	X
Typhlopidae	<i>Anilius australis</i>	Southern Blind Snake			X			X	X	X	
Typhlopidae	<i>Anilius pinguis</i>	Fat Blind Snake						X			
Typhlopidae	<i>Anilius waitii</i>	Southern Beaked Blindsnake						X			
Varanidae	<i>Varanus gouldii gouldii</i>	Gould's Monitor				X		X		X	X
Varanidae	<i>Varanus tristis tristis</i>	Black-headed Monitor		X					X	X	X
Mammals											
Canidae	<i>Canis domesticus</i>	Domestic Dog	int			X	X	X	X	X	X
Canidae	<i>Vulpes vulpes</i>	Red Fox	int	X		X	X	X	X	X	X
Felidae	<i>Felis catus</i>	Cat	int	X		X	X	X	X	X	X
Leporidae	<i>Oryctolagus cuniculus</i>	European Rabbit	int	X		X	X	X	X	X	X
Macropodidae	<i>Macropus fuliginosus</i>	Western Grey Kangaroo		X		X	X	X	X	X	X
Macropodidae	<i>Notamacropus irma</i>	Western Brush Wallaby	P4	X		X				X	X

Family	Taxon	Common Name	Listing	CALM 1993	Maryan pers comm. 1996- 2004	DPaW 2013	GHD 2014a	GHD 2014b	MRIA 2018	This Survey	
				Level 2	Level 1	Level 2	Level 1	Level 2	Level 2	Level 2	Level 2
Molossidae	<i>Tadarida australis</i>	White-striped Freetail Bat		X				X		X	X
Molossidae	<i>Mormopterus kitcheneri</i>	South-western Freetail Bat								X	X
Muridae	<i>Mus musculus</i>	House Mouse	int	X		X		X	X	X	X
Muridae	<i>Rattus rattus</i>	Black Rat	int			X		X	X	X	
Peramelidae	<i>Isodon fusciventer</i>	Southern Brown Bandicoot	P4			X		X	X	X	X
Phalangeridae	<i>Trichosurus vulpecula</i>	Common Brushtail Possum					X	X		X	X
Tachyglossidae	<i>Tachyglossus aculeatus</i>	Echidna				X	X	X	X	X	X
Tarsipedidae	<i>Tarsipes rostratus</i>	Honey Possum		X						X	
Vespertilionidae	<i>Chalinolobus gouldii</i>	Gould's Wattle Bat						X		X	X
Vespertilionidae	<i>Nyctophilus geoffroyi or gouldii</i>	Long-eared Bats						X		X	X
Vespertilionidae	<i>Verperdilus regulus</i>	Southern Forest Bat								X	X
Amphibians											
Hylidae	<i>Litoria adelaidensis</i>	Slender tree frog			X						X
Myobatrachidae	<i>Crinia insignifera</i>	Sign-bearing froglet			X						
Myobatrachidae	<i>Heleioporus eyrei</i>	Moaning Frog		X					X		X
Myobatrachidae	<i>Limnodynastes dorsalis</i>	Pobblebonk		X	X					X	
Myobatrachidae	<i>Myobatrachus gouldii</i>	Turtle Frog						X			

Trapping results sites 1 to 6

Common Name	Listing	Trap Site 1					Trap Site 2					Trap Site 3					Trap Site 4					Trap Site 5					Trap Site 6				
		P	T	A	C	B	P	T	A	C	B	P	T	A	C	B	P	T	A	C	B	P	T	A	C	B	P	T	A	C	B
Birds																															
Inland Thornbill																															
Yellow-rumped Thornbill																															
Western Thornbill																	18														
Western Gerygone				1						7															3						
Weebill										15																					
White-browed Scrubwren																									8					2	
Collared Sparrowhawk																															
Brown Goshawk										1																					
Wedge-tailed Eagle																															
Swamp Harrier																															
Little Eagle																	1													1	
Whistling Kite																															
Black-shouldered Kite																															
Australian Reed-warbler																															
Musk Duck																															
Black Swan																															
Australian Shelduck																															
Pacific Black Duck																															
Black-faced Woodswallow																	2														
Australian Magpie										12																					
Grey Butcherbird				1						3																					
Western Corella																															
Little Corella																															
Forrest Red-tailed Black-Cockatoo	Vu, Vu																														
Carnaby's Black Cockatoo	En, En			11						1					9					6					17					9	
Galah				11						15					2					4					6						
Black-faced Cuckoo-shrike															8					2											
White-winged Triller																															
Emu																	1														
Feral Pigeon	int																								1					2	
Crested Pigeon				1																											
Common Bronzewing				1						5					3																
Laughing Dove	int									2															1					2	
Spotted Dove	int																								4						
Australian Raven				8						3					2					4					5						
Pallid Cuckoo																															
Shining Bronze-cuckoo															1										1					3	
Horsefield's Bronze Cuckoo										1					1																
Nankeen Kestrel										1																					
Hobby Falcon																															
Peregrine Falcon	OS																													1	
Brown Falcon															1																
Laughing Kookaburra	int									5															3						
Welcome Swallow																															
Tree Martin				4											2															4	

Common Name	Listing	Trap Site 1					Trap Site 2					Trap Site 3					Trap Site 4					Trap Site 5					Trap Site 6						
		Traps	Active search	Bird Census	Noct. Search	Bat Census	Traps	Active search	Bird Census	Noct. Search	Bat Census	Traps	Active search	Bird Census	Noct. Search	Bat Census	Traps	Active search	Bird Census	Noct. Search	Bat Census	Traps	Active search	Bird Census	Noct. Search	Bat Census	Traps	Active search	Bird Census	Noct. Search	Bat Census		
White-backed swallow													2																				
Splendid Fairy-wren													2					17					4										
White-winged Fairy-wren													10																				
Western Spinebill													1																				
Red Wattlebird				11								11											3										
Western Little Wattlebird				2									1					1															
Singing Honeyeater				3									1					11												2			
Brown Honeyeater				2														28												7			
Brown-headed Honeyeater																		2															
White-cheeked Honeyeater																															1		
New Holland Honeyeater																															10		
Rainbow bee-eater				2									5																		2		
Magpie-lark													1																				
Richards Pipit																																	
Mistletoebird																																	
Varied Sittella																																	
Grey Shrike-thrush				1																											1		
Golden Whistler																																	
Rufous Whistler													1																				
Striated Pardalote				1									4																				
Australian Pelican																																	
Scarlet Robin																																	
Jacky Winter																																	
Brown Quail																																	
Tawny Frogmouth													4																				
Australian Ringneck				3									6																		6		
Purple-crowned Lorikeet																																	
Elegant Parrot				2														5													4		
Red-capped Parrot				2																													
Rainbow Lorikeet	int																																
Eurasian coot																																	
Purple Swamphen																																	
Willie Wagtail				1																												2	
Grey Fantail													1																				
Boobook Owl					1									1																		1	
Australian White Ibis																																	
Straw-necked ibis																																	
Barn Owl																																	
Silvereye																																1	
Painted button-quail																																	
Reptiles																																	
Western Bearded Dragon		1	1																													4	
Southwestern long-neck turtle																																	
Soft Spiny-tailed Gecko																																	
Southern Shovel-nosed Snake																																	
Reticulated Whip Snake																																	
Dugite		2	1																														
Mulga Snake																																	

Common Name	Listing	Trap Site 1					Trap Site 2					Trap Site 3					Trap Site 4					Trap Site 5					Trap Site 6				
		Traps	Active search	Bird Census	Noct. Search	Bat Census	Traps	Active search	Bird Census	Noct. Search	Bat Census	Traps	Active search	Bird Census	Noct. Search	Bat Census	Traps	Active search	Bird Census	Noct. Search	Bat Census	Traps	Active search	Bird Census	Noct. Search	Bat Census	Traps	Active search	Bird Census	Noct. Search	Bat Census
Black-naped Snake																															
Jan's Banded Snake																															
Bardick snake																															
Gould's Hooded Snake																															
Marbled Gecko																															
Frasier's Legless Lizard		1																													
Side-barred delma																															
Javelin legless lizard																															
Burton's Legless Lizard		3																													
Common Scalyfoot																															
Buchanan's Snake-eyed Skink			7																												
West Coast Long-tailed Ctenotus																															
West Coast Ctenotus		4	2																												
Western Slender Blue-tongue		4	2																												
Napoleon Skink																															
King skink																															
Two-toed Earless Skink		2	6																												
West Coast Four-toed Skink		3																													
Southern dotted-line robust slider																															
West Coast Worm-slider																															
Common Dwarf Skink		4	1																												
Pale-flecked Snake-eyed Skink																															
Shrubland Snake-eyed Skink																															
Western Bluetongue																															
Bobtail		3																													
Southern Blind Snake		2																													
Gould's Monitor																															
Black-headed Monitor																															
Mammals																															
Domestic Dog	int		1																												
Red Fox	int		2																												
Cat	int																														
European Rabbit	int																														
Western Grey Kangaroo			1																												
Western Brush Wallaby	P4																														
White-striped Freetail Bat																															
South-western Freetail Bat																															
House Mouse	int		1																												
Southern Brown Bandicoot	P4																														
Honey Possum																															
Gould's Wattle Bat																															
Long-eared Bats																															
Southern Forest Bat																															
Amphibians																															
Slender tree frog																															
Moaning Frog																															
Pobblebonk																															

Common Name	Listing	Trap Site 7					Trap Site 8					Trap Site 9					Cage - Line 10 (east)	Cage - Line 11 (west)	Active searches																	Opp.	Totals		
		Traps	Active search	Bird census	Noct. Search	Bat Census	Traps	Active search	Bird Census	Noct. Search	Bat Census	Traps	Active search	Bird Census	Noct. Search	Bat Census			Traps	Traps	1 Active	2 Active	3 Active	4 Active	5 Active	6 Active	7 Active	8 Active	9 Active	10 Active	11 Active	12 Active	13 Active	14 Active	15 Active			16 Active	17 Active
Soft Spiny-tailed Gecko					1						2			1			1																						16
Southern Shovel-nosed Snake												1																										1	
Reticulated Whip Snake											1																										1		
Dugite		1										1														1											9		
Mulga Snake																																1			1	2			
Black-naped Snake																									1												2		
Jan's Banded Snake											2														2												6		
Bardick snake			1																																	4			
Gould's Hooded Snake																																				3			
Marbled Gecko																																	1	1	5				
Frasier's Legless Lizard											1														1											9			
Side-barred delma												1																								3			
Javelin legless lizard																																				1			
Burton's Legless Lizard		3					4																									1				28			
Common Scalyfoot											1																									3			
Buchanan's Snake-eyed Skink																									1	1								1		14			
West Coast Long-tailed Ctenotus																																				14			
West Coast Ctenotus		8					9	2			3																									91			
Western Slender Blue-tongue		1	3				1				1																									55			
Napoleon Skink																																				1			
King skink																																				1			
Two-toed Earless Skink		1					16	1				6																								117			
West Coast Four-toed Skink		4									3	1																								34			
Southern dotted-line robust slider																																				1			
West Coast Worm-slider			1									2																								21			
Common Dwarf Skink		2					5	3			4																									46			
Pale-flecked Snake-eyed Skink																																				4			
Shrubland Snake-eyed Skink																																				10			
Western Bluetongue																																				1			
Bobtail		2					2				3	3																								14			
Southern Blind Snake							2																													5			
Gould's Monitor		1										1																						1	1	6			
Black-headed Monitor												1																								4			
Mammals																																							
Domestic Dog	int		1																																	2			
Red Fox	int							1				1																						1	3	16			
Cat	int											1																								2	5		
European Rabbit	int											2																								10			
Western Grey Kangaroo								1				3																								37			
Western Brush Wallaby	P4																																			1			
White-striped Freetail Bat						8					10																									1	86		
South-western Freetail Bat						4					4																									41			

Camera Trapping data (Hits per 24 hour period)

Common Name	Cam27	Cam5	Cam6	Cam11	Cam8	GHD1	GHD13	GHD4	GHD C	CAM G	R14	SG1	SG3	SG4	SG5	SG6	SG7	SG10
Birds																		
White-browed Scrubwren										1					2			
White-winged Triller	1																	
Laughing Dove				1														
Australian Raven																5		
Splendid Fairy-wren															3			
Brown Honeyeater																	2	
Scarlet Robin											1							
Willie Wagtail						2												
Grey Fantail															2			
Silvereye															1		2	
Painted button-quail			3															
Reptiles																		
Reticulated Whip Snake				1														
Buchanan's Snake-eyed Skink											1				3		6	
Western Bluetongue				2						1								
Bobtail	14	1		7	16	3	4	6		4	13			3				2
Gould's Monitor			2	2	1		1	3		1	3							
Black-headed Monitor					1													
Mammals																		
Domestic Dog		4								6								
Red Fox		2		2		6	1		2	1					1	2	2	2
Cat	4	1	2									1			1			3
Western Grey Kangaroo	2	1	2	11	7	2	3	3		4	3					3		11
Western Brush Wallaby					13		1	4		1	3							

Common Name	Cam27	Cam5	Cam6	Cam11	Cam8	GHD1	GHD13	GHD4	GHD C	CAM G	R14	SG1	SG3	SG4	SG5	SG6	SG7	SG10
Black Rat															6			
Southern Brown Bandicoot	10	4	20	1	8	4		7	17	7	2		3	4				11
Common Brushtail Possum													1		6	5		
Echidna		3	1	1	1								1					

Black cocky trees survey within the survey area

Number	Tree Species	Easting	Northing	DBH	Hollows Present	Hollow Entrance Size (CM)	Hollow Heights (M)	Breeding Evidence	Hollow Pole Cam Inspection	Hollow Depth	Hollow Angle	Hollow Suitability	Feeding Evidence	Roosting Evidence	Comment
T1	Tuart	378241.3	6500511.2	1700	No	-	-	No	-	-	-	-	No	No	
T2	Tuart	378219.6	6500514.8	1500	No	-	-	No	-	-	-	-	No	No	
T3	Tuart	378225.2	6500509.4	630	No	-	-	No	-	-	-	-	No	No	
T4	Tuart	378223.7	6500509.4	540	No	-	-	No	-	-	-	-	No	No	
T5	Tuart	378218.3	6500508.4	520	No	-	-	No	-	-	-	-	No	No	
T6	Tuart	378219.7	6500506.3	600	No	-	-	No	-	-	-	-	No	No	
T7	Tuart	378207.1	6500508.8	530	No	-	-	No	-	-	-	-	No	No	
T8	Marri	378191.2	6500626.7	500	No	-	-	No	-	-	-	-	Yes	No	BC feeding evidence on Marri nuts
T9	Tuart	378242.5	6500649.6	1720	No	-	-	No	-	-	-	-	No	No	
T10	Marri	378233.9	6500658.7	810	No	-	-	No	-	-	-	-	No	No	
T11	Marri	378218.7	6500652.9	820	No	-	-	No	-	-	-	-	No	No	
T12	Marri	378217.5	6500672.0	870	No	-	-	No	-	-	-	-	Yes	No	BC feeding evidence on Marri nuts
T13	Marri	378226.5	6500678.0	674	No	-	-	No	-	-	-	-	No	No	
T14	Marri	378195.4	6500646.0	589	No	-	-	No	-	-	-	-	No	No	
T15	Marri	378191.7	6500641.9	500	No	-	-	No	-	-	-	-	No	No	
T16	Marri	378170.5	6500640.8	710	No	-	-	No	-	-	-	-	No	No	
T17	Marri	378163.2	6500635.5	510	No	-	-	No	-	-	-	-	No	No	
T18	Marri	378195.2	6500663.5	600	No	-	-	No	-	-	-	-	No	No	
T19	Marri	378177.2	6500661.2	510	No	-	-	No	-	-	-	-	No	No	
T20	Marri	378176.9	6500656.8	580	No	-	-	No	-	-	-	-	No	No	
T21	Marri	378166.7	6500661.6	610	No	-	-	No	-	-	-	-	No	No	
T22	Marri	378161.2	6500671.7	590	No	-	-	No	-	-	-	-	No	No	
T23	Tuart	378154.6	6500680.1	980	No	-	-	No	-	-	-	-	No	No	
T24	Tuart	378153.6	6500693.2	510	No	-	-	No	-	-	-	-	No	No	
T25	Tuart	378160.4	6500684.4	510	No	-	-	No	-	-	-	-	No	No	
T26	Tuart	378169.5	6500687.3	500	No	-	-	No	-	-	-	-	No	No	
T27	Tuart	378171.5	6500686.9	890	No	-	-	No	-	-	-	-	No	No	
T28	Tuart	378175.3	6500682.2	610	No	-	-	No	-	-	-	-	No	No	
T29	Tuart	378171.3	6500693.2	510	No	-	-	No	-	-	-	-	No	Yes	Multistem, lots of scats and clippings looks BC
T30	Tuart	378175.6	6500694.8	510	No	-	-	No	-	-	-	-	No	No	
T31	Tuart	378181.4	6500697.7	590	No	-	-	No	-	-	-	-	No	No	
T32	Tuart	378182.3	6500699.7	710	No	-	-	No	-	-	-	-	No	No	
T33	Tuart	378186.3	6500704.5	500	No	-	-	No	-	-	-	-	No	No	
T34	Tuart	378180.6	6500706.6	500	No	-	-	No	-	-	-	-	No	Yes	Lots of scats and clippings looks BC
T35	Tuart	378188.8	6500679.1	600	No	-	-	No	-	-	-	-	No	No	
T36	Tuart	378191.7	6500685.0	940	No	-	-	No	-	-	-	-	No	No	
T37	Marri	378181.1	6500670.7	690	No	-	-	No	-	-	-	-	No	No	
T38	Tuart	378188.1	6500720.3	1010	No	-	-	No	-	-	-	-	No	No	

Number	Tree Species	Easting	Northing	DBH	Hollows Present	Hollow Entrance Size (CM)	Hollow Heights (M)	Breeding Evidence	Hollow Pole Cam Inspection	Hollow Depth	Hollow Angle	Hollow Suitability	Feeding Evidence	Roosting Evidence	Comment
T39	Tuart	378177.0	6500715.7	770	No	-	-	No	-	-	-	-	No	Yes	Lots of scats and clippings looks BC
T40	Tuart	378170.3	6500725.6	810	No	-	-	No	-	-	-	-	No	No	
T41	Tuart	378151.4	6500719.8	1520	1 small	6	12	No evidence of use	No to high	Hollow to small	45	Not suitable	No	No	
T42	Tuart	378145.1	6500718.7	670	No	-	-	No	-	-	-	-	No	No	
T43	Tuart	378148.8	6500724.6	500	No	-	-	No	-	-	-	-	No	No	
T44	Tuart	378150.5	6500729.4	580	No	-	-	No	-	-	-	-	No	No	
T45	Tuart	378152.4	6500728.1	620	No	-	-	No	-	-	-	-	No	No	
T46	Tuart	378183.2	6500734.4	580	No	-	-	No	-	-	-	-	No	No	
T47	Tuart	378162.2	6500757.1	1200	No	-	-	No	-	-	-	-	No	No	
T48	Tuart	378140.9	6500744.2	980	No	-	-	No	-	-	-	-	No	No	
T49	Tuart	378144.7	6500757.7	580	No	-	-	No	-	-	-	-	No	No	
T50	Tuart	378149.8	6500760.6	550	No	-	-	No	-	-	-	-	No	No	
T51	Tuart	378161.4	6500770.4	570	No	-	-	No	-	-	-	-	No	No	
T52	Tuart	378148.1	6500783.4	770	No	-	-	No	-	-	-	-	No	No	
T53	Tuart	378152.7	6500820.8	2100	No	-	-	No	-	-	-	-	No	No	
T54	Tuart	378148.5	6500845.4	520	No	-	-	No	-	-	-	-	No	No	
T55	Tuart	378141.7	6500836.1	540	No	-	-	No	-	-	-	-	No	No	Multistem
T56	Marri	378196.4	6500789.3	610	No	-	-	No	-	-	-	-	No	No	
T57	Marri	378207.2	6500798.5	790	No	-	-	No	-	-	-	-	No	No	
T58	Marri	378200.0	6500798.2	510	No	-	-	No	-	-	-	-	No	No	
T59	Tuart	378186.0	6500838.3	780	No	-	-	No	-	-	-	-	No	No	
T60	Tuart	378185.1	6500844.7	810	No	-	-	No	-	-	-	-	No	No	
T61	Tuart	378193.6	6500886.0	1090	No	-	-	No	-	-	-	-	No	No	
T62	Tuart	378174.8	6500884.8	1800	No	-	-	No	-	-	-	-	No	No	
T63	Tuart	378179.0	6500892.8	510	No	-	-	No	-	-	-	-	No	No	
T64	Tuart	378180.4	6500897.8	1100	No	-	-	No	-	-	-	-	No	No	
T65	Tuart	378177.2	6500903.0	780	No	-	-	No	-	-	-	-	No	No	
T66	Tuart	378182.7	6500903.7	690	No	-	-	No	-	-	-	-	No	No	
T67	Tuart	378179.1	6500918.9	970	No	-	-	No	-	-	-	-	No	No	
T68	Tuart	378168.1	6500917.7	1600	No	-	-	No	-	-	-	-	No	No	
T69	Tuart	378165.0	6500901.7	580	No	-	-	No	-	-	-	-	No	No	
T70	Tuart	378137.0	6500877.2	530	No	-	-	No	-	-	-	-	No	No	
T71	Tuart	378135.9	6500874.8	640	No	-	-	No	-	-	-	-	No	No	
T72	Tuart	378109.4	6500883.2	1350	No	-	-	No	-	-	-	-	No	No	
T73	Tuart	378107.5	6500886.3	1410	3 large	all 20 plus	7, 9, 12	No evidence of use	Yes	7m >1m, 9m is 40cm, 12m is 30 cm	2 x vertical, 1 x 45	Yes, monitor	No	No	7m one >1m deep into trunk but had barn owl present (can be seen poking head out of hollow in Picture), 9m blocked at 40cm, other trunk but bees present
T74	Tuart	378120.6	6500889.7	1750	1 large, 1 small, 1 medium	16, 6, 10	2, 4, 8	No evidence of use	Yes	All blocked	45, 2 x horizontal	Not suitable	Yes	No	Large to low and bees others to small

Number	Tree Species	Easting	Northing	DBH	Hollows Present	Hollow Entrance Size (CM)	Hollow Heights (M)	Breeding Evidence	Hollow Pole Cam Inspection	Hollow Depth	Hollow Angle	Hollow Suitability	Feeding Evidence	Roosting Evidence	Comment
T75	Tuart	378114.5	6500931.9	710	No	-	-	No	-	-	-	-	No	No	
T76	Tuart	378112.2	6500936.3	550	No	-	-	No	-	-	-	-	No	No	
T77	Tuart	378118.1	6500966.2	710	No	-	-	No	-	-	-	-	No	No	
T78	Tuart	378102.9	6500961.1	920	3 large	16, 20, 24	7, 12, 15	Potential old chews	Yes, lower hollow	7m is 30cm deep	Slight angle	Yes, visual monitor	No	No	Old chews in lower hollow, galah in top one
T79	Jarrah	378093.7	6500997.5	1150	No	-	-	No	-	-	-	-	No	No	
T80	Tuart	378098.6	6501009.3	1350	No	-	-	No	-	-	-	-	No	No	
T81	Tuart	378085.7	6501013.9	830	No	-	-	No	-	-	-	-	No	No	
T82	Tuart	378097.6	6501018.9	620	No	-	-	No	-	-	-	-	No	No	
T83	Tuart	378094.4	6501035.5	1003	No	-	-	No	-	-	-	-	No	No	
T84	Tuart	378105.8	6501039.8	1280	No	-	-	No	-	-	-	-	No	No	
T85	Tuart	378088.7	6501039.8	580	No	-	-	No	-	-	-	-	No	No	
T86	Tuart	378082.7	6501042.8	560	No	-	-	No	-	-	-	-	No	No	
T87	Tuart	378076.2	6501063.5	2500	2 large	2 x 16	12 to 15	No evidence of use	Yes	12 m is 10 cm, 15 m to high	Almost vertical	Yes, monitor	No	No	15 m to high but Eastern Long-billed Corella in 15 m
T88	Tuart	378064.8	6501088.0	1280	2 large	24, 18	2 x 8	No evidence of use	Yes	2 x blocked at 30 cm	Horizontal, 45	Not suitable	No	No	
T89	Tuart	378080.5	6501081.2	690	No	-	-	No	-	-	-	-	No	No	
T90	Tuart	378098.8	6501081.2	920	No	-	-	No	-	-	-	-	No	No	
T91	Tuart	378095.2	6501087.2	560	No	-	-	No	-	-	-	-	No	No	
T92	Tuart	378094.6	6501092.1	540	No	-	-	No	-	-	-	-	No	No	
T93	Tuart	378154.7	6501073.8	1300	No	-	-	No	-	-	-	-	No	No	
T94	Tuart	378137.0	6501122.6	950	No	-	-	No	-	-	-	-	No	No	
T95	Tuart	378140.1	6501120.8	540	No	-	-	No	-	-	-	-	No	No	
T96	Tuart	378138.7	6501132.7	700	No	-	-	No	-	-	-	-	No	No	Multistem
T97	Tuart	378134.4	6501141.8	570	No	-	-	No	-	-	-	-	No	No	
T98	Tuart	378137.7	6501141.9	760	No	-	-	No	-	-	-	-	No	No	Multistem
T99	Tuart	378130.4	6501151.9	860	No	-	-	No	-	-	-	-	No	No	Multistem
T100	Tuart	378133.4	6501153.2	790	No	-	-	No	-	-	-	-	No	No	Multistem
T101	Tuart	378128.4	6501173.0	1850	No	-	-	No	-	-	-	-	No	No	Multistem
T102	Tuart	378115.1	6501225.0	1900	No	-	-	No	-	-	-	-	No	No	
T103	Tuart	378042.8	6501227.3	1300	1 large	16	6	No evidence of use	Yes	6 m is < 1m	Almost vertical	Yes, monitor	No	No	Potentially a bit low but monitor
T104	Tuart	378052.9	6501217.6	1650	1 small	6	12	No evidence of use	No to small	Too small	Almost vertical	Not suitable	No		A pair of 28's in tree potential another hollow in canopy
T105	Tuart	378066.9	6501196.2	880	No	-	-	No	-	-	-	-	No	No	Multistem
T106	Tuart	378060.2	6501158.3	1600	4 large	All 20 plus	4, 6, 8, 12	No evidence of use	Yes	4 m approx. 1 m, 6m is 20 cm, 8 m is 1.2m	2 x vertical, 2 x horizontal	Yes, monitor	No	No	8 m is 1.2 deep with galah nesting a great hollow
T107	Tuart	378053.9	6501128.7	740	No	-	-	No	-	-	-	-	No	No	
T108	Tuart	378077.4	6501104.4	790	No	-	-	No	-	-	-	-	No	No	
T109	Tuart	378065.0	6501106.1	610	No	-	-	No	-	-	-	-	No	No	
T110	Tuart	378048.0	6501472.7	1000	No	-	-	No	-	-	-	-	No	No	Multistem

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T111	Tuart	378011.2	6501469.4	900	No	-	-	No	-	-	-	-	Yes	No	Banksia feeding
T112	Tuart	377995.4	6501520.9	550	No	-	-	No	-	-	-	-	No	No	Multistem
T113	Tuart	377971.7	6501564.6	590	No	-	-	No	-	-	-	-	No	No	Multistem
T114	Tuart	377976.2	6501571.9	1225	No	-	-	No	-	-	-	-	No	No	
T115	Tuart	377859.6	6501846.4	640	No	-	-	No	-	-	-	-	No	No	Multistem
T116	Tuart	377861.6	6501851.5	600	No	-	-	No	-	-	-	-	No	No	Multistem
T117	Tuart	377855.7	6501867.9	860	No	-	-	No	-	-	-	-	No	No	Multistem
T118	Tuart	377868.3	6501861.1	620	No	-	-	No	-	-	-	-	No	No	
T119	Tuart	377872.0	6501859.5	670	No	-	-	No	-	-	-	-	No	No	Multistem
T120	Tuart	377874.7	6501881.2	980	No	-	-	No	-	-	-	-	No	No	Multistem
T121	Tuart	377862.8	6501871.0	500	No	-	-	No	-	-	-	-	No	No	
T122	Tuart	377866.7	6501873.4	620	No	-	-	No	-	-	-	-	No	No	Multistem
T123	Tuart	377867.1	6501877.5	620	No	-	-	No	-	-	-	-	No	No	Multistem
T124	Tuart	377853.4	6501888.5	1020	No	-	-	No	-	-	-	-	No	No	
T125	Tuart	377906.0	6501847.6	540	No	-	-	No	-	-	-	-	No	No	
T126	Tuart	377899.9	6501865.6	570	No	-	-	No	-	-	-	-	No	No	
T127	Tuart	377863.7	6501899.2	500	No	-	-	No	-	-	-	-	No	No	Multistem
T128	Tuart	377852.4	6501922.0	580	No	-	-	No	-	-	-	-	No	No	Multistem
T129	Tuart	377864.2	6501937.7	520	No	-	-	No	-	-	-	-	Yes	No	Yes on sheoak FRTBC
T130	Tuart	377855.5	6501959.4	710	No	-	-	No	-	-	-	-	No	No	
T131	Tuart	377816.5	6501951.4	500	No	-	-	No	-	-	-	-	No	No	
T132	Tuart	377800.6	6501940.7	1040	No	-	-	No	-	-	-	-	No	No	
T133	Tuart	377860.1	6501987.5	910	No	-	-	No	-	-	-	-	No	No	Multistem
T134	Tuart	377844.6	6502007.1	580	No	-	-	No	-	-	-	-	No	No	Multistem
T135	Tuart	377837.4	6502031.1	1010	No	-	-	No	-	-	-	-	No	No	Multistem
T136	Tuart	377777.2	6502023.5	1190	No	-	-	No	-	-	-	-	No	No	Multistem
T137	Tuart	377793.1	6502041.2	500	No	-	-	No	-	-	-	-	No	No	Multistem
T138	Tuart	377794.4	6502058.5	580	No	-	-	No	-	-	-	-	Yes	No	Banksia's feeding, Carnaby BC
T139	Tuart	377845.7	6502088.7	990	No	-	-	No	-	-	-	-	No	No	
T140	Jarrah	377839.0	6502094.1	1500	2 large	2 x 80 gapes	11 and 12	no evidence of use	No	Damaged trunk	Vertical	Not suitable	No	No	Trunk damage hollows/gaps in side of tree
T141	Tuart	377844.3	6502102.3	840	No	-	-	No	-	-	-	-	No	No	
T142	Jarrah	377810.3	6502176.0	700	No	-	-	No	-	-	-	-	No	No	Multistem
T143	Jarrah	377813.8	6502201.1	1007	No	-	-	No	-	-	-	-	No	No	
T144	Jarrah	377785.3	6502171.1	900	1 large	60	3	No evidence of use	No too low	Debris filled	Vertical	Not suitable	No	No	Multistem
T145	Tuart	377934.3	6502115.7	600	No	-	-	No	-	-	-	-	No	No	Multistem, bark chews on main trunk at 4 m looks Galah
T146	Tuart	377944.7	6502106.2	530	No	-	-	No	-	-	-	-	No	No	Multistem
T147	Tuart	377949.3	6502106.5	560	No	-	-	No	-	-	-	-	No	No	
T148	Tuart	377901.0	6502037.7	500	No	-	-	No	-	-	-	-	No	No	Multistem
T149	Tuart	377899.9	6502032.6	850	No	-	-	No	-	-	-	-	No	No	

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T150	Tuart	377902.1	6502015.7	600	No	-	-	No	-	-	-	-	No	No	Multistem
T151	Tuart	377903.2	6502001.6	750	No	-	-	No	-	-	-	-	No	No	Multistem
T152	Tuart	377961.7	6501822.4	800	2 medium	2 x 10	3, 11	No evidence of use	Yes	3 m is 4 cm, 11 m is 50cm	Vertical	Not suitable	No	No	Multistem with possible 2 more hollows at 4 m and 5.5 m, 5 pics taken
T153	Tuart	377953.0	6501849.6	500	No	-	-	No	-	-	-	-	No	No	Active red tails within row of trees
T154	Tuart	377952.3	6501852.5	800	No	-	-	No	-	-	-	-	No	No	Active red tails within row of trees, multistem
T155	Tuart	377948.3	6501861.7	800	No	-	-	No	-	-	-	-	No	No	Active red tails within row of trees
T156	Tuart	377955.7	6501875.5	600	No	-	-	No	-	-	-	-	No	No	Active red tails within row of trees
T157	Tuart	377944.5	6501870.9	900	No	-	-	No	-	-	-	-	No	No	Active red tails within row of trees
T158	Tuart	377942.1	6501878.1	1200	No	-	-	No	-	-	-	-	No	No	Active red tails within row of trees
T159	Tuart	377937.4	6501890.6	1400	No	-	-	No	-	-	-	-	No	No	Active red tails within row of trees
T160	Tuart	378018.6	6501680.6	600	No	-	-	No	-	-	-	-	No	No	
T161	Tuart	378046.9	6501604.5	500	No	-	-	No	-	-	-	-	No	No	
T162	Tuart	378068.4	6501560.0	1105	No	-	-	No	-	-	-	-	No	No	
T163	Tuart	378073.4	6501546.4	1000	No	-	-	No	-	-	-	-	No	No	
T164	Tuart	378074.7	6501541.6	550	No	-	-	No	-	-	-	-	No	No	Multistem
T165	Tuart	378076.8	6501535.3	500	No	-	-	No	-	-	-	-	No	No	Multistem
T166	Tuart	378091.2	6501497.9	1400	No	-	-	No	-	-	-	-	No	No	Multistem, possible bark chews at 8m looks Galah
T167	Tuart	378091.9	6501491.9	1500	2 to 4	40, 20	2, 7	No evidence of use	No too low	Debris filled	45	Not suitable	No	No	Tree has one surviving branch. Rest is dead wood with some burn marks and evidence of human cutting. Bees at 7 m.
T168	Tuart	378092.9	6501488.2	1200	No	-	-	No	-	-	-	-	No	No	
T169	Tuart	378108.0	6501459.2	1200	No	-	-	No	-	-	-	-	No	No	Multistem
T170	Tuart	378120.1	6501381.2	540	No	-	-	No	-	-	-	-	yes	No	Multistem, feeding evidence Banksia cone, Carnaby's
T171	Tuart	378128.1	6501357.1	520	No	-	-	No	-	-	-	-	No	No	Multistem
T172	Marri	378136.3	6501315.4	500	No	-	-	No	-	-	-	-	yes	No	Fresh FRTBC marri nut chews
T173	Marri	378137.0	6501307.4	600	No	-	-	No	-	-	-	-	yes	No	Fresh FRTBC marri nut chews
T174	Tuart	378149.7	6501294.2	650	No	-	-	No	-	-	-	-	No	No	Multistem
T175	Tuart	378151.9	6501295.3	700	No	-	-	No	-	-	-	-	No	No	
T176	Tuart	378147.0	6501286.4	1250	No	-	-	No	-	-	-	-	No	No	Multistem
T177	Tuart	378143.8	6501282.6	500	No	-	-	No	-	-	-	-	No	No	Multistem

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T178	Tuart	378138.1	6501281.2	900	1 medium, 1 small	10, 5	8, 7	No evidence of use	No to small	Hollow entrance to small	45	Not suitable	No	No	Multistem
T179	Tuart	378150.8	6501239.0	600	No	-	-	No	-	-	-	-	No	No	
T180	Tuart	378155.3	6501237.0	700	No	-	-	No	-	-	-	-	No	No	
T181	Tuart	378151.8	6501235.0	500	No	-	-	No	-	-	-	-	No	No	
T182	Tuart	378153.1	6501228.5	500	No	-	-	No	-	-	-	-	No	No	
T183	Tuart	378154.7	6501230.6	500	No	-	-	No	-	-	-	-	No	No	Multistem
T184	Tuart	378158.1	6501231.1	600	No	-	-	No	-	-	-	-	No	No	
T185	Tuart	378157.0	6501227.9	500	No	-	-	No	-	-	-	-	No	No	
T186	Tuart	378156.5	6501221.4	620	No	-	-	No	-	-	-	-	No	No	
T187	Tuart	378155.4	6501220.5	500	No	-	-	No	-	-	-	-	No	No	
T188	Tuart	378158.9	6501219.7	700	No	-	-	No	-	-	-	-	No	No	
T189	Tuart	378157.1	6501211.9	1100	No	-	-	No	-	-	-	-	No	No	
T190	Tuart	378161.2	6501199.1	1100	No	-	-	No	-	-	-	-	No	No	
T191	Tuart	378161.1	6501198.0	800	No	-	-	No	-	-	-	-	No	No	
T192	Tuart	378163.6	6501194.5	900	No	-	-	No	-	-	-	-	No	No	
T193	Tuart	378161.5	6501193.6	850	No	-	-	No	-	-	-	-	No	No	
T194	Tuart	378163.9	6501190.5	700	No	-	-	No	-	-	-	-	No	No	Multistem
T195	Tuart	378163.0	6501188.1	550	No	-	-	No	-	-	-	-	No	No	
T196	Tuart	378164.6	6501186.7	520	No	-	-	No	-	-	-	-	No	No	
T197	Tuart	378165.5	6501183.8	500	No	-	-	No	-	-	-	-	No	No	
T198	Tuart	378167.2	6501173.1	750	No	-	-	No	-	-	-	-	No	No	
T199	Tuart	378169.8	6501171.1	600	No	-	-	No	-	-	-	-	No	No	
T200	Tuart	378168.8	6501170.0	600	No	-	-	No	-	-	-	-	No	No	
T201	Tuart	378169.4	6501168.5	650	No	-	-	No	-	-	-	-	No	No	
T202	Tuart	378177.4	6501153.2	1100	1 small	3	2	No evidence of use	No to small	Hollow entrance to small	45	Not suitable	No	No	Dead tree with hollow with bees
T203	Tuart	378176.1	6501144.4	650	No	-	-	No	-	-	-	-	No	No	
T204	Tuart	378175.5	6501142.7	500	No	-	-	No	-	-	-	-	No	No	
T205	Tuart	378176.2	6501141.6	500	No	-	-	No	-	-	-	-	No	No	Multistem
T206	Tuart	378178.5	6501139.2	700	No	-	-	No	-	-	-	-	No	No	Multistem
T207	Tuart	378171.7	6501126.5	520	2 small	2 x 2	2, 3	No evidence of use	No to small	Hollow entrance to small	45	Not suitable	No	No	
T208	Tuart	378174.5	6501124.7	1500	3 small	2 x 4	18	No evidence of use	No too high	Hollow entrance to small	45	Not suitable	No	No	
T209	Tuart	378184.0	6501117.1	900	No	-	-	No	-	-	-	-	No	No	
T210	Tuart	378183.3	6501102.6	800	No	-	-	No	-	-	-	-	No	No	
T211	Tuart	378165.5	6501103.5	1200	No	-	-	No	-	-	-	-	No	No	
T212	Tuart	378167.7	6501096.7	1200	No	-	-	No	-	-	-	-	No	No	Multistem
T213	Tuart	378169.7	6501089.4	1100	No	-	-	No	-	-	-	-	No	No	Multistem
T214	Tuart	378172.1	6501071.7	850	No	-	-	No	-	-	-	-	No	No	Multistem
T215	Tuart	378187.6	6501094.9	1200	1 medium	10	16	No evidence of use	No to high	Hollow entrance to small	Vertical	Not suitable	No	No	Multistem
T216	Tuart	378192.7	6501072.0	800	No	-	-	No	-	-	-	-	No	No	Multistem

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T217	Tuart	378197.4	6501069.1	1400	1 medium	7	20	No evidence of use	No to high	Hollow entrance to small	Vertical	Not suitable	No	No	Multistem form with 2 lorikeets at top of snapped dead wood branch - possible hollow
T218	Tuart	378206.7	6501066.8	900	No	-	-	No	-	-	-	-	No	No	
T219	Tuart	378208.3	6501060.7	1200	No	-	-	No	-	-	-	-	No	No	Multistem
T220	Tuart	378210.6	6501039.7	800	No	-	-	No	-	-	-	-	No	No	
T221	Tuart	378210.4	6501035.0	550	No	-	-	No	-	-	-	-	No	No	Multistem
T222	Tuart	378211.9	6501032.0	500	No	-	-	No	-	-	-	-	No	No	
T223	Tuart	378207.5	6501029.6	1400	No	-	-	No	-	-	-	-	No	No	
T224	Tuart	378191.9	6501021.4	600	No	-	-	No	-	-	-	-	No	No	
T225	Tuart	378185.2	6501028.2	1200	No	-	-	No	-	-	-	-	No	No	
T226	Tuart	378208.5	6501018.2	500	No	-	-	No	-	-	-	-	No	No	Multistem
T227	Tuart	378214.8	6501017.5	2300	3 large, 2 medium	20, 10, 10, 20, 15	4, 6, 11, 11, 13	No evidence of use	Yes	4 m is 30 cm, 6 m is 10 cm, 11 m is 10 cm	45 and vertical	Not suitable	No	No	Multistem. 4 m high hollow is 30 cm deep and too low for BC. Hollow at 6 m and 10 m are blocked. Possible other higher hollows but too high to be reached with pole cam. No monitoring.
T228	Tuart	378219.1	6500995.0	1100	1 small	5	0.5	No evidence of use	No too low	Hollow entrance to small	45	Not suitable	No	No	Multistem
T229	Tuart	378218.4	6500991.6	1100	No	-	-	No	-	-	-	-	No	No	
T230	Jarra	378221.4	6500983.4	800	2 large	30	1, 4	No evidence of use	No too low	1 m is 40 cm	Horizontal	Not suitable	No	No	
T231	Tuart	378234.4	6500949.6	1100	No	-	-	No	-	-	-	-	No	No	
T232	Euc sp.	378237.4	6500930.1	1100	No	-	-	No	-	-	-	-	No	No	
T233	Jarra	378229.7	6500880.5	1500	2 large	12, 12	3, 10	No evidence of use	Yes	3 m is 70 cm, 10 m is 20 cm	Vertical	Not suitable	No	No	Bees in tree hard to pick where hive is positioned
T234	Tuart	378233.9	6500879.2	600	No	-	-	No	-	-	-	-	No	No	Multistem
T235	Tuart	378225.6	6500876.8	750	No	-	-	No	-	-	-	-	No	No	Multistem
T236	Tuart	378229.6	6500868.5	2200	1 large, 1 small	20, 5	20, 3	No evidence of use	Yes	3 m is 30 cm (bees)	Vertical	Yes, visual monitor	No	No	Multistem, Bees in lower hollow, possibly other higher hollows but too high to reach with cam. Monitor.
T237	Marri	378254.7	6500883.2	500	No			No					yes	No	Feeding evidence on Marri nuts
T238	Tuart	378262.1	6500861.0	1600	1 large	30	2	No evidence of use	No too low	2 m is 30 cm	45	Not suitable	No	No	
T239	Tuart	378262.2	6500854.1	2200	2 large, 2 medium	10, 15, 15, 10	6, 8, 8.5, 20	Old chews present	Yes	6 m is 10 cm, 8 m is 10 cm, 8.5 m is 10 cm	45 and vertical	Yes, visual monitor	No	No	Multistem, 28 parrots nesting in upper canopy. Large hollow at 15-20 m appears to have chews. Tree martins nesting in canopy. 6 m & 8 m hollows checked with camera but blocked. Monitor large hollow.
T240	Tuart	378228.5	6500826.6	1500	No	-	-	No	-	-	-	-	No	No	

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T241	Tuart	378225.9	6500819.0	1100	No	-	-	No	-	-	-	-	No	No	
T242	Tuart	378243.3	6500827.9	1800	2 large, 1 medium	20, 10, 20	8, 15, 20	Possible internal chews	Yes	8 m is 90 cm	Vertical	Yes, visual monitor	No	No	20 m hollow guarded by galahs in tree, numerous hollows near top and at least one has bees. Large hollow at 7 m, 20 cm wide and 90 cm deep. Possibly worked in the past Monitor. Gallahs nesting in higher hollow.
T243	E. rudis	378270.9	6500829.4	550	No	-	-	No	-	-	-	-	No	No	Multistem
T244	Tuart	378237.6	6500809.4	700	No	-	-	No	-	-	-	-	No	No	
T245	Tuart	378243.6	6500804.0	2000	3 large	20, 15, 20	25, 30, 10	No evidence of use	No too high	Not assessed	45	Yes, visual monitor	No	No	Galah in tree and chewing on branches, bees present in lower hollow but upper large ones look good but too high for pole cam.
T246	E. rudis	378276.7	6500814.2	500	No	-	-	No	-	-	-	-	No	No	
T247	Tuart	378282.4	6500794.7	600	No	-	-	No	-	-	-	-	No	No	Multistem
T248	Tuart	378256.7	6500787.3	800	1 large, 1 medium	10, 30	5, 1.7	No evidence of use	Yes	1.7 m is 10 cm, 5m is 20 cm	45	Not suitable	No	No	Multistem form galahs in tree, second large hollow in old burnt out stem, lots of gaps in wood. No monitoring.
T249	Tuart	378285.7	6500779.2	600	No	-	-	No	-	-	-	-	No	No	Multistem form 28 parrots in tree, may be higher hollow
T250	Tuart	378277.1	6500780.0	1200	No	-	-	No	-	-	-	-	No	No	
T251	Tuart	378246.2	6500757.3	550	No	-	-	No	-	-	-	-	No	No	Multistem
T252	Tuart	378264.7	6500757.3	1600	2 large	15, 15	15, 25	Old chews present	No too high	not assessed	45	Yes, visual monitor	No	No	Bees in lower hollow, but large above has chews possible Galah but too high for pole cam, monitor.
T253	Tuart	378268.2	6500756.9	500	No	-	-	No	-	-	-	-	No	No	
T254	Tuart	378291.0	6500759.6	2000	No	-	-	No	-	-	-	-	No	No	Possible large hollow at 10 m
T255	Tuart	378248.2	6500738.6	1400	No	-	-	No	-	-	-	-	No	No	
T256	Tuart	378256.8	6500736.9	550	No	-	-	No	-	-	-	-	No	No	
T257	Tuart	378265.0	6500739.3	500	No	-	-	No	-	-	-	-	No	No	
T258	Tuart	378273.5	6500742.8	900	No	-	-	No	-	-	-	-	No	No	Multistem
T259	Tuart	378275.3	6500727.7	1300	2 large, 1 medium	20, 20, 10	10, 16, 17	No evidence of use	Yes	10 m is 20 cm, 2 large look good	Vertical	Yes, visual monitor	No	No	Multistem form. All hollows in dead wood from original main stem, more hollows further up. One at 10 m appears blocked but in dense foliage, others too high to assess. Monitor.
T260	Tuart	378271.1	6500719.4	900	No	-	-	No	-	-	-	-	No	No	

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T261	Tuart	378269.8	6500718.0	900	1 medium	10	16	No evidence of use	No, foliage	To high	Vertical	Not suitable	No	No	Dead/Dying Tuart, Pardalotes nesting in a very small cavity. Checked from ground level. Too high for pole cam.
T262	Tuart	378294.3	6500716.2	900	No	-	-	No	-	-	-	-	No	No	
T263	Tuart	378297.1	6500700.0	1050	1 medium	10	5	No evidence of use	Yes	5 m is 30 cm	45	Not suitable	No	No	Medium hollow at 5 m, 30 cm. Deep, not suitable. No monitoring.
T264	Tuart	378273.0	6500694.4	1200	No	-	-	No	-	-	-	-	No	No	
T265	Marri	378254.8	6500713.6	700	No	-	-	No	-	-	-	-	No	No	
T266	Tuart	378273.5	6500673.2	900	No	-	-	No	-	-	-	-	No	No	-
T267	Tuart	378280.6	6500665.3	1200	No	-	-	No	-	-	-	-	No	No	-
T268	Tuart	378279.6	6500663.7	1300	No	-	-	No	-	-	-	-	No	No	-
T269	Tuart	378400.1	6500499.7	950	1 medium	7	2	No evidence of use	No too low	2 m is 10 cm	45	Not suitable	No	No	-
T270	Tuart	378369.8	6500498.0	1100	No	-	-	No	-	-	-	-	No	No	-
T271	Tuart	378478.6	6500244.3	900	No	-	-	No	-	-	-	-	No	No	-
T272	Tuart	378490.8	6500232.6	500	No	-	-	No	-	-	-	-	No	No	-
T273	Tuart	378491.1	6500230.4	500	No	-	-	No	-	-	-	-	No	No	-
T274	Tuart	378494.1	6500227.2	550	No	-	-	No	-	-	-	-	No	No	-
T275	Jarrah	378954.5	6499433.7	1500	3 large	25, 20, 20	5, 8, 10	No evidence of use	Yes	5 m 30cm, 8 m 30 cm, 10 m 30cm	45	Not suitable	yes	No	Chewed nuts with no mandible marks possible FRTBC, all hollows blocked, deepest at 30 cm. No monitoring.
T276	Jarrah	378967.4	6499431.4	830	No	-	-	No	-	-	-	-	yes	No	
T277	Jarrah	378985.7	6499409.1	500	No	-	-	No	-	-	-	-	No	No	
T278	Jarrah	379011.2	6499380.2	1000	1 medium, 1 small	10, 5	10, 11	No evidence of use	Yes	10 m is 10 cm, 11 m is 15 cm	45	Not suitable	No	No	Both large hollows blocked, 2 small hollows are good hollows but too small for BC. No monitoring.
T279	Jarrah	379012.1	6499369.6	650	3 large, 2 small	5, 5, 20, 20, 15	11, 11, 6, 8, 9	No evidence of use	Yes	11 m is 60 cm, 11 m is 50 cm, 6m is 15 cm, 8 m is 20 cm, 9 m is 30 cm	45 and vertical	Not suitable	No	No	Several potential hollows, most blocked or too small for BC (15-30 cm deep). Two small/medium hollows are at least 60 cm deep but too small. No monitoring.
T280	Jarrah	378999.5	6499363.9	1400	1 large, 2 medium, 2 small	10, 15, 3, 6, 7	6, 7, 5, 10, 10	No evidence of use	Yes	All blocked	46 and vertical	Not suitable	No	No	
T281	Jarrah	379001.2	6499359.1	900	2 medium, 1 small	5, 10, 10	11, 11, 12	No evidence of use	Yes	All blocked	47 and vertical	Not suitable	No	No	
T282	Jarrah	378986.3	6499357.0	900	2 large	20, 20	6, 3	No evidence of use	Yes	6 m is 30 cm, 3 m blocked	Vertical	Not suitable	No	No	Dead/Dying Jarrah with hollows
T283	Jarrah	379023.9	6499351.6	800	2 small	5	15	No evidence of use	No too high	Not assessed	Vertical	Not suitable	yes	No	Chewed banksia, carney's

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T284	Jarrah	379012.8	6499337.2	650	No	-	-	No	-	-	-	-	yes	No	Chewed jarrah nuts no mandible mark
T285	Jarrah	379049.2	6499318.1	1100	2 medium, 2 small	5, 5, 10, 10	15, 14, 13, 15	No evidence of use	No too high	Not assessed	45 and vertical	Not suitable	No	No	To small
T286	Jarrah	379059.4	6499309.6	600	No	-	-	No	-	-	-	-	No	No	
T287	Jarrah	379077.3	6499328.0	1000	2 large	20, 20	4.5, 6	No evidence of use	Yes	All blocked	47 and vertical	Not suitable	No	No	Dead/Dying Jarrah with hollows
T288	Jarrah	379084.9	6499322.0	500	No	-	-	No	-	-	-	-	No	No	-
T289	Jarrah	379194.2	6499217.9	800	No	-	-	No	-	-	-	-	yes	No	
T290	Jarrah	379216.3	6499225.4	550	No	-	-	No	-	-	-	-	No	No	-
T291	Jarrah	379221.3	6499225.5	800	1 medium, 1 small	10, 5	5, 6	No evidence of use	No	Hollows to small	47 and vertical	Not suitable	No	No	-
T292	Jarrah	379215.7	6499182.6	500	No	-	-	No	-	-	-	-	No	No	-
T293	Tuart	379279.6	6499157.2	800	No	-	-	No	-	-	-	-	No	No	Multistem
T294	Tuart	379291.4	6499118.4	850	No	-	-	No	-	-	-	-	No	No	-
T295	Tuart	379347.2	6499139.3	1100	No	-	-	No	-	-	-	-	No	No	-
T296	Tuart	379357.3	6499114.3	1000	No	-	-	No	-	-	-	-	No	No	-
T297	Tuart	379398.7	6499106.6	1500	No	-	-	No	-	-	-	-	No	No	-
T298	Tuart	379409.8	6499102.1	900	No	-	-	No	-	-	-	-	No	No	-
T299	Tuart	379385.6	6499076.5	1200	1 small, 2 large	5, 2 x 20	8, 11, 15	Old chews present	Yes	8 m >1 m, 11 m is 1 m	Vertical	Yes, monitor	No	No	Lowest hollow has bees. Hollow at 11 m has old chews and is BC size but can't see pics/ 11 m medium hollow is good to be a nest hollow. Large hollow is too high to photograph but looks good from ground level. Monitor.
T300	Jarrah	379365.9	6499067.7	650	No	-	-	No	-	-	-	-	No	No	-
T301	Tuart	379412.8	6499033.9	600	No	-	-	No	-	-	-	-	No	No	Multistem
T302	Jarrah	379416.6	6499014.3	900	2 large, 1 medium	20, 20, 10	5, 8, 9	No evidence of use	Yes	5 m is 10 cm, 8 m is 20 cm, 9 m is 15 cm	Vertical and 45	Not suitable	No	No	3 hollows, all blocked or too small. No evidence of being worked. No monitoring.
T303	Jarrah	379430.9	6498994.7	750	2 small	5, 2	1.5, 2	No evidence of use	No	Hollows to small	47 and vertical	Not suitable	No	No	-
T304	Tuart	379457.9	6498940.0	1000	No	-	-	No	-	-	-	-	No	No	-
T305	Tuart	379436.4	6499066.7	600	No	-	-	No	-	-	-	-	No	No	-
T306	Jarrah	379461.6	6499041.8	700	No	-	-	No	-	-	-	-	No	No	-
T307	Tuart	379461.0	6499024.2	1200	2 medium	10, 10,	10, 10	No evidence of use	No	Hollows to small	Vertical	Not suitable	No	No	3 other possible hollows at branch terminations
T308	Tuart	379460.6	6499022.9	750	2 large, 1 small	5, 30, 20	5, 7, 4	Old chews present	Yes	5 m and 7 m are same hollow and 1 m, 4 m is 20 cm	Vertical and 45	Yes, monitor	No	No	Dead Tuart with hollows. Lowest large hollow blocked at 20 cm. Hollows in main stem with multiple entrances, monitor but unlikely to be used again.
T309	Tuart	379520.9	6498914.7	550	No	-	-	No	-	-	-	-	No	No	Multistem

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T310	Tuart	379518.7	6498916.2	570	3 medium, 1 small	5, 10, 10, 10	5, 6, 10, 10	Old chews present	Yes	Hollows too small	47 and vertical	Not suitable	No	No	Dead Tuart with hollows, two higher hollows- one blocked and split at 40 cm, the other at 30 cm. No monitoring.
T311	Tuart	379532.2	6498865.9	720	No	-	-	No	-	-	-	-	No	No	Multistem
T312	Tuart	379552.4	6498890.1	750	No	-	-	No	-	-	-	-	No	No	Multistem, 5 red tails in adjacent east tree
T313	Tuart	379569.0	6498824.0	650	No	-	-	No	-	-	-	-	No	No	
T314	Tuart	379580.4	6498779.0	1300	2 large, 3 medium	10, 15, 20, 10, 10	3, 11, 3.5, 7, 13,	No evidence of use	Yes	3 m 10 cm, 11 m 20 cm, 3.5 m 5 cm, 7 m 30 cm	vertical and 45	Not suitable	No	No	3 m hollow is split and not a hollow, not large enough for BC, 2 medium hollows only 20-30 cm deep. 28s nesting in canopy but can't see hollow. No monitoring.
T315	Tuart	379615.2	6498756.9	1700	6 medium	10, 10, 10, 10, 10	4, 13, 14, 20, 5	No evidence of use	Yes	4 m is 20 cm, 5 m is 5 cm	vertical and 46	Not suitable	No	No	Galahs sitting in tree near hollow
T316	Tuart	379594.1	6498734.2	1900	No	-	-	No	-	-	-	-	No	No	-
T317	Tuart	379601.0	6498710.4	850	No	-	-	No	-	-	-	-	No	No	-
T318	Tuart	379593.4	6498539.6	600	No	-	-	No	-	-	-	-	No	No	Multistem
T319	Tuart	379587.8	6498632.5	800	No	-	-	No	-	-	-	-	No	No	-
T320	Tuart	379596.7	6498640.6	600	No	-	-	No	-	-	-	-	No	No	Multistem
T321	Tuart	379587.1	6498655.4	530	No	-	-	No	-	-	-	-	No	No	-
T322	Tuart	379571.8	6498700.2	600	No	-	-	No	-	-	-	-	No	No	Multistem
T323	Tuart	379570.4	6498704.1	600	No	-	-	No	-	-	-	-	No	No	Multistem
T324	Tuart	379571.9	6498706.1	600	No	-	-	No	-	-	-	-	No	No	-
T325	Tuart	379575.7	6498730.0	800	1 large	30	7	Old chews present	Yes	1.2 m deep	Vertical	Yes, monitor	No	No	1 large hollow at 7 m, 20 cm deep, old chews, monitor.
T326	Tuart	379563.9	6498728.4	500	No	-	-	No	-	-	-	-	No	No	-
T327	Tuart	379566.4	6498768.2	950	4 large	20, 20, 15, 25	3, 5, 6, 11	Old chews present	Yes	3 m is 10 cm, 5 m is 10 cm, 6 m is 10 cm, 11 m is 2 m	vertical and 45	Yes, monitor	No	No	Multistem. Lower three hollows blocked. 11 m, 25 cm wide with old chews, possibly 2 m deep. Potentially suitable. Monitor.
T328	Tuart	379560.6	6498795.1	540	No	-	-	No	-	-	-	-	No	No	Multistem
T329	Tuart	379536.7	6498818.5	950	1 large, 2 medium, 1 small	10, 10, 5, 15	4, 8, 11, 5	No evidence of use	Yes	4 m is 30 cm, 8 m is 10 cm, 11 m is 10 cm, 5 m is 10 cm	vertical and 45	Not suitable	No	No	All hollows blocked, not large enough for BC. No monitoring.
T330	Tuart	379531.4	6498839.5	550	No	-	-	No	-	-	-	-	No	No	Multistem
T331	Tuart	379516.8	6498850.0	600	No	-	-	No	-	-	-	-	No	No	-
T332	Tuart	379503.2	6498838.6	650	No	-	-	No	-	-	-	-	No	No	-
T333	Tuart	379492.3	6498858.6	550	No	-	-	No	-	-	-	-	No	No	-
T334	Tuart	379492.8	6498868.9	550	No	-	-	No	-	-	-	-	No	No	-

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T335	Tuart	379479.1	6498869.0	700	2 large, 2 medium	20, 15, 10, 10	1.5, 4, 6, 8,	No evidence of use	Yes	1.5 m is 30 cm, 4 m is 20 cm, 6 m is 10 cm, 8 m is 15 cm	vertical and 45	Not suitable	No	No	Multistem. Low hollow filled with termite mud, lowest horizontal hollow is 30 cm deep. Highest hollow looks big from the entrance but becomes smaller and is too small for BC. No monitoring.
T336	Tuart	379488.7	6498891.9	650	No	-	-	No	-	-	-	-	No	No	-
T337	Tuart	379457.0	6498940.1	850	No	-	-	No	-	-	-	-	No	No	-
T338	Tuart	379451.7	6498969.0	600	No	-	-	No	-	-	-	-	No	No	-
T339	Tuart	379434.9	6498961.7	1000	1 large, 1 small	20, 5	5, 11	No evidence of use	Yes	5 m is 10 cm	Vertical and 45	Not suitable	No	No	Dead Tuart with hollows. One hollow is blocked at entrance, the other is 10 cm deep. No monitoring.
T340	Jarra	379431.0	6498994.4	700	No	-	-	No	-	-	-	-	No	No	-
T341	Tuart	380059.9	6497674.7	900	No	-	-	No	-	-	-	-	No	No	-
T342	Tuart	380308.7	6497000.9	570	No	-	-	No	-	-	-	-	No	No	-
T343	Tuart	379497.3	6498694.7	900	4 large	30, 30, 25, 20	7, 7, 5, 7	No evidence of use	Yes	All blocked at around 20 cm	Vertical and 45	Not suitable	No	No	Multistem
T344	Tuart	379524.5	6498722.1	1100	2 large, 2 medium	25, 20, 10, 10	2, 11, 4, 7	No evidence of use	Yes	All blocked	Vertical and 45	Not suitable	No	No	All hollows blocked
T345	Tuart	379535.9	6498663.7	500	No	-	-	No	-	-	-	-	No	No	Multistem
T346	Tuart	379533.8	6498642.1	800	No	-	-	No	-	-	-	-	No	No	-
T347	Jarra	379481.8	6498792.4	900	No	-	-	No	-	-	-	-	No	No	-
T348	Tuart	379475.8	6498808.3	900	No	-	-	No	-	-	-	-	No	No	-
T349	Jarra	379472.2	6498808.0	550	No	-	-	No	-	-	-	-	No	No	-
T350	Jarra	379453.6	6498834.4	500	No	-	-	No	-	-	-	-	No	No	-
T351	Jarra	379435.5	6498836.7	550	No	-	-	No	-	-	-	-	No	No	-
T352	Tuart	379455.2	6498843.5	900	No	-	-	No	-	-	-	-	No	No	-
T353	Jarra	379433.7	6498877.8	550	No	-	-	No	-	-	-	-	No	No	-
T354	Jarra	379426.0	6498883.3	580	No	-	-	No	-	-	-	-	No	No	-
T355	Jarra	379416.7	6498893.2	660	No	-	-	No	-	-	-	-	No	No	-
T356	Jarra	379429.0	6498897.1	900	No	-	-	No	-	-	-	-	No	No	-
T357	Jarra	379384.3	6498934.9	550	No	-	-	No	-	-	-	-	No	No	Multistem
T358	Jarra	379407.9	6498942.6	1100	No	-	-	No	-	-	-	-	No	No	Multistem
T359	Jarra	379383.6	6498960.0	700	No	-	-	No	-	-	-	-	No	No	-
T360	Jarra	379383.7	6498934.4	600	No	-	-	No	-	-	-	-	No	No	Multistem
T361	Jarra	379357.9	6498868.1	600	No	-	-	No	-	-	-	-	Yes	No	Chewed jarrah nuts FRTBC
T362	Jarra	379358.9	6498856.2	650	No	-	-	No	-	-	-	-	Yes	No	Chewed jarrah nuts FRTBC
T363	Jarra	379379.3	6498855.1	650	No	-	-	No	-	-	-	-	Yes	No	Chewed jarrah nuts
T364	Jarra	379385.3	6498850.5	570	No	-	-	No	-	-	-	-		No	-
T365	Tuart	379393.6	6498833.1	700	1 large, 1 medium	25, 11	6 and 7	No evidence of use	Yes	6 is 40 cm, 7 is 20 cm	Vertical and horizontal	Not suitable	Yes	No	To shallow
T366	Jarra	379384.8	6498819.5	600	No	-	-	No	-	-	-	-	No	No	-

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T367	Jarrah	379379.6	6498799.4	670	1 small	6	6	No evidence of use	Yes	20 cm	Vertical	Not suitable	No	No	To shallow
T368	Jarrah	379411.2	6498804.3	910	1 large	16	4	No evidence of use	Yes	30 cm	Vertical	Not suitable	Yes	No	To shallow
T369	Jarrah	379424.3	6498777.8	510	No	-	-	No	-	-	-	-	No	No	-
T370	Jarrah	379431.7	6498760.7	530	No	-	-	No	-	-	-	-	No	No	-
T371	Jarrah	379428.3	6498751.6	620	1 large	30	4	No evidence of use	Yes	20 cm	45	Not suitable	Yes	No	To shallow
T372	Tuart	378234.3	6500486.3	1950	5 medium	10, 7, 10, 10, 10	12, 6, 5, 7, 15	No	-	-	-	Not suitable	No	No	Two hollows blocked at 20 cm, one blocked at 10 cm, 6 m high hollow may have old Galah chews.
T373	Tuart	378229.4	6500483.9	650	No	-	-	No	-	-	-	-	No	No	-
T374	Tuart	378216.6	6500495.7	1550	No	-	-	No	-	-	-	-	Yes	No	FRTBC chew marri nut
T375	Tuart	378273.9	6500459.4	850	No	-	-	No	-	-	-	-	No	No	Multistem
T376	Tuart	378268.1	6500455.3	600	No	-	-	No	-	-	-	-	No	No	-
T377	Tuart	378278.2	6500455.9	800	No	-	-	No	-	-	-	-	No	No	Multistem
T378	Tuart	378282.4	6500453.2	650	No	-	-	No	-	-	-	-	No	No	-
T379	Jarrah	378282.6	6500444.7	1250	2 small	2 x 6	5	No evidence of use	No	Hollow to small	-	Not suitable	No	No	-
T380	Tuart	378287.5	6500437.9	500	No	-	-	No	-	-	-	-	No	No	Multistem
T381	Tuart	378288.9	6500464.8	1100	No	-	-	No	-	-	-	-	No	No	-
T382	Tuart	378166.4	6500491.4	600	No	-	-	No	-	-	-	-	No	No	-
T383	Tuart	378164.9	6500491.4	640	No	-	-	No	-	-	-	-	No	No	-
T384	Tuart	378153.4	6500506.1	500	No	-	-	No	-	-	-	-	No	No	Multistem
T385	Tuart	378145.7	6500491.6	950	No	-	-	No	-	-	-	-	No	No	Multistem
T386	Tuart	378157.6	6500450.3	900	No	-	-	No	-	-	-	-	No	No	-
T387	Tuart	378168.7	6500434.9	600	No	-	-	No	-	-	-	-	No	No	-
T388	Jarrah	378128.1	6500422.0	550	No	-	-	No	-	-	-	-	Yes	No	4 red tails feeding on nearby marri
T389	Tuart	378114.2	6500434.4	900	No	-	-	No	-	-	-	-	Yes	No	Multistem, chewed nuts and nearby red tails
T390	Jarrah	378042.2	6500420.7	500	No	-	-	No	-	-	-	-	Yes	No	Multistem, chewed nuts and nearby red tails
T391	Jarrah	378030.9	6500429.7	680	No	-	-	No	-	-	-	-	Yes	No	red tail chewed nuts
T392	Jarrah	378023.5	6500440.3	970	1 medium	10	9	No evidence of use	No	Hollow to small	45	Not suitable	Yes	No	Multistem, chewed nuts, red tails
T393	Jarrah	378032.0	6500453.5	700	No	-	-	No	-	-	-	-	Yes	No	Chewed jarrah nuts
T394	Jarrah	378019.3	6500452.7	1200	No	-	-	No	-	-	-	-	Yes	No	FRTBC chewed nuts, half of tree has been previously burnt
T395	Jarrah	378005.9	6500441.6	500	No	-	-	No	-	-	-	-	No	No	-
T396	Jarrah	378009.0	6500451.4	650	No	-	-	No	-	-	-	-	No	No	Multistem
T397	Jarrah	377960.0	6500439.2	500	No	-	-	No	-	-	-	-	No	No	-
T398	Jarrah	377956.8	6500434.8	600	No	-	-	No	-	-	-	-	Yes	No	Old chewed nuts
T399	Jarrah	377939.7	6500442.6	550	No	-	-	No	-	-	-	-	No	No	Multistem
T400	Jarrah	377929.9	6500431.2	550	No	-	-	No	-	-	-	-	No	No	Multistem

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T401	Jarrah	377925.7	6500445.8	600	No	-	-	No	-	-	-	-	No	No	-
T402	Jarrah	377912.8	6500427.9	600	No	-	-	No	-	-	-	-	No	No	-
T403	Jarrah	377858.0	6500436.6	500	No	-	-	No	-	-	-	-	No	No	-
T404	Tuart	378101.4	6500472.7	800	No	-	-	No	-	-	-	-	No	No	Multistem
T405	Tuart	378097.9	6500459.4	550	No	-	-	No	-	-	-	-	No	No	-
T406	Tuart	378103.6	6500456.0	500	No	-	-	No	-	-	-	-	No	No	-
T407	Tuart	378092.3	6500475.5	1050	No	-	-	No	-	-	-	-	No	No	-
T408	Jarrah	378080.1	6500466.9	750	No	-	-	No	-	-	-	-	No	No	-
T409	Jarrah	378068.7	6500469.8	850	No	-	-	No	-	-	-	-	No	No	-
T410	Jarrah	378087.3	6500489.3	500	No	-	-	No	-	-	-	-	No	No	-
T411	Jarrah	378044.8	6500470.4	800	No	-	-	No	-	-	-	-	No	No	-
T412	Jarrah	378033.2	6500460.0	750		-	-	No	-	-	-	-	Yes	Yes	Droppings and possible clippings
T413	Jarrah	378032.7	6500464.6	500	No	-	-	No	-	-	-	-	Yes	Yes	Clippings from adjacent tree, droppings
T414	Jarrah	378039.1	6500489.6	650	1 small	6	7	No evidence of use	Yes	30-40 cm	Horizontal	Not suitable	Yes	No	Dead jarrah with hollows
T415	Jarrah	378036.9	6500490.8	600	No	-	-	No	-	-	-	-	No	No	-
T416	Jarrah	378015.6	6500489.3	550	No	-	-	No	-	-	-	-	No	No	-
T417	Tuart	377997.6	6500482.9	1100	No	-	-	No	-	-	-	-	No	No	-
T418	Jarrah	377997.6	6500471.7	800	No	-	-	No	-	-	-	-	No	No	-
T419	Jarrah	378000.2	6500472.6	550	No	-	-	No	-	-	-	-	No	No	-
T420	Jarrah	377982.6	6500479.9	1300	1 large, 1 medium, 1 small	16, 10, 5	8, 12, 16	No evidence of use	Yes	20 cm, 40 cm, too high	-	Not suitable	No	No	To shallow
T421	Jarrah	377983.1	6500465.7	850	No	-	-	No	-	-	-	-	No	No	-
T422	Jarrah	377967.2	6500462.9	570	No	-	-	No	-	-	-	-	No	No	-
T423	Jarrah	377929.1	6500461.4	550	No	-	-	No	-	-	-	-	No	No	-
T424	Jarrah	377892.2	6500459.3	940	2 small	4, 5	8, 9	No evidence of use	No	Hollow too small	45	Not suitable	Yes	No	BC chewed nuts
T425	Jarrah	377863.7	6500461.6	500	No	-	-	No	-	-	-	-	No	No	-
T426	Jarrah	377847.2	6500458.4	1000	1 medium	10	4	No evidence of use	Yes	60 cm	45	Not suitable	Yes	No	To shallow, BC chewed nuts
T427	Jarrah	377828.9	6500487.7	1470	1 large	12	10	No evidence of use	Yes	40 cm	Vertical	Not suitable	Yes	No	To shallow-
T428	Jarrah	377858.7	6500503.4	550	No	-	-	No	-	-	-	Not suitable	No	No	-
T429	Jarrah	377894.5	6500501.5	1400	No	-	-	No	-	-	-	-	No	No	-
T430	Jarrah	377905.5	6500510.1	1500	No	-	-	No	-	-	-	-	No	No	-
T431	Jarrah	377976.3	6500512.0	640	No	-	-	No	-	-	-	-	No	No	Multistem
T432	Jarrah	378004.8	6500509.0	750	No	-	-	No	-	-	-	-	Yes	No	FRTBC feeding evidence
T433	Tuart	378000.2	6500559.3	1180	No	-	-	No	-	-	-	-	No	No	-
T434	Tuart	377995.0	6500573.5	700	No	-	-	No	-	-	-	-	No	No	-
T435	Tuart	378008.5	6500571.1	510	No	-	-	No	-	-	-	-	No	No	-
T436	Tuart	378015.3	6500553.3	600	No	-	-	No	-	-	-	-	No	No	-
T437	Tuart	378060.6	6500561.3	660	No	-	-	No	-	-	-	-	No	No	-
T438	Jarrah	378057.8	6500547.4	500	No	-	-	No	-	-	-	-	No	No	-

Number	Tree Species	Easting	Northing	DBH	Hollows Present	Hollow Entrance Size (CM)	Hollow Heights (M)	Breeding Evidence	Hollow Pole Cam Inspection	Hollow Depth	Hollow Angle	Hollow Suitability	Feeding Evidence	Roosting Evidence	Comment
T439	Jarrah	378068.5	6500547.8	580	No	-	-	No	-	-	-	-	No	No	-
T440	Jarrah	378073.4	6500546.1	750	1 medium	11	11	No evidence of use	Yes	50 cm	Vertical	Not suitable	No	No	To shallow
T441	Jarrah	378055.8	6500541.4	910	No	-	-	No	-	-	-	-	No	No	Multistem
T442	Jarrah	378081.4	6500541.6	700	No	-	-	No	-	-	-	-	No	No	Multistem
T443	Jarrah	378107.4	6500567.5	690	No	-	-	No	-	-	-	-	No	No	Multistem
T444	Jarrah	378084.0	6500507.7	1580	4 large, many smalls	20 to 30, many 5	6, 6, 8, 8, 10	No evidence of use	Yes	All to 10 cm	Vertical to 45	Not suitable	Yes	No	To shallow
T445	Tuart	377845.9	6499382.0	1100	No	-	-	No	-	-	-	-	No	No	-
T446	Tuart	377846.6	6499389.7	560	No	-	-	No	-	-	-	-	No	No	-
T447	Tuart	377867.1	6499398.5	600	No	-	-	No	-	-	-	-	No	No	-
T448	Tuart	377578.3	6499455.9	1100	No	-	-	No	-	-	-	-	No	No	-
T449	Tuart	377576.1	6499440.0	560	No	-	-	No	-	-	-	-	No	No	-
T450	Tuart	377538.9	6499420.8	700	No	-	-	No	-	-	-	-	No	No	Multistem
T451	Tuart	377559.3	6499393.7	650	No	-	-	No	-	-	-	-	No	No	Multistem
T452	Tuart	377671.9	6499441.8	700	No	-	-	No	-	-	-	-	No	No	Multistem
T453	Tuart	377774.4	6499481.5	700	No	-	-	No	-	-	-	-	No	No	Multistem
T454	Tuart	377776.9	6499394.9	580	No	-	-	No	-	-	-	-	No	No	-
T455	Tuart	377798.0	6499393.2	500	No	-	-	No	-	-	-	-	No	No	Multistem
T456	Tuart	377804.0	6499389.5	1100	1 large	30	10	No evidence of use	Yes	40 cm	Vertical	Not suitable	Yes	No	To shallow
T457	Jarrah	377741.3	6499373.9	500	No	-	-	No	-	-	-	-	No	No	Multistem
T458	Tuart	377766.0	6499361.4	530	No	-	-	No	-	-	-	-	No	No	Multistem
T459	Tuart	377772.4	6499362.0	1100	No	-	-	No	-	-	-	-	No	No	Multistem
T460	Tuart	377757.6	6499329.1	740	No	-	-	No	-	-	-	-	No	No	Multistem
T461	Tuart	377759.2	6499326.5	540	No	-	-	No	-	-	-	-	No	No	-
T462	Tuart	377763.4	6499313.3	500	No	-	-	No	-	-	-	-	No	No	Multistem
T463	Tuart	377769.2	6499298.1	1450	1 large, 2 small	5, 5, 20	10, 12, 16	No evidence of use	Yes	Small's 30 cm	Vertical	Not suitable	No	No	Large one not checked due to galahs nesting
T464	Tuart	377779.8	6499282.4	670	No	-	-	No	-	-	-	-	No	No	-
T465	Tuart	377776.1	6499269.1	500	No	-	-	No	-	-	-	-	No	No	-
T466	Tuart	377781.0	6499257.9	540	No	-	-	No	-	-	-	-	No	No	-
T467	Tuart	377814.8	6499252.6	520	No	-	-	No	-	-	-	-	No	No	Multistem
T468	Tuart	377814.3	6499245.3	510	No	-	-	No	-	-	-	-	No	No	-
T469	Tuart	377802.3	6499224.0	500	No	-	-	No	-	-	-	-	No	No	-
T470	Tuart	377809.4	6499211.9	560	No	-	-	No	-	-	-	-	No	No	Multistem
T471	Tuart	377800.9	6499185.9	540	No	-	-	No	-	-	-	-	No	No	Multistem
T472	Tuart	377797.6	6499179.9	520	No	-	-	No	-	-	-	-	No	No	Multistem
T473	Tuart	377821.1	6499155.3	540	No	-	-	No	-	-	-	-	No	No	-
T474	Tuart	377817.3	6499185.5	730	No	-	-	No	-	-	-	-	Yes	No	Carnaby feeding
T475	Tuart	377858.6	6499144.4	540	No	-	-	No	-	-	-	-	No	No	-
T476	Tuart	377862.5	6499178.4	500	No	-	-	No	-	-	-	-	No	No	-
T477	Tuart	377844.5	6499181.5	700	No	-	-	No	-	-	-	-	No	No	-
T478	Tuart	377843.0	6499182.8	530	No	-	-	No	-	-	-	-	No	No	-

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T479	Tuart	377882.0	6499229.8	570	No	-	-	No	-	-	-	-	No	No	-
T480	Tuart	377876.5	6499242.6	510	No	-	-	No	-	-	-	-	No	No	Multistem
T481	Tuart	377915.8	6499178.2	500	No	-	-	No	-	-	-	-	No	No	Multistem
T482	Tuart	377845.2	6499247.2	1450	2 large	2 x 20	7, 8	No evidence of use	Yes	Both to 30 cm	Vertical	Not suitable	No	No	To shallow, second hollow not checked due to bees
T483	Tuart	377823.1	6499277.1	1200	No	-	-	No	-	-	-	-	No	No	-
T484	Tuart	377813.6	6499276.0	500	No	-	-	No	-	-	-	-	No	No	-
T485	Tuart	377845.4	6499285.7	700	No	-	-	No	-	-	-	-	No	No	-
T486	Tuart	377847.9	6499286.6	1100	3, medium, 1 small	5, 3 x 10	8, 15, 15, 17	Chews present	No too high	To high to assess	-	Visual monitor 17 m	No	No	2 mediums have Galah and 28 parrots nesting
T487	Tuart	377865.3	6499289.9	1050	3 medium	3 x 10	12, 12, 13	No	-	-	-	Not suitable	No	No	One hollow with galah
T488	Tuart	377859.6	6499329.7	660	No	-	-	No	-	-	-	-	No	No	-
T489	Tuart	377853.0	6499330.6	500	No	-	-	No	-	-	-	-	No	No	-
T490	Tuart	377827.6	6499337.3	790	No	-	-	No	-	-	-	-	No	No	-
T491	Tuart	377813.6	6499328.3	530	No	-	-	No	-	-	-	-	No	No	-
T492	Tuart	377816.1	6499344.3	1350	3 large 3 small	30, 20, 15, 3 x 5	7, 10, 11	1 large extensive chews	Yes	All >1 m	Vertical	Yes, monitor	No	No	1 large 28 parrots breeding, 1 large/3 smalls with bees present
T493	Tuart	377805.9	6499311.8	1130	1 medium	12	7	No evidence of use	Yes	20 cm	45	Not suitable	No	No	-
T494	Tuart	377795.1	6499325.4	500	No	-	-	No	-	-	-	-	No	No	-
T495	Tuart	377796.3	6499342.5	500	No	-	-	No	-	-	-	-	No	No	-
T496	Tuart	377805.6	6499351.3	510	No	-	-	No	-	-	-	-	No	No	-
T497	Tuart	377826.3	6499368.9	570	No	-	-	No	-	-	-	-	No	No	Multistem
T498	Tuart	377844.2	6499359.0	580	No	-	-	No	-	-	-	-	No	No	Multistem
T499	Jarrah	378008.8	6499078.2	900	No	-	-	No	-	-	-	-	No	No	-
T500	Jarrah	378028.6	6499097.1	610	No	-	-	No	-	-	-	-	No	No	Multistem
T501	Jarrah	378046.2	6499094.1	660	No	-	-	No	-	-	-	-	Yes	No	Chews on jarrah nuts
T502	Jarrah	378067.3	6499095.6	500	No	-	-	No	-	-	-	-	No	No	Multistem
T503	Jarrah	378108.0	6499093.1	810	2 small	2 x 6	2 x 5	No evidence of use	Yes	2 x 10 cm deep	45	Not suitable	No	No	No but elegant parrot breeding in tree
T504	Jarrah	378112.1	6499093.1	550	No	-	-	No	-	-	-	-	No	No	-
T505	Jarrah	378107.7	6499060.3	550	No	-	-	No	-	-	-	-	No	No	Multistem
T506	Jarrah	378088.8	6499065.5	680	No	-	-	No	-	-	-	-	No	No	-
T507	Jarrah	378074.6	6499057.7	680	No	-	-	No	-	-	-	-	No	No	-
T508	Jarrah	378068.8	6499041.6	700	No	-	-	No	-	-	-	-	Yes	No	-
T509	Jarrah	378098.8	6499019.0	530	No	-	-	No	-	-	-	-	No	No	-
T510	Jarrah	378093.2	6499004.3	870	1 large	30	2	No evidence of use	Yes	40 cm	Horizontal	Not suitable	No	No	-
T511	Jarrah	378103.6	6498993.7	700	No	-	-	No	-	-	-	-	No	No	-
T512	Jarrah	378109.8	6499008.1	540	No	-	-	-	-	-	-	-	Yes	No	Jarrah and surrounding sessilis feeding evidence
T513	Jarrah	378102.8	6498976.8	550	1 medium	9	3	No evidence of use	Yes	40 cm	Horizontal	Not suitable	No	No	Multistem
T514	Jarrah	378023.8	6499005.0	520	No	-	-	No	-	-	-	-	No	No	Multistem
T515	Jarrah	378021.7	6499021.0	630	No	-	-	No	-	-	-	-	No	No	Multistem

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T516	Jarrah	378033.0	6499029.9	700	No	-	-	No	-	-	-	-	No	No	-
T517	Jarrah	378005.0	6499189.4	560	No	-	-	No	-	-	-	-	No	No	-
T518	Jarrah	378011.5	6499200.3	640	No	-	-	y	-	-	-	-	No	No	Multistem
T519	Jarrah	378059.1	6499173.0	650	No	-	-	No	-	-	-	-	No	No	-
T520	Jarrah	378072.2	6499151.7	530	No	-	-	No	-	-	-	-	No	No	-
T521	Jarrah	378086.0	6499122.0	560	No	-	-	No	-	-	-	-	No	No	-
T522	Jarrah	378055.8	6499130.9	740	No	-	-	No	-	-	-	-	No	No	-
T523	Jarrah	379783.8	6495749.1	530	No	-	-	No	-	-	-	-	No	No	Multistem
T524	Tuart	377186.0	6500595.1	1280	No	-	-	No	-	-	-	-	No	No	-
T525	Tuart	377220.3	6500622.5	670	No	-	-	No	-	-	-	-	No	No	-
T526	Tuart	377182.4	6500636.3	1130	2 large	12, 20	5, 7	No evidence of use	Yes	>1m, couldn't see base	Vertical, 45	Yes, monitor	No	No	Good deep hollow
T527	Tuart	377155.0	6500627.3	940	1 large	40, 20	7	No evidence of use	Yes	7 m is 1 m	Vertical	Yes, monitor	No	No	Multistem, good deep hollow
T528	Tuart	377150.3	6500637.0	630	No	-	-	No	-	-	-	-	No	No	-
T529	Tuart	377130.8	6500632.8	580	No	-	-	No	-	-	-	-	No	No	Multistem
T530	Tuart	377128.3	6500639.2	1200	No	-	-	No	-	-	-	-	No	No	-
T531	Tuart	377157.7	6500639.1	500	No	-	-	No	-	-	-	-	No	No	Multistem
T532	Tuart	377156.1	6500658.6	500	No	-	-	No	-	-	-	-	No	No	Multistem
T533	Tuart	377158.7	6500659.0	680	No	-	-	No	-	-	-	-	No	No	-
T534	Tuart	377173.3	6500672.1	500	No	-	-	No	-	-	-	-	No	No	Multistem
T535	Tuart	377159.8	6500681.9	500	No	-	-	No	-	-	-	-	No	No	Multistem
T536	Tuart	377152.5	6500693.6	1350	No	-	-	No	-	-	-	-	No	No	Multistem
T537	Tuart	377131.4	6500653.5	600	No	-	-	No	-	-	-	No suitable	No	No	Multistem, one stem next to main trunk has hollows but badly compromised
T538	Tuart	377125.4	6500676.3	1100	No	-	-	No	-	-	-	-	No	No	-
T539	Tuart	377130.7	6500690.9	680	No	-	-	No	-	-	-	-	No	No	-
T540	Tuart	377103.0	6500712.2	750	No	-	-	No	-	-	-	-	No	No	Multistem
T541	Tuart	377059.5	6500729.3	1410	1 large	20	4	No evidence of use	Yes	1-1.5 m but difficult to tell	Vertical	Not suitable	No	No	Too low for BC. Previously identified habitat tree.
T542	Tuart	377056.1	6500735.6	540	No	-	-	No	-	-	-	-	No	No	Multistem
T543	Tuart	377044.3	6500733.2	500	No	-	-	No	-	-	-	-	No	No	-
T544	Tuart	377041.0	6500706.8	520	No	-	-	No	-	-	-	-	No	No	-
T545	Tuart	377003.9	6500798.3	710	1 medium	10	5	No evidence of use	-	5 m is 5 cm	45	Not suitable	No	No	To shallow
T546	Tuart	377078.5	6500674.8	840	2 large	30, 18	6, 7	No evidence of use	Yes	6 m is 30 cm, 7 m is 50 cm	Vertical	Not suitable	Yes	No	To shallow
T547	Tuart	377084.4	6500665.6	530	No	-	-	No	-	-	-	-	No	No	Multistem
T548	Tuart	377098.6	6500638.6	1100	2 large	20, 15	15, 10	No evidence of use	Yes	>1m but hollow compromised	Vertical	Not suitable	No	No	Galah breeding in highest hollow, Barn Owl in the other
T549	Tuart	377071.5	6500635.2	1030	2 large	30, 16	5, 7	No evidence of use	Yes	20 cm, not checked second	45	Yes, monitor	No	No	Kookaburra eggs. Suitable but possibly too low for BC.

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T550	Tuart	377091.9	6500618.9	650	No	-	-	No	-	-	-	-	No	No	-
T551	Tuart	377069.5	6500656.6	530	No	-	-	No	-	-	-	-	No	No	Multistem
T552	Tuart	377046.8	6500634.8	730	No	-	-	No	-	-	-	-	No	No	Multistem
T553	Tuart	377034.0	6500637.9	610	No	-	-	No	-	-	-	-	No	No	Multistem
T554	Tuart	377049.7	6500618.5	1220	No	-	-	No	-	-	-	-	No	No	-
T555	Tuart	377101.6	6500608.9	570	No	-	-	No	-	-	-	-	No	No	Multistem
T556	Tuart	377088.0	6500573.6	560	No	-	-	No	-	-	-	-	No	No	Multistem
T557	Tuart	377106.4	6500577.6	600	No	-	-	No	-	-	-	-	No	No	Multistem
T558	Tuart	377127.3	6500589.6	580	No	-	-	No	-	-	-	-	No	No	Multistem
T559	Tuart	377129.3	6500599.7	540	No	-	-	No	-	-	-	-	No	No	-
T560	Tuart	377146.2	6500583.2	1100	No	-	-	No	-	-	-	-	No	No	-
T561	Tuart	377142.9	6500615.7	510	No	-	-	No	-	-	-	-	No	No	-
T562	Tuart	377120.1	6500624.0	520	No	-	-	No	-	-	-	-	No	No	Multistem
T563	Jarrah	379051.9284	6497372.365	500	No	-	-	No	-	-	-	-	No	No	-
T564	Jarrah	379138.9703	6497379.616	500	No	-	-	No	-	-	-	-	No	No	-
T565	Jarrah	379183.5997	6497321.528	600	No	-	-	No	-	-	-	-	No	No	-
T566	Jarrah	379165.1223	6497323.062	600	No	-	-	No	-	-	-	-	No	No	-
T567	Jarrah	379172.7453	6497302.847	500	No	-	-	No	-	-	-	-	No	No	-
T568	Jarrah	379170.7453	6497300.847	500	No	-	-	No	-	-	-	-	No	No	-
T569	Jarrah	379175.7453	6497305.847	500	No	-	-	No	-	-	-	-	No	No	-
T570	Tuart	377742.8491	6500561.394	500	No	-	-	No	-	-	-	-	No	No	-

Trees with suitable hollows selected for monitoring in the survey area

Number	Tree Species	DBH	Hollows Present	Hollow Entrance Size (CM)	Hollow Heights (M)	Breeding Evidence	Hollow Pole Cam Inspection	Hollow Depth	Hollow Angle	Comment August	Comment November	Comment January
T73	Tuart	1410	3 large	all 20 plus	7, 9, 12	no evidence of use	yes	7m >1m, 9m 40cm, 12m 30 cm	2x vertical, 1x 45	7m is blocked, 9 m >1 m deep into trunk but had barn owl, 12 m blocked at 40 cm, other unknown but bees present. No Black Cocky use	Barn owl hollow too high to reach with pole cam but no external evidence of use. Lower large hollow checked but blocked with wood. No Black Cocky use	3 x hollows checked. 7 m hollow blocked with rotten wood, 9 m hollow is trunk hollow, 12 m hollow is trunk hollow with bees present. No evidence of black cocky use.
T78	Tuart	920	3 large	16, 20, 24	7, 12, 15	potential old chews	yes, lower hollow	7m is 30 cm deep	slight angle	old chews in lower hollow, galah in top one. No Black Cocky use	Top hollow that had Galahs has chews but no signs of current activity. Bees in second hollow. No camera pic. No Black Cocky use	No hollow visible at 7 m (branch down). 12 m is spout hollow on south side of tree, old chew marks and possible owl scats (urates) visible. 15 m hollow contains bees. No Black Cocky use
T87	Tuart	2500	2 large	2x 16	12 to 15	no evidence of use	yes	12 m 10 cm, 15 m to high	almost vertical	15 m to high but Eastern Long-billed Corella in 15 m. No Black Cocky use	Visual only as hollow was too high for pole cam. Hollow hard to inspect but no external evidence of use. No Black Cocky use	2 x hollows visually inspected. 12 m and 15 m hollows both in diagonal branch. Also a recently fallen branch containing hollow. No Black Cocky use
T103	Tuart	1300	1 large	16	6	no evidence of use	yes	1m	almost vertical	Potentially a bit low monitor. No Black Cocky use	Visual inspection as too high for pole cam. No signs of use. No Black Cocky use	1 x hollow checked, vertical sawn off spout at 4 m. No evidence of use. No Black Cocky use
T106	Tuart	1600	4 large	all 20 plus	4, 6, 8, 12	no evidence of use	yes	4 m approx 1 m, 6m 20 cm, 8 m 1.2m	2x vertical, 2x horizontal	8 m 1.2 deep galah nesting great hollow. Old chews but no Black Cocky use	Visual inspection as hollow too high for pole cam. No visual external evidence of use. Galahs were gone. No use observed. No Black Cocky use	4 x hollows checked. 4 m hollow had termite activity, 6 m hollow had dead wood blocking most of hollow, 8 m hollow had a barn owl roosting who flew out, 12 m was too high for pole cam but was visually inspected with no evidence of use. No Black Cocky use
T236	Tuart	2200	1 large, 1 small	20, 5	20, 3	no evidence of use	yes	3 m 30 cm (bees)	vertical	Multistem with listed hollow contains beehive. No Black Cocky use	Galahs in large hollow. No Black Cocky use	3 m high hollow contains bees and is located on east side of tree. 20 m hollow is located on west side of tree on a spout. No evidence of use.
T239	Tuart	2200	2 large, 2 medium	10, 15, 15, 10	6, 8, 8.5, 20	old chews present	yes	6 m 10 cm, 8 m 10 cm, 8.5 m 10 cm	45 and vertical	Multistem, 28 parrots appear nesting in upper canopy. Numerous hollows but no Black Cocky use	No Black Cocky use	2 large at 8 m. Low empty and shallow, 8 m is solid stump with no hollow, 8.5 m is 20 cm deep. 20 m had visual inspection, no bees and no evidence of use. Whistling kite hanging around. The 20 m hollow is north facing on a broken branch. No Black Cocky use
T242	Tuart	1800	2 large, 1 medium	20, 10, 20	8, 15, 20	Possible internal chews	yes	8 m 90 cm	vertical	20 m hollow guarded by galahs in tree. No Black Cocky use	Bees present in 2 hollows (1 x large, 1 x med), other large hollow had chews, feathers and nesting material.	Medium hollow located on northwest side, at least 50 cm deep. No evidence of use. 15 m hollow is a branch hollow on the north side of tree. No evidence of use. 15 m hollow is in black fork hollow (burned) in centre of tree. No evidence of use. 20 m hollow is south facing vertical branch hollow near top of tree. Old chew marks present, otherwise no evidence of use.
T245	Tuart	2000	3 large	20, 15, 20	25, 30, 10	no evidence of use	no to high	not assessed	45	Galahs in tree and chewing on branches, bees present in lower hollow but upper large ones look good	Some chews on highest hollow, no other evidence of use suspect Galah. Could not reach with pole cam.	10 m hollow is southwest facing at about 20 cm deep. No evidence of use. 25 m hollow has 20 cm diameter and is a trunk hollow near a fork. Bees present. 30 m hollow is trunk hollow facing east in centre of tree. No evidence of use.
T252	Tuart	1600	2 large	15, 15	15, 25	old chews present	no to high	not assessed	45	bees in lower hollow, but large above has chews possible Galah but monitor	Large hollow has historic chews - Galah. Small hollow contains bees. Bees also present in split at Galah hollow which is probably not in use.	15 m hollow is spout hollow with bees present, possible chew marks, NE facing. 25 m hollow at 45 degree angle east facing on branch. No evidence of use, possible old chew marks.
T259	Tuart	1300	2 large, 1 medium	20, 20, 10	10, 16, 17	no evidence of use	yes	10 m 20 cm, 2 large look good	vertical	Multistem form, All hollows in dead wood from original main stem, potentially more hollows higher	No activity. All hollow appear unused	10 m hollow on north side of tree is burned and shallow/not hollow. 16 m hollow is east facing. 18 m branch hollow is almost vertical on south side of tree. No evidence of use at any hollow. 18 m branch hollow had bees present on the north section of the tree facing south. Possible hollow at 13 m facing north but to high no use.
T299	Tuart	1200	2 large	2x 20	8, 11	old chews present	yes	8 m >1 m, 11 m 1 m	vertical	Two large hollows present but possible old chews present.	Large hollow has old chews present but no signs of current use. Too high for pole cam to reach. Lower hollow now contains bees - not assessed with pole. Highest hollow may be impacted by beehive below it.	8 m hollow has bees, 11 m too high for pole cam. Possible old chew marks, no other evidence of use. No sign of bees in upper hollow compared to previous assessment.
T308	Tuart	750	2 large, 1 small	5, 30, 20	5, 7, 4	old chews present	yes	5 m and 7 m same hollow. 1 m, 4 m 20cm	vertical and 45	Dead Tuart with hollows in mainstem, likely all hollows are linked to form one and maybe to deep for use. Possible old chews present.	Several hollows part of the same trunk hollow. Largest hollow blocked with debris at 40 cm, no signs of use, photos taken. Next highest is deep but no signs of activity.	3 x hollows checked. 4 m hollow was angled and shallow, located on east side of tree, 20 cm deep with frass. 5 m hollow is deep in south side of tree, possible old chew marks. 7 m hollow is deep. No other evidence of use at any hollow.
T325	Tuart	800	1 large	30	7	old chews present	yes	1.2 m	vertical	One large hollow of great depth and size possible old chews present externally, no recent use	1 x large hollow present and deep. No external sign of use, no internal signs of use. Photos taken.	7 m hollow is deep and near vertical, possible old chew marks externally. No other evidence of use.
T327	Tuart	950	4 large	20, 20, 15, 25	3, 5, 6, 11	old chews present	yes	3 m 10 cm, 5 m 10 cm, 6 m 10 cm, 11m 2m	vertical and 45	Multistem form, Several large hollows with old chews present. Nothing fresh monitor.	Tallest hollow no activity at entrance - no chews. Pics taken of lower hollow - 40 cm deep. No signs of use.	4 x hollows checked. 3 m hollow 10 cm deep. 7 m (more like 6 m) big spout hollow. 5 m no hollow, too shallow - 10 cm deep and filled with leaf litter. No evidence of black cocky use at any hollow.

Number	Tree Species	DBH	Hollows Present	Hollow Entrance Size (CM)	Hollow Heights (M)	Breeding Evidence	Hollow Pole Cam Inspection	Hollow Depth	Hollow Angle	Comment August	Comment November	Comment January
T486	Tuart	1100	3, medium, 1 small	5, 3x 10	8, 15, 15, 17	chews present	no to high	To high to assess		2 medium hollows have Galah and 28 parrots nesting	1 x medium hollow with fresh chews. Too high to reach with pole cam, bees present in hollow, no sign of previous breeding events but bees have taken over 28 Parrot breeding hollow.	8 m branch hollow/spout, photos taken, no longer looks like hollow or shallow hollow, some chew marks, south facing. 10 m small branch hollow was chewed but too small for black cocky, NE facing. 13 m branch hollow is north facing, no evidence of use. 10 m hollow is north facing trunk slit, no evidence of use.
T492	Tuart	1350	3 large 3 small	30, 20, 15, 3x 5	7, 10, 11	1 large extensive chews	yes	All >1 m	vertical	1 large hollow with 28 parrots breeding, 1 large/3 smalls with bees present	Aggravated bees - could not reach hollow, no chews or evidence of use, no photos taken	7 m hollow is south facing on burned trunk and had bees present, no other evidence of use. 10 m trunk hollow is east facing and 20 cm in diameter, has fresh chews, no bees and is oblong shape. 13 m trunk hollow is north facing with bees present, possible old chews. Note all 3 hollows on same trunk section. No actual signs of Black Cockatoo use
T526	Tuart	1130	2 large	12, 20	5, 7	no evidence of use	yes	>1m, couldnt see base	vertical, 45	One of the large hollow ever deep however no signs of use	Bees in one of the large hollows. No signs of use on the other	2 x hollows checked. Bees in larger hollow, abandoned bee hive in smaller hollow.
T527	Tuart	940	1 large	40, 20	7	no evidence of use	yes	1 m	vertical	Multistem, one large hollow and deep. No signs of use.	Bees now in trunk under main hollow which had no obvious chews, scat etc. Not photographed as bees very aggravated.	No evidence of use. 1 x hollow checked. Reduced bee activity.
T549	Tuart	1030	2 large	30, 16	5, 7	no evidence of use	yes	40 cm, not checked second	45	Hollow checked with cam and 3 kookaburra eggs present (Kookabuura upset in tree). Suitable but possibly to low for BC.	Bees taken over 2 x hollows (including one previously containing kookaburra eggs). Two gallahs defending other large hollow (from bees).	2 x hollows checked, no evidence of use. Bees in a 3rd small hollow at 5 m. Bees subsided from previous assessment but no BC use recorded.

Fauna likelihood of occurrence assessment of conservation significant fauna identified in the desktop assessment as potentially occurring within the study area.

Species name	Status			Source		Habitat Requirements	Likelihood of occurrence Survey area	Likelihood of occurrence Extended Survey area
	EPBC Act	BC Act	DBCA	EPBC Act PMST	NM			
Birds								
<i>Botaurus poiciloptilus</i> Australasian Bittern	EN	EN		x		Densely vegetated freshwater wetlands and, rarely, in estuaries or tidal wetlands. In the southwest of Western Australia, the Bittern is found in beds of tall rush mixed with or near short fine sedge or open pools. It also occurs around swamps, lakes, pools, rivers and channels fringed with lignum <i>Muehlenbeckia</i> , canegrass <i>Eragrostis</i> or other dense vegetation. It occasionally ventures into areas of open water or onto banks (DotE 2018b).	Highly Unlikely - There is no suitable habitat for this species within the survey area.	Likely - There is suitable habitat for this species around Nowergup Lake.
<i>Calyptorhynchus banksii naso</i> Forest Red-tailed Black Cockatoo	VU	VU		x	x	The Forest Red-tailed Black Cockatoo inhabits the dense jarrah, karri, and marri forests receiving more than 600 mm annual average rainfall but also occurs in a range of other forest and woodland types, including Blackbutt (<i>E. patens</i>), Wandoo (<i>E. wandoo</i>), Tuart (<i>E. gomphocephala</i>), Albany Blackbutt (<i>E. staeri</i>), Yate (<i>E. cornuta</i>), and Flooded Gum (<i>E. rudis</i>) (DotE 2012). Habitats tend to have an understorey of balga (<i>Xanthorrhoea</i> spp.), kingia (<i>Kingia australis</i>), snottygobble (<i>Persoonia</i> spp.), parrot bush (<i>Banksia sessilis</i>), holly-leaved mirbelia (<i>Mirbelia dilatata</i>), bull banksia (<i>B. grandis</i>), bullich (<i>Taxandria</i> spp.) and sheoak (<i>Allocasuraina fraseriana</i>). They are most common in the jarrah forest region of the northern Darling Range from Collie north to Mundaring and are very local throughout the lower south-west. They can be found on the Swan Coastal Plain, mainly in search of food the exotic white cedar (<i>Melia azedarach</i>). There are also several small isolated populations in the eastern parts of its range (DotE 2012).	Known – The species was recorded during the survey	Known – The species was recorded during the survey
<i>Calyptorhynchus latirostris</i> Carnaby's Black Cockatoo	EN	EN		x	x	Carnaby's Black Cockatoo occurs in uncleared or remnant native eucalypt woodlands, especially those that contain salmon gum, wandoo, marri, jarrah and karri, and in shrubland or kwongan heathland dominated by <i>Hakea</i> , <i>Dryandra</i> , <i>Banksia</i> and <i>Grevillea</i> species. Breeding activity is restricted to eucalypt	Known – The species was recorded during the survey	Known – The species was recorded during the survey

Species name	Status			Source		Habitat Requirements	Likelihood of occurrence Survey area	Likelihood of occurrence Extended Survey area
	EPBC Act	BC Act	DBCA	EPBC Act PMST	NM			
						woodlands mainly in the semiarid and subhumid interior, from Kalbarri in the north, Three Springs District south to the Stirling Range, west to Cockleshell Gully and east to Manmanning. The species has expanded its breeding range westward and south into the jarrah-marri forests of the Darling Scarp and into the tuart forests of the Swan Coastal Plain, including the Yanchep area, Lake Clifton and near Bunbury. It nests in trees older than 120-150 years (DotEE 2018b).		
<i>Falco peregrinus</i> Peregrine Falcon		OS			x	The Peregrine Falcon is found on and near cliffs, gorges, timbered watercourses, riverine environments, wetlands, plains, open woodlands, and pylons and spires of buildings, though less frequently in desert regions (Morcombe 2004). They are not common but can be found almost anywhere throughout WA and in the southwest, including particularly at Fitzgerald River, Stirling Range, Porongurup National Parks, Kondinin, and Peak Charles, with many more locations north of Perth (Nevill 2013).	Known – The species was recorded during the survey	Known – The species was recorded during the survey
<i>Leipoa ocellata</i> Malleefowl	VU	VU		x		The Malleefowl generally occurs in semi-arid areas of Western Australia, in shrublands and low woodlands that are dominated by mallee vegetation, as well as native pine <i>Callitris</i> woodlands, <i>Acacia</i> shrublands, paperbark, skheoak, Broombush <i>Melaleuca uncinata</i> vegetation, eucalypt woodlands, or coastal heathlands. Mostly they are found where there are sandy or gravel soils. The nest is a large mound of sand or soil and organic matter (Jones and Goth 2008; Morcombe 2004; Nevill 2013). In WA they are found from the southwest Nullarbor to Albany, north, and then west from Moore River up to Shark Bay, past Cue, across to Wiluna and east to the northern Victoria Desert south of the Blackstone Ranges (Nevill 2013).	Highly Unlikely - The survey area is outside the currently known distribution for this species.	Highly Unlikely - The survey area is outside the currently known distribution for this species.

Species name	Status			Source		Habitat Requirements	Likelihood of occurrence Survey area	Likelihood of occurrence Extended Survey area
	EPBC Act	BC Act	DBCA	EPBC Act PMST	NM			
<i>Limosa lapponica baueri</i> Bar-tailed Godwit	VU	VU		x		The Bar-tailed godwit (Western Alaskan) occurs mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays. It has also been recorded in coastal sewage farms and saltworks, saltlakes and brackish wetlands near coasts, sandy ocean beaches, rock platforms, and coral reef-flats. It is widespread around the coast, from Eyre to Derby (TSSC 2016). They are uncommon in the south west (Nevill 2013).	Highly Unlikely - There is no suitable habitat for this species within the survey area.	Highly Unlikely - There is no suitable habitat for this species within the survey area.
<i>Limosa lapponica menzbieri</i> Northern Siberian Bar-tailed Godwit	CE	VU		x		The Bar-tailed Godwit (northern Siberian) is found mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays. It is found often around beds of seagrass and, sometimes, in nearby saltmarsh. It has been sighted in coastal sewage farms and saltworks, saltlakes and brackish wetlands near coasts, sandy ocean beaches, rock platforms, and coral reef-flats (DotEE 2018a). They are uncommon in the south west, but can be sighted from Geraldton to Bunbury, at Alfred Cove, and then at a few estuaries on the south coast including Kalgan River Mouth and Oyster Harbour (Nevill 2013).	Highly Unlikely - There is no suitable habitat for this species within the survey area.	Highly Unlikely - There is no suitable habitat for this species within the survey area.
<i>Numenius madagascariensis</i> Eastern Curlew	CE, Mi	VU		x		The Eastern Curlew is most commonly associated with sheltered coasts, especially estuaries, bays, harbours, inlets and coastal lagoons, with large intertidal mudflats or sandflats, often with beds of seagrass. Occasionally, the species occurs on ocean beaches (often near estuaries), and coral reefs, rock platforms, or rocky islets. The birds are often recorded among saltmarsh and on mudflats fringed by mangroves, sometimes within the mangroves, and in coastal saltworks and sewage farms. In the south west, Eastern Curlews are recorded from Eyre, and there are scattered records from Stokes Inlet to Peel Inlet (Marchant & Higgins 1993). They are uncommon further south of Geraldton, but can be spotted in Alfred Cove, Peel Inlet and the Albany region (Nevill 2013).	Highly Unlikely - There is no suitable habitat for this species within the survey area.	Highly Unlikely - There is no suitable habitat for this species within the survey area.

Species name	Status			Source		Habitat Requirements	Likelihood of occurrence Survey area	Likelihood of occurrence Extended Survey area
	EPBC Act	BC Act	DBCA	EPBC Act PMST	NM			
<i>Oxyura australis</i> Blue-billed Duck			P4		x	The blue-billed duck is a small Australian almost entirely aquatic duck (Morcombe 2004). The blue-billed duck is endemic to Australia's temperate regions, ranging from the south west of WA, extending to southern Queensland, through New South Wales and Victoria, to Tasmania. The species is readily seen on freshwater lakes where deep fresh water is present (Morcombe 2004).	Highly Unlikely - There is no suitable habitat for this species within the survey area.	Likely - There is suitable habitat for this species at Nowergup Lake.
<i>Rostratula australis</i> Australian Painted Snipe	EN, Mi	EN		x		The Australian Painted Snipe generally inhabits shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans. They also use inundated or waterlogged grassland or saltmarsh, dams, rice crops, sewage farms and bore drains. Typical sites include those with rank emergent tussocks of grass, sedges, rushes or reeds, or samphire; often with scattered clumps of lignum Muehlenbeckia, canegrass, or sometimes tea-tree (Melaleuca). It sometimes uses areas that are lined with trees, or that have some scattered fallen or washed-up timber (DotEE 2018a). In the south west it can be found around Carnarvon and wetlands north of Perth, particularly those west of Moora and Gin Gin (Nevill 2013).	Highly Unlikely - There is no suitable habitat for this species within the survey area.	Likely - There is suitable habitat for this species at Nowergup Lake.
<i>Sternula nereis nereis</i> Australian Fairy Tern	VU, Mi	VU		x		The Fairy Tern occurs along the coast of WA as far north as the Dampier Archipelago near Karratha, but mostly in the southern part of Australia including most of the coastline in the south west. It nests on sheltered sandy beaches, coastal inlets, spits and banks above the high tide line and below vegetation. It has been found in embayments of a variety of habitats including offshore, estuarine or lacustrine (lake) islands, wetlands, and mainland coastline (DotEE 2018a, Nevill 2013). They can also be seen in saltfields, saline or brackish lakes, and sewage ponds near the coast.	Highly Unlikely - There is no suitable habitat for this species within the survey area.	Highly Unlikely - There is no suitable habitat for this species within the survey area.

Species name	Status			Source		Habitat Requirements	Likelihood of occurrence Survey area	Likelihood of occurrence Extended Survey area
	EPBC Act	BC Act	DBCA	EPBC Act PMST	NM			
<i>Actitis hypoleucos</i> Common Sandpiper	Mi	IA		x	x	The Common Sandpiper is found along all coastlines of Australia and uses a wide range of coastal wetlands and some inland wetlands, with varying levels of salinity, and is mostly found around often narrow and steep muddy margins or rocky shores. The species has been recorded in estuaries and deltas of streams, as well as on banks further upstream; around lakes, pools, mangroves, billabongs, reservoirs, dams and claypans, and occasionally piers and jetties. It is often found near mangroves, and sometimes in areas of mud littered with rocks or snags (DotEE 2018a). They are somewhat uncommon in the south west, but can be found on Rottnest and Penguin Islands, and along the south coast all the way to the Esperance region, including the inland lakes like Lake Warden (Nevill 2013).	Highly Unlikely - There is no suitable habitat for this species within the survey area.	Likely - There is suitable habitat for this species at Nowergup Lake.
<i>Calidris melanotos</i> Pectoral Sandpiper	Mi	IA		x		In Western Australia, the Pectoral Sandpiper is rarely recorded (DotEE 2018a). It prefers shallow fresh to saline wetlands and is found in coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands. The species is usually found in coastal or near coastal habitat but occasionally found further inland. It prefers wetlands that have open fringing mudflats and low, emergent or fringing vegetation, such as grass or samphire. The species has also been recorded in swamp overgrown with lignum. They forage in shallow water or soft mud at the edge of wetlands (Higgins & Davies 1996).	Highly Unlikely - There is no suitable habitat for this species within the survey area.	Likely - There is suitable habitat for this species at Nowergup Lake.
<i>Motacilla cinerea</i> Grey Wagtail	Mi	IA		x		The Grey Wagtail is an opportunistic migrant to Australia. The species typically migrates to Indonesia occasionally landing in Australia. Most records for the species are from Northern Australia and South Australia (Morcombe 2004). The non-breeding habitat only of the Grey Wagtail has a strong association with water, particularly rocky substrates along water courses but also lakes and marshes (DotEE 2018a). It can be found mainly in banks and rocks in fast-running freshwater habitats: rivers, creeks, streams, and around waterfalls, both in	Highly Unlikely - There is no habitat for this species within the survey area.	Highly Unlikely - There is no habitat for this species within the survey area.

Species name	Status			Source		Habitat Requirements	Likelihood of occurrence Survey area	Likelihood of occurrence Extended Survey area
	EPBC Act	BC Act	DBCA	EPBC Act PMST	NM			
						forest and open country; but occurs almost anywhere during migration (Johnstone & Storr 2004).		
<i>Pandion haliaetus</i> Osprey	Mi	IA		x	x	Ospreys occur in littoral and coastal habitats and terrestrial wetlands of tropical and temperate Australia and offshore islands. They are mostly found in coastal areas but occasionally travel inland along major rivers, particularly in northern Australia. They require extensive areas of open fresh, brackish or saline water for foraging. They frequent a variety of wetland habitats including inshore waters, reefs, bays, coastal cliffs, beaches, estuaries, mangrove swamps, broad rivers, reservoirs and large lakes and waterholes. They exhibit a preference for coastal cliffs and elevated islands in some parts of their range but may also occur on low sandy, muddy or rocky shores and over coral cays (DotEE 2018a). The osprey is found along all of the south west coast line except east of Cape le Grand where it becomes scarce (Nevill 2013).	Highly Unlikely - There is no suitable habitat for this species within the survey area.	Highly Unlikely - There is no suitable habitat for this species within the survey area.
<i>Tringa nebularia</i> Common Greenshank	Mi	IA		x	x	The Common Greenshank is found in a wide variety of inland wetlands and coastal habitats of varying salinity. It occurs in sheltered coastal areas typically with large mudflats and saltmarsh, mangroves or seagrass, including embayments, harbours, river estuaries, deltas and lagoons, but less often in round tidal pools, rock-flats and rock platforms. The species uses both permanent and ephemeral terrestrial wetlands, including swamps, lakes, dams, rivers, creeks, billabongs, waterholes and inundated floodplains, claypans and saltflats, and artificial wetlands. They occur around most of the coast from Cape Arid in the south to Carnarvon in the north-west (DotEE 2018a), and are moderately common here given suitable habitat. They can be found in areas including Wannamal Lake, many Perth lakes, Alfred Cove, Peel Inlet, Vasse and Harvey Estuaries, and the Albany and Esperance regions (Nevill 2013).	Highly Unlikely - There is no suitable habitat for this species within the survey area.	Likely - There is suitable habitat for this species at Nowergup Lake.

Mammals

Species name	Status			Source		Habitat Requirements	Likelihood of occurrence Survey area	Likelihood of occurrence Extended Survey area
	EPBC Act	BC Act	DBCA	EPBC Act PMST	NM			
<i>Bettongia pencillata</i> subsp. <i>oglibyi</i> Woylie	EN	CR			x	Preferred habitat for the Woylie includes dense undergrowth, logs and rock-cavities and occasionally in burrows (Burbidge 2004). Scattered Woylie populations may be found throughout the Jarrah forest in the south-west corner of WA. Extant naturally occurring populations of the species are restricted to three small wheatbelt reserves – Dryandra Woodland, Tutanning Nature Reserve and Perup Forest. All are characterised by the presence of thickets of the plant <i>Gastrolobium</i> (Van Dyck and Strahan 2008). The species is now restricted to forests and areas where predation has been controlled (or excluded). It rests during the day in a well-concealed nest, built over a shallow depression. The nest is most commonly built using long strands, of grasses, but other material such as strips of bark are also used (in the forest) or dried seagrass and/or triodia (in arid coastal areas) (Freegard 2007).	Highly Unlikely - This species has experienced considerable population decline in the wild, and only naturally occurs in three Wheatbelt reserves in WA. The fragmented nature of the survey area and presence of feral cats and foxes would reduce the likelihood of the species.	Highly Unlikely - This species has experienced considerable population decline in the wild, and only naturally occurs in three Wheatbelt reserves in WA. The fragmented nature of the survey area and presence of feral cats and foxes would reduce the likelihood of the species.
<i>Dasyurus geoffroi</i> Chuditch, Western Quoll	VU	VU		x	x	The Chuditch inhabits eucalypt forest (especially Jarrah, <i>E. marginata</i>), dry woodland, mallee shrublands, heaths, and desert, particularly in the south coast of WA. They also occur at lower densities in drier woodland and mallee shrubland in the goldfields and wheatbelt, as well as in Kalbarri National Park (translocated). Chuditch require adequate numbers of suitable den and refuge sites (horizontal hollow logs or earth burrows) to survive (DEC 2012). In Jarrah forest, Chuditch populations occur in both moist, densely vegetated, steeply sloping forest and drier, open, gently sloping forest (Van Dyck and Strahan 2008). The species can travel large distances, and for this reason requires habitats that are of a suitable size and not excessively fragmented (DEC 2012).	Unlikely - The Chuditch had disappeared from the Swan Coastal Plain in the 1930s, (Orell and Morris 1994). Scattered individuals have since been recorded but these are considered disbursal individuals from the Darling range not a sustained population.	Unlikely - The Chuditch had disappeared from the Swan Coastal Plain in the 1930s, (Orell and Morris 1994). Scattered individuals have since been recorded but these are considered disbursal individuals from the Darling range not a sustained population.

Species name	Status			Source		Habitat Requirements	Likelihood of occurrence Survey area	Likelihood of occurrence Extended Survey area
	EPBC Act	BC Act	DBCA	EPBC Act PMST	NM			
<i>Isoodon fusciventer</i> Quenda, Southwestern Brown Bandicoot			P4		x	The Quenda prefers dense scrubby, often swampy, vegetation with dense cover up to one metre high. However, it also occurs in woodlands, and may use less ideal habitat where this habitat occurs adjacent to the thicker, more desirable vegetation. On the Swan Coastal Plain, Quenda are often associated with wetlands. The species often feeds in adjacent Jarrah and Wandoo forest and woodland that is burnt on a regular basis and in areas of pasture and cropland lying close to dense cover (Van Dyck and Strahan 2008).	Known – The species was recorded during the survey	Known – The species was recorded during the survey
<i>Notamacropus irma</i> Western Brush Wallaby			P4		x	The Western Brush Wallaby is found primarily in open forest or woodland, particularly favouring open, seasonally-wet flats with low grasses and open scrubby thickets. It is also found in some areas of mallee and heathland, and is uncommon in karri forest (Van Dyck and Strahan 2008).	Known – The species was recorded during the survey	Known – The species was recorded during the survey
<i>Parameles bougainville</i> subsp. <i>bougainville</i> Western Barred Bandicoot	EN	VU			x	The Western Barred Bandicoot is now restricted to Bernier and Dorre Islands in Shark Bay, but was reintroduced to Heirisson Prong and to Faure Island in Shark Bay, although they are presumed extinct at the former. Historically the Western Barred Bandicoot occupied a wide variety of semi-arid and arid landscapes and vegetation types, including the saltbush covered Nullarbor Plain, sand ridges with woodlands, bluebush plains, desert Acacia, dense shrublands (particularly thickets of <i>Allocasuarina</i> seedlings) and heath, broken by sandhills and limestone outcrops in western central Australia. On Bernier and Dorre Islands, the populations are found widely in all habitats, but are most likely found in tall scrub (Richards 2012; Van Dyck & Strahan 2008).	Highly Unlikely- The mainland sub-species of the Western Barred Bandicoot is extinct.	Highly Unlikely- The mainland sub-species of the Western Barred Bandicoot is extinct.

Species name	Status			Source		Habitat Requirements	Likelihood of occurrence Survey area	Likelihood of occurrence Extended Survey area
	EPBC Act	BC Act	DBCA	EPBC Act PMST	NM			
<i>Petrogale lateralis</i> subsp. <i>lateralis</i> Black-flanked Rock-wallaby	VU	EN			x	Current known Black-flanked Rock-wallaby populations remain restricted to suitable habitat in the Little Sandy Desert, Cape and Calvert Ranges, with seven populations in the Wheatbelt region, Barrow and Salisbury Islands, and Ningaloo Station. Populations have been re-established via translocation to a number of sites in the Avon Valley and Cape le Grand National Parks and Paruna Sanctuary. In the south-west, colonies are largely confined to scattered granite outcrops in remnants of mallee scrub surrounded by cleared agricultural land. The habitat varies between colonies but always involves grassland feeding habitat for feeding in close proximity to cliff, rock-pile, talus or escarpment refuge habitat. Rock cliffs or other steep substrates with adequate shelter and refuge are essential for breeding (Pearson 2013; Van Dyck & Strahan 2008).	Highly Unlikely - There is no suitable habitat present within the survey area for this species. The survey area is outside its currently known distribution.	Highly Unlikely - There is no suitable habitat present within the survey area for this species. The survey area is outside its currently known distribution.
Reptiles								
<i>Neelaps calonotos</i> Black-striped Snake			P3		x	The Black-striped Snake is a burrowing snake that is restricted to the southwest coastal regions of WA, on sand plains along the Swan Coastal Plain, from Dongara south to Mandurah (Wilson and Swan 2017).	Likely - Suitable habitat for the Black-striped Snake is present within the survey area and there are a number of records of this species within the study area (DPaW and WAM 2013). It is likely to only occur in larger areas of contiguous native vegetation within the survey area.	Likely - Suitable habitat for the Black-striped Snake is present within the survey area and there are a number of records of this species within the study area (DPaW and WAM 2013). It is likely to only occur in larger areas of contiguous native vegetation within the survey area.
<i>Pseudonaja affinis</i> subsp.			P4		x	This subspecies of Dugite occurs only of Rottnest Island.	Highly unlikely - This subspecies of	Highly unlikely - This subspecies of

Species name	Status			Source		Habitat Requirements	Likelihood of occurrence Survey area	Likelihood of occurrence Extended Survey area
	EPBC Act	BC Act	DBCA	EPBC Act PMST	NM			
<i>exillis</i> Rottnest Island Dugite							dugite is restricted to Rottnest Island.	dugite is restricted to Rottnest Island.
<i>Ctenotus gemmula</i> Jewelled southwest Ctenotus(Swan Coastal Plain population)			P3			Apparently disjunct populations occur on the lower west coastal plain, and south coast and adjacent interior of Western Australia. Known to occur on pale sands supporting heaths in association with banksia or mallee woodlands (Wilson and Swan 2017).	Likely - There is suitable habitat present for this species within the survey area. The closest known record is approximately 13 km south east of the survey area from Melaleuca Park.	Likely - There is suitable habitat present for this species within the survey area. The closest known record is approximately 13 km south east of the survey area from Melaleuca Park.

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Document Status

Revision	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
A	E Lynch G Gaikhorst	J Collins R Browne- Cooper		D Farrar		11/03/2019
0	E Lynch A Benkovic	D Farrar J Tindiglia		D Farrar		30/6/2019

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