Targeted Flora Survey:
Quaranup Road, Big Grove
CPS 9013/1

Report prepared for

J. Rowe

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1 SUMMARY

Southern Ecology was engaged to conduct a targeted flora survey and vegetation assessment of Lot 56 on Plan 61012 in Big Grove, south of Albany. The survey was undertaken to inform the environmental planning for clearing application CPS 9013/1. The survey included a 2.76 hectares (ha) targeted flora survey and a 14 ha vegetation assessment.

- Six vegetation types concordant with regional mapping 'Units' were recorded in the survey area; all are in Excellent condition:
  1. Coastal *Banksia ilicifolia*/Peppermint Low Woodland
  2. Coastal Yate Forest
  3. Marri/Jarrah Coastal Hills Forest
  4. Coastal Heath
  5. Karri Forest
  6. *Melaleuca preissiana* Low Woodland
- Three of these vegetation types (1, 2, and 3) are also present within the proposed clearing envelope (CPS 9013/1). These are considered regionally 'rare' as their extent is below 1,500 ha. However, they are also likely to occur outside the Albany region and are included within the regional reservation system.
- None of the vegetation is considered to be concordant with any Threatened Ecological Community (TEC) protected under the BC Act or the EPBC Act or any Priority Ecological Community listed with the DBCA.
- All of the vegetation within the survey area is generally long unburnt and is relatively undisturbed, therefore is in 'Excellent' condition.
- The field assessment opportunistcally identified a total of 106 species from 35 families.
- No 'Threatened' flora protected under the *Biodiversity Conservation Act 2016* (BC Act) and the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) were recorded within the survey area.
- One taxon, *Adenanthos x cunninghamii* listed as Priority 4 flora by the Department of Biodiversity, Conservation and Attractions (DBCA) was recorded.

2 INTRODUCTION

2.1 Project Background

The client is proposing to undertake clearing of approximately 2.76 hectares (ha) of native vegetation (under clearing application CPS 9013/1) within a 14 ha residential allotment at Big Grove, south of Albany (Figure 1). The clearing will facilitate the construction of a new dwelling and associated bushfire mitigation. Approximately 0.68 ha of the survey area is cleared under permit from the city of Albany for proposed construction of a shed and water tank with a 22 m fire protection offset. The allotment is located at Lot 56 on Plan 61012 on the eastern side of Quaranup Road. Southern Ecology was engaged to conduct a targeted flora survey of the clearing area (2.76 ha) and a vegetation assessment of the total allotment (14 ha), to inform the environmental planning for the proposed clearing.

2.2 Scope and Objectives

The objective of the targeted flora survey is to delineate key flora values within the survey area and to determine potential sensitivity to impact. The outcome of the survey and information supplied in the flora survey report will be used to inform the environmental assessment and approvals process. The Scope of Works included the following:

- **Desktop**

  Prior to field survey work complete a desktop assessment results of the study area (10 km radius of survey area) to identify if any threatened and priority flora or vegetation that may occur in the survey area. Prior to the survey, identify all biological features and constraints, which may be in, or nearby the project area.

- **Field survey**

  Conduct a detailed single-phase targeted flora survey to:

  - verify/ground truth the desktop assessment findings.
  - record the presence of any Threatened and Priority flora, Weeds of National Significance (WoNS) or Declared Pests and map the extent of populations if encountered.

- **Provide a targeted flora assessment report.**

2.3 Physical and Biological Environment

2.3.1 *Interim Biogeographic Regionalisation for Australia*

The Interim Biogeographic Regionalisation for Australia (IBRA version 7) divides the Australian continent into 89 large geographically distinct bioregions based on common climate, geology, landform, native vegetation and species information. The 89 bioregions are further refined to form 419 subregions which are more localised and homogenous geomorphological units in each bioregion (Department of the Environment [DotE] 2014a).

The survey area occurs in the Warren bioregion (and Warren subregion WAR01), of which greater than 30% is protected within the national reserve system which includes all lands protected by State and Commonwealth government, Indigenous Protected Areas and private lands (Department of the Environment and Energy [DotEE] 2016).

2.3.2 *Vegetation*

Broad scale (1:250,000) pre-European vegetation mapping (Shepherd *et al.* 2002) indicates that the native vegetation of the area is composed of:

- "Low woodland or open low woodland: Other *Acacia, Banksia*, *Allocasuarina spp*, *Agonis flexuosa, Callitris* spp.*, Eucalyptus loxophleba*. (Vegatation association: Torndirrup 22).

Torndirrup National Park is adjacent to the southern side of the survey area and the remainder surrounded by vegetated private property with some cleared areas on those situated to the east. The vegetated verge of Quaranup Road is adjacent to the western boundary of the survey area.

2.3.3 *Hydrological Features and Environmentally Significant Areas*

No Wetlands of International Importance (i.e., Ramsar wetlands) or Nationally Important Wetlands occur within the survey area (DotEE 2018a, 2018b). The nearest Ramsar wetlands is the Lake Muir – Byenup Lagoon system, located more than 120 km northwest of the survey area. The nearest Nationally Important Wetland is the seasonal Oyster Harbour system (located approximately 10 km north of the survey area) (DotEE 2018b).

The southern boundary of the survey area is approximately 20 m from the Torndirrup National Park, which is classed as an Environmentally Significant Area (ESA). The next nearest an ESA to the survey area is the Porongurup National Park which occurs approximately 42km to the north (DAFWA 2020).

2.3.4 *Land Systems and Soils*

One soil-landscape system within soil-landscape zone has been mapped within the survey area (DAFWA 2020):

Albany Sandplain Zone (242): Gently undulating plain dissected by a number of short rivers flowing south. Eocene marine sediments overlying Proterozoic granitic and metamorphic rocks. Soils are sandy duplex soils, often alkaline and sodic, with some sands and gravels.

- **Mount Many Peaks System (242Mm):** Granitic hills and headlands, on the southern edge of the Albany Sandplain Zone, with shallow gravel, bare rock grey shallow sandy duplex and sandy gravel. Low woodland, scrub heath and mosses and lichens on rocks.

2.3.5 *Conservation Reserves*

The nearest conservation reserve is the Torndirrup National Park located approximately 20m south of the survey area. C-class water reserve (R 25480) occurs 250m west of the survey area.

Figure 1. Location of target flora survey area (blue polygon) and study area (black dashed line) south of Albany.

3 METHODS

3.1 Personnel

The flora survey (desktop and field assessment) was conducted by Damien Rathbone (BScHons Plant Science, Scientific License FB62000229). Damien has over 14 years of experience conducting biological surveys in southern Western Australia. Within the South Coast region, he has previously undertaken Department of Biodiversity, Conservation and Attractions (DBCA) regional surveys (Albany Regional Vegetation Survey, Fitzgerald River National Park Flora Survey, Ravensthorpe Range Flora Survey), threatened species survey and recovery implementation.

3.2 Desktop Assessment

3.2.1 *Database Searches*

A desktop assessment of known or potential significant flora within a 10 km radius of the survey area (the study area) was undertaken using the following sources:

- NatureMap (DBCA 2021; results attached in Appendix E).
- Protected Matters Search Tool (PMST) (Department of the Environment and Energy [DotEE] 2021a; results attached in Appendix E).
- Other relevant consultant reports.

The database search results are presented in Appendix E. Prior to conducting the survey, the taxa and occurrence records returned from the database searches were assessed (pre-survey likelihood of occurrence) for several attributes including, spatial accuracy or records, key morphological characteristics, flowering times and habitat preferences. This information was used to optimise the flora to target during the surveys.

3.3 Field Assessment

3.3.1 *Field Survey Schedule and Type*

The survey effort encompassed a detailed targeted flora survey. The survey was conducted in accordance with the Environmental Protection Authority (EPA) Technical Guidance - Flora and Vegetation Surveys for Environmental Impact Assessment (EPA 2016). The field survey was undertaken on the 3rd September 2021. The survey effort (derived from GPS tracklogs) is provided with the attached spatial dataset.

3.3.2 *Weather*

Daily weather observations recorded from the nearby Little Grove weather station (9766) were used to describe local rainfall totals preceding the survey period (Figures 2). Overall rainfall in 2021 was above average (1087 mm to September 30 [2021] compared to the average rainfall of 777 mm to September 30 [all years]) Bureau of Meteorology [BOM] 2021).

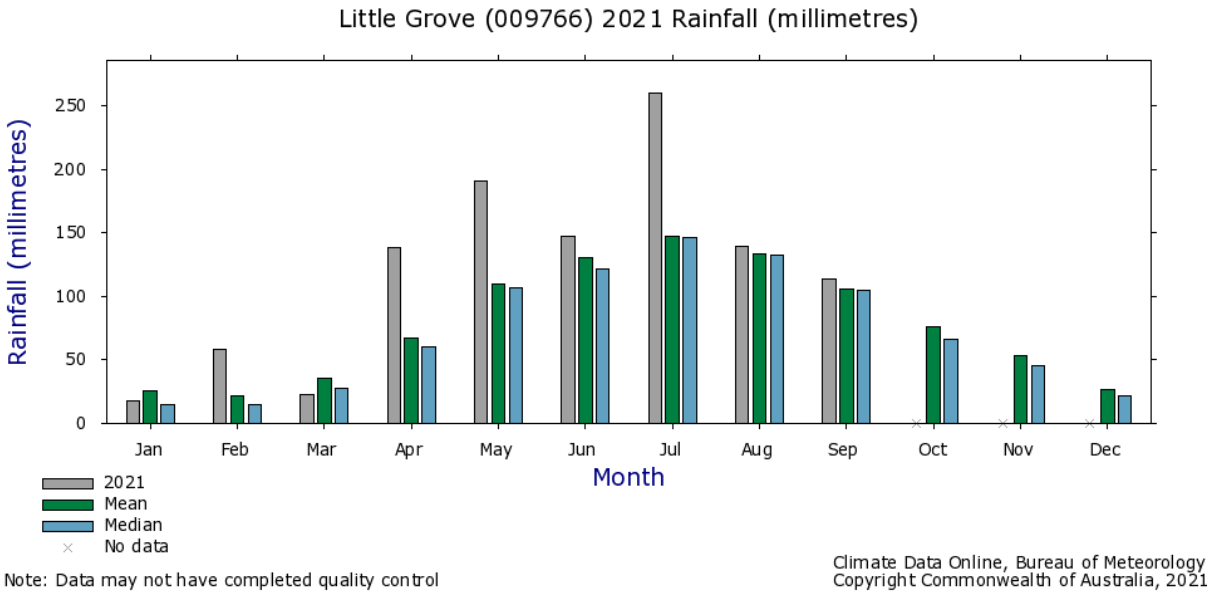


Figure 2. Rainfall statistics for 9 months leading up to the assessment period compared with historical averages (all years available) from the nearest weather station (Little Grove 9766) (BOM 2021).

3.4 Targeted Flora Search

A targeted search for potential threatened and priority flora identified from the desktop assessment was conducted across the survey area. The search was conducted in the appropriate season (spring) to detect the majority of threatened or priority species considered possible or likely to occur within the survey area. The assessment was initially undertaken via a meandering traverse to identify vegetation type and condition. Where vegetation was identified as potential habitat for threatened or priority flora, an intensive grid of suitably spaced transects (according to species, ranging from approximately 2 m to 25 m) was surveyed. Population census and site information of threatened or priority flora was recorded in accordance with the Threatened and Priority Flora Report Form Field Manual (Department of Biodiversity, Conservation, and Attractions 2017). Population size was determined by either direct counts, area occupied (for rhizomatous or spreading plants), or by estimation of plant density using transects or suitably sized quadrats. The location of any signifcant flora within the survey area was recorded with a handheld GPS (Garmin Oregon 7000, ± 5m).

3.5 Vegetation Assessment

A comprehensive assessment (using quadrats) of the vegetation communities was not undertaken due to the adequacy of existing regional vegetation mapping by Sandiford and Barrett (2010). The survey area was traversed by foot and vehicle and vegetation type and condition observations were recorded. Vegetation condition was aligned with nationally recognized categories (Table 1). Vegetation communities were manually compared and aligned with Albany Regional Vegetation Survey (ARVS) mapping units (Sandiford and Barrett 2010) to determine conservation significance. Vegetation community types and condition categories were mapped using a combination of opportunistic observations and extrapolation of orthophotos in an ARCGIS environment.

Table 1. Vegetation condition scale (EPA 2016).

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

3.6 Post-Survey Likelihood of Occurrence Assessment

Following the field survey, all conservation significant flora and fauna species identified in the database searches that were not detected during the survey were assessed to determine their likelihood of occurrence in the survey area (post-survey likelihood of occurrence, Appendix D). Habitat suitability was determined from information in herbarium voucher labels, published descriptions, and knowledge from the authors. Survey effectiveness reflected the probability of detecting a particular species where suitable habitat was present, which could be dependent on thoroughness of the survey, flowering period or timing of emergence (i.e., annuals or disturbance responsive species). Each species in the post-survey likelihood of occurrence (Appendix F) was assessed on a case-by-case basis according to the general categories summarized in Table 2.

Table 2. Matrix of habitat suitability and effectiveness of field surveys to determine the likely presence of significant flora post survey.

		Survey Effectiveness		
		No survey limitations present that would have prevented detection; all habitats were thoroughly surveyed	Moderate survey limitations present (i.e. inconspicuous or cryptic species; dense vegetation)	Major survey limitations present (i.e. species is a post fire ephemeral and habitat are long unburnt; habitat inaccessible)
Habitat and Proximity	Species reliably recorded within close vicinity (<2 km) and suitable habitat present	Unlikely	Possible	Likely
	Species previously recorded within vicinity (2-10 km) but suitable habitat present or unknown	Unlikely	Possible	Possible
	No suitable habitat appears to be present	Highly Unlikely	Unlikely	Possible

3.7 Weeds

The locations of all weeds considered to be significant (Declared pests (DPIRD 2019a, b) or WoNS (DotEE 2019)) were mapped (Appendix B).

3.8 Survey Limitations

In accordance with the EPA (2016) document *Technical Guidance - Flora and Vegetation Surveys for Environmental Impact Assessment* an assessment of potential survey limitations was undertaken (Table 3). No avoidable limitations were identified that can be expected to have affected the reliability of the results of the field survey.

The information provided within this report is accurate and correct to the best of the author's knowledge. However, no liability is accepted for loss, damage or injury arising from its use. Plant populations can fluctuate over time, particularly after disturbance events such as fire and drought. Consequently, all mapping, vegetation descriptions and population estimates within this report should not be considered accurate indefinitely.

Table 3. Assessment of potential survey limitations for flora.

Potential for limitation	Assessment
Availability of contextual information	Regional vegetation mapping and flora records were available to allow for an appropriate level of contextual information prior to the field survey. The Albany Regional Vegetation Survey (Sandiford and Barrett 2010) covers the survey area.
Personnel experience	The senior ecologists conducting the assessments are competent with extensive experience (>10 years) in surveying south coast biota.
Proportion of flora recorded or identification issues	All taxa observed were identified to species level.
Extent of survey and site access	The vegetated areas in the survey area were generally well covered with sufficient intensity over one field day during early spring.
Timing/weather/season/cycle	The survey timing was in early, which is considered appropriate for botanical surveys in this bioregion. However, not all taxa can be guaranteed to flower within this period. The desktop assessment assessed the flowering times of potential conservation significant taxa, which indicated that all significant flora were likely to have been flowering during the survey period (see section 4.1.1). *Calectasia cyanea* (T) and *Caladenia harringtoniae* (T) were both flowering at the time of the survey.
Disturbances (e.g. fire, flood, accidental human intervention etc.) which affected results of survey	No disturbances were likely to have affected the survey results. The absence of recent fire in most of the survey area may have prevented the detection of post-fire ephemeral flora (see Appdenix D).

4 FLORA RESULTS

4.1 Desktop Assessment

4.1.1 *Flora*

The desktop assessment identified 56 conservation significant flora species which have been previously recorded within 10 km of the survey area (Appendix D). This included 13 Threatened species, five Priority one, 11 Priority two, 13 Priority three and 14 Priority four taxa.

A pre-survey likelihood of occurrence assessment discounted 34 species, as no suitable habitat was anticipated to be in the survey area or they represented geospatial errors. Habitat for the remaining 22 species was considered to potentially occur in the survey area, therefore these species were incorporated into the targeted flora survey.

4.1.2 *Vegetation*

The desktop assessment deemed that two Threatened Ecological Communities, "*Subtropical and temperate saltmarsh"* (Vulnerable) and "*Proteaceae Dominated Kwongkan Shrublands*" may occur within the survey area (DotEE 2014, 2021a, 2021b). "*Subtropical and temperate saltmarsh"* community is confined to the saline tidal margins of Princess Royal Harbour and is considered highly unlikely to occur with the survey area. *"Proteaceae Dominated Kwongkan Shrublands"* only occurs east of the survey area within the South-East Botanical Province.

The extent and reservation status of broad-scale regional vegetation mapping within the survey area is presented in Table 4. One vegetation type is present, which is currently above the 30% threshold of remaining extent in the state.

Table 4. Extent of pre-European vegetation from the survey area (GoWA 2019).

Vegetation Type	Pre-European Extent (ha)	Proportion of Pre-European extent remaining (%)	Current extent in Warren bioregion (ha)	Current extent in formal protection (%)
Torndirrup 22: "Low woodland or open low woodland"	3333.79	72.7	2842.83	48.2

4.2 Field Assessment

4.2.1 *Flora*

The field assessment identified a total of 106 species from 35 families within the survey area (including 6 weed species, Appendix C). The most species rich families were Fabaceae (15), Proteaceae (12) and Myrtaceae (11). The diversity and assemblages encountered are typical of vegetation within the region and are comparable to those recorded in the ARVS (Sandiford and Barrett 2010).

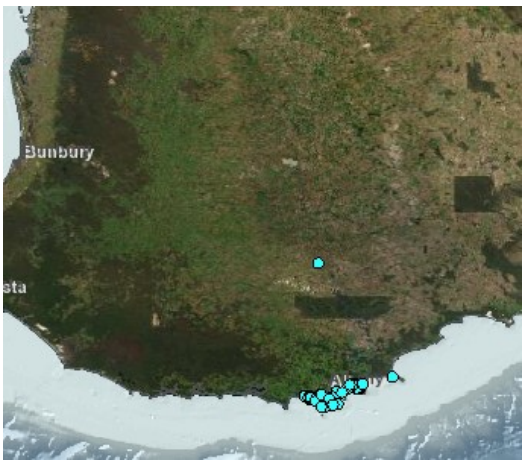
4.2.2 *Conservation Significant Flora*

No 'Threatened' flora protected under the BC Act or the EPBC Act were recorded within the survey area.

One taxon *Adenanthos x cunninghamii* listed by the DBCA as Priority 4 flora was recorded within the survey area. Locations for all species are mapped in Appendix B; habitat and abundance details are summarised below.

***Adenanthos x cunninghamii* P4**

Adenanthos x cunninghamii from the Proteaceae, is an erect shrub to 4 m with small pink/red flowers. It is a stable hybrid between two common species, *A. sericeus* and *A. cuneatus*. It is a Priority 4 flora, known from 80 records across a range of approximately 64 km between Waychinicup National Park and the Sand Patch area. An outlying record north of the Stirling Range is considered a geospatial error as the locality on the herbarium record is described as "Little Grove" (adjacent to Torndirrup National Park). The species is found on grey sands in coastal areas. One large plant of *Adenanthos x cunninghamii* was recorded on the eastern side of the entrance driveway. This occurs outside the proposed clearing area.



Plates 1 and 2. *Adenanthos x cunninghamii* (P4) and regional distribution (DBCA 2021).

4.2.3 *Vegetation*

Six vegetation types were mapped within the survey area (Lot 56); three of these vegetation types are also present within the proposed clearing envelope (CPS 9013/1) (Plate 3, 4 and 5; Table 5), namely Coastal *Banksia ilicifolia*/Peppermint Low Woodland, Coastal Yate Forest and Marri/Jarrah Coastal Hills Forest. These three communities are considered regionally 'rare' as their extent is below 1,500 ha (Sandiford and Barrett 2010). However, Coastal *Banksia ilicifolia*/Peppermint Low Woodland and Coastal Yate Forest are also likely to occur outside the ARVS region and are all three are partially included (20-50% of ARVS extent) within the regional reservation system (Table 6).

None of the vegetation is considered to be concordant with any Threatened Ecological Community (TEC) protected under the BC Act or the EPBC Act or any Priority Ecological Community listed with the DBCA. Five of the vegetation types are generally associated with dunes or uplands of granite and laterite. One vegetation type is associated with ground water expression, therefore could be considered "wetland" (*Melaleuca preissiana* Low Woodland).

All of the vegetation within the survey area is generally long unburnt and is relatively undisturbed, therefore would be considered in 'Excellent' condition. Approximately 0.68 ha of the survey area is currently cleared under permit from the city of Albany for proposed construction of a shed and water tank with a 22 m fire protection offset.

Table 5. Extent (ha) of the vegetation types recorded from the survey area. *Indicates the three vegetation types that occur within the clearing envelope (CPS 9013/1).

Vegetation Type	ARVS Unit	Proposed Clearing Area	Not Impacted	Total
*Coastal *Banksia ilicifolia*/Peppermint Low Woodland	4	1.92	3.19	5.11
*Coastal Yate Forest	1	0.36	4.17	4.53
*Marri/Jarrah Coastal Hills Forest	17	0.14	2.34	2.49
Coastal Heath	3a		0.49	0.49
Karri Forest	9		0.54	0.54
Melaleuca preissiana Low Woodland	49		0.23	0.23
Cleared			0.68	0.68
	Total	2.42	11.65	14.08

Table 6. Current extent (ha) of vegetation types (mapping units) in the region (Albany Regional Vegetation Survey (ARVS)) and proportion in IUCN reserves. *Indicates the three vegetation types that occur within the clearing envelope (CPS 9013/1).

Vegetation Type	Current Extent in ARVS Area (Ha)	% Current Extent in IUCN Reserves
*Coastal *Banksia ilicifolia*/Peppermint Low Woodland (Unit 4)	506	39.9
*Coastal Yate Woodland (Unit 1)	416	21.4
*Marri/Jarrah Coastal Hills Forest (Unit 17)	1,238	50.5
Coastal Heath (Unit 3a)	3,737	22.2
Karri Forest (Unit 9)	885	1.6
Melaleuca preissiana Low Woodland (Unit 49)	679	7.7

Plate 3. Coastal *Banksia ilicifolia*/Peppermint Low Woodland

Plate 4. Coastal Yate Forest

Plate 5. Marri/Jarrah Coastal Hills Forest

4.2.4 ***Weeds***

One significant weed species recognised as a Declared Pest (DP) in Western Australia under the BAM Act (DPIRD 2019b) was recorded from the survey area and is mapped in Appendix B:

- **Zantedeschia aethiopica* (Arum Lily) (DP)

Other weeds were present that may become problematic if clearing is undertaken are **Arctotheca calendula* (Cape Weed) and **Acacia longifolia* (Sydney Wattle).

4.2.5 ***Other Features***

Opportunistic observations of other features were undertaken during the field survey and are mapped in Appendix B. Symptomatic evidence of *Phytophthora cinnamomi* was observed on the granitic hillslope above the proposed clearing area with frequent deaths of *Xanthorrhoea platyphylla*, *Banksia formosa* and *Patersonia umbrosa*. A noongar lizard trap was also observed on the exposed granite (this occurs outside the proposed clearing area) (Guislain et al. 2020).

Plate 6. Symptomatic evidence of *Phytophthora cinnamomi.*

Plate 7. Noongar lizard trap, often observed on granite outcrops on Torndirrup peninsula.

4.2.6 ***Post-Survey Flora Likelihood of Occurrence***

A post-survey likelihood of occurrence assessment of conservation significant flora (Appendix D) was undertaken after the field visits to determine the suitability of habitats derived from the current survey

and the effectiveness of the survey effort and timing (in accordance with Table 1). The assessment determined the following:

- One significant taxon identified in the desktop assessment was recorded in the survey area (See section 4.2.2).
- Limitations for two potential taxa were present due to the absence of fire and winter flowing time.
- All other species were considered 'unlikely' to be present as either no suitable habitat was observed (combining both pre-survey and post-survey assessment) or all suitable habitats were thoroughly searched and no survey limitations were identified.

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6 APPENDIX A - Conservation Status Definitions

Table A1. Acts relevant to environmental impact assessment.

Environment Protection and Biodiversity Conservation [EPBC] *Act 1999*	https://www.legislation.gov.au/Details/C2016C00777
Environmental Protection [EP] *Act 1986*	https://www.slp.wa.gov.au/legislation/statutes.nsf/law_a252.html
Biodiversity Conservation [BC] *Act 2016*	https://www.slp.wa.gov.au/legislation/statutes.nsf/law_a147120.html

Table A2. The categories for flora and fauna listed as Threatened or specially protected. Taxa can be recognised as Threatened (T) or Conservation Dependent under Commonwealth (EPBC) and / or State (BC) Acts.

Threat category	Definition
Threatened - Critically Endangered (T-CR)	Considered to be facing an extremely high risk of extinction in the wild
Threatened – Endangered (T-EN)	Considered to be facing a very high risk of extinction in the wild
Threatened – Vulnerable (T-VN)	Considered to be facing a high risk of extinction in the wild
Threatened - Presumed extinct (T-EX)	Species which have been adequately searched for and there is no reasonable doubt that the last individual has died.
Conservation dependant (CD)	Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened
Migratory birds protected under international agreement (IA)	Birds that are subject to an agreement between the government of Australia and the governments of Japan (JAMBA), China (CAMBA) and The Republic of Korea (ROKAMBA), and the Bonn Convention, relating to the protection of migratory birds
Other specially protected fauna (OS)	Fauna otherwise in need of special protection to ensure their conservation

Table A3. Flora or fauna that are potentially threatened but do not meet the survey criteria or are otherwise data deficient are listed under Priority categories with the Department of Biodiversity, Conservation and Attractions.

Category	Description
Priority One (P1)	Known from few locations (generally <5), small populations and/or occurring on land with insecure tenure
Priority Two (P2)	Known from few locations (generally <5), small populations with some occurring on land with secure tenure
Priority Three (P3)	Known from several locations with habitat not under imminent threat
Priority Four (P4)	(a) Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These species are usually represented on conservation lands. (b) Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for Vulnerable, but are not listed as Conservation Dependent. (c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy

Table A4. Categories for ecological communities listed as Threatened (TEC). Communities can be recognised as Threatened under Commonwealth (EPBC) and / or State (BC) Acts.

Category	Description
Presumed totally destroyed (PU)	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)	Adequately surveyed and is found to be facing an extremely high risk of total destruction in the immediate future.
Endangered (EN)	Adequately surveyed and is not Critically Endangered but is facing a very high risk of total destruction in the near future.
Vulnerable (VU)	Adequately surveyed and is not Critically Endangered or Endangered but is facing a high risk of total destruction or significant modification in the medium (within approximately 50 years) to long-term future.

Table A5. The categories for ecological communities listed as Priority (PEC) with the Department of Biodiversity, Conservation and Attractions.

Category	Description
Priority One (P1)	Known from very few occurrences with a very restricted distribution (generally ≤5 occurrences or a total area of ≤ 100ha) and are currently under threat
Priority Two (P2)	Known from few occurrences with a restricted distribution (generally ≤10 occurrences or a total area of ≤200ha). At least some occurrences are not believed to be under immediate threat (within approximately 10 years)
Priority Three (P3)	Known from several to many occurrences, a significant number or area of which are not under threat of habitat destruction or degradation or: (ii) known from a few widespread occurrences, which are either large or with significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat (within approximately 10 years), or; (iii) made up of large, and/or widespread occurrences, that may or may not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing by domestic and/or feral stock, inappropriate fire regimes, clearing, hydrological change etc
Priority Four (P4)	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
Priority Five (P5)	Conservation dependant ecological communities. Not threatened but are subject to a specific conservation program, the cessation of which would result in the community becoming threatened within five years

Table A6. Species that are 'introduced' or 'weeds' can potentially be listed under the state Biosecurity Management Act (DPIRD 2019) or under the commonwealth Weeds of National Significance (WoNS) (DotEE 2019b).

Category	Description
Declared Pest, Prohibited - s12	Prohibited organism and may only be imported and kept subject to permits. Permit conditions applicable to some species may only be appropriate or available to research organisations or similarly secure institutions
Permitted - s11	Permitted organisms must satisfy any applicable import requirements when imported. They may be subject to an import permit if they are potential carriers of high-risk organisms
Declared Pest - s22(2)	Declared pests must satisfy any applicable import requirements when imported, and may be subject to an import permit if they are potential carriers of high-risk organisms. They may also be subject to control and keeping requirements once within Western Australia
Permitted, Requires Permit - r73	Regulation 73 permitted organisms may only be imported subject to an import permit. These organisms may be subject to restriction under legislation other than the Biosecurity and Agriculture Management Act 2007. Permit conditions applicable to some species may only be appropriate or available to research organisations or similarly secure institutions
WoNS	Weeds of National Significance – this is nationally recognised list of weeds agreed by Australian governments based on an assessment process that prioritised weeds based on their invasiveness, potential for spread and environmental, social and economic impacts. Consideration was also given to their ability to be successfully managed.

7 APPENDIX B - Map 1

Map 1: Targeted Flora Survey: Quaranup Road, Big Grove. CPS 9013/1.

Map produced by Damien Rathbone on 18/11/2021.
Report Reference: Rathbone (2021). Targeted Flora Survey: Quaranup Road, Big Grove. CPS 9013/1. Unpublished report by Southern Ecology (SE2113).
Map Projection: Transverse Mercator Horizontal Datum GDA 1994
Grid: MGA Zone 50 Map Size: A3

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583200 583300 583400 583500 583600 583700 583800 583900 584000

6117300 6117200 6117100 6117000 6116900 6116800 6116700 6116600

Proposed Clearing Envelope (~2.76 ha)

Tenure (Lot 56 - 14 ha)

Vegetation Type

- Coastal *Banksia ilicifolia*/Peppermint Low Woodland
- Coastal Heath
- Coastal Yate Forest
- Karri Forest
- Marri/Jarrah Coastal Hills Forest
- *Melaleuca preissiana* Low Woodland
- Cleared

Conservation Significant Flora

- *Adenanthos cunninghamii* P4

Weeds

- **Zantedeschia aethiopica* (Declared Pest)
- **Arctotheca calendula* (Invasive Ag. Weed)

Other Features

- Noongar lizard trap
- Symptomatic evidence of *Phythphora cinnamomi*

0 25 50 100
Metres

8 APPENDIX C - Plant Taxa Inventory

Table C1: Vascular plant taxa recorded opportunistically in the survey area. Nomenclature and status according WAH (1998-), DotEE (2017b) and DPIRD (2018). *denotes weed taxon. DP = Declared pest. WoNS = Weed of National Significance.

FAMILY		SPECIES	CONSV_CODE
Anarthriaceae		*Anarthria prolifera*	
Anarthriaceae		*Anarthria scabra*	
Anarthriaceae		*Lyginia barbata*	
Apiaceae		*Daucus glochidiatus*	
Apiaceae		*Xanthosia rotundifolia*	
Araceae	*	*Zantedeschia aethiopica*	Declared Pest
Asparagaceae		*Chamaescilla corymbosa*	
Asparagaceae		*Lomandra pauciflora*	
Asteraceae	*	*Arctotheca calendula*	
Asteraceae	*	*Hypochaeris glabra*	
Asteraceae		*Lagenophora huegelii*	
Boryaceae		*Borya sphaerocephala*	
Casuarinaceae		*Allocasuarina fraseriana*	
Chenopodiaceae		*Rhagodia baccata*	
Cyperaceae		*Baumea juncea*	
Cyperaceae		*Cyathochaeta equitans*	
Cyperaceae		*Ficinia nodosa*	
Cyperaceae		*Lepidosperma angustatum*	
Cyperaceae		*Lepidosperma gladiatum*	
Cyperaceae		*Lepidosperma striatum*	
Cyperaceae		*Schoenus caespititius*	
Cyperaceae		*Tetraria octandra*	
Cyperaceae		*Tetraria* sp. Jarrah Forest (R. Davis 7391)	
Dasypogonaceae		*Dasypogon bromeliifolius*	
Dennstaedtiaceae		*Pteridium esculentum*	
Dilleniaceae		*Hibbertia cuneiformis*	
Dilleniaceae		*Hibbertia cunninghamii*	
Dilleniaceae		*Hibbertia furfuracea*	
Droseraceae		*Drosera erythrogyne*	
Droseraceae		*Drosera pallida*	
Droseraceae		*Drosera pulchella*	
Elaeocarpaceae		*Tremandra stelligera*	
Ericaceae		*Andersonia caerulea*	
Ericaceae		*Andersonia sprengelioides*	
Ericaceae		*Leucopogon australis*	
Ericaceae		*Leucopogon gibbosus*	
Ericaceae		*Leucopogon rubricaulis*	
Ericaceae		*Leucopogon verticillatus*	
Ericaceae		*Lysinema conspicuum*	
Ericaceae		*Oligarrhena micrantha*	
Fabaceae		*Acacia cyclops*	

FAMILY		SPECIES	CONSV_CODE
Fabaceae		*Acacia hastulata*	
Fabaceae		*Acacia littorea*	
Fabaceae	*	*Acacia longifolia*	
Fabaceae		*Acacia pulchella*	
Fabaceae		*Bossiaea linophylla*	
Fabaceae		*Chorizema glycinifolium*	
Fabaceae		*Gastrolobium bilobum*	
Fabaceae		*Gompholobium capitatum*	
Fabaceae		*Hardenbergia comptoniana*	
Fabaceae		*Hovea chorizemifolia*	
Fabaceae		*Jacksonia horrida*	
Fabaceae	*	*Psoralea pinnata*	
Fabaceae		*Pultenaea reticulata*	
Fabaceae		*Sphaerolobium grandiflorum*	
Goodeniaceae		*Dampiera leptoclada*	
Goodeniaceae		*Dampiera linearis*	
Goodeniaceae		*Lechenaultia formosa*	
Goodeniaceae		*Scaevola striata*	
Haemodoraceae		*Anigozanthos flavidus*	
Haemodoraceae		*Conostylis aculeata*	
Hemerocallidaceae		*Caesia micrantha*	
Iridaceae		*Patersonia occidentalis*	
Iridaceae		*Patersonia umbrosa* var. *umbrosa*	
Juncaceae		*Juncus pallidus*	
Lentibulariaceae		*Utricularia tenella*	
Menyanthaceae		*Ornduffia albiflora*	
Menyanthaceae		*Ornduffia parnassifolia*	
Myrtaceae		*Agonis flexuosa*	
Myrtaceae		*Astartea fascicularis*	
Myrtaceae		*Corymbia calophylla*	
Myrtaceae		*Eucalyptus cornuta*	
Myrtaceae		*Eucalyptus diversicolor*	
Myrtaceae		*Eucalyptus marginata*	
Myrtaceae		*Eucalyptus megacarpa*	
Myrtaceae		*Melaleuca preissiana*	
Myrtaceae		*Melaleuca thymoides*	
Myrtaceae		*Taxandria linearifolia*	
Myrtaceae		*Taxandria parviceps*	
Olacaceae		*Olax benthamiana*	
Orchidaceae		*Cryptostylis ovata*	
Orchidaceae		*Pyrorchis nigricans*	
Orchidaceae		*Thelymitra flexuosa*	
Pittosporaceae		*Billardiera variifolia*	
Poaceae		*Amphipogon debilis*	
Poaceae	*	*Briza maxima*	
Proteaceae		*Adenanthos sericeus*	
Proteaceae		*Adenanthos x cunninghamii*	P4

FAMILY	SPECIES	CONSV_CODE
Proteaceae	*Banksia arctotidis*	
Proteaceae	*Banksia attenuata*	
Proteaceae	*Banksia formosa*	
Proteaceae	*Banksia grandis*	
Proteaceae	*Banksia ilicifolia*	
Proteaceae	*Banksia littoralis*	
Proteaceae	*Banksia quercifolia*	
Proteaceae	*Hakea florida*	
Proteaceae	*Hakea oleifolia*	
Proteaceae	*Hakea ruscifolia*	
Ranunculaceae	*Clematis pubescens*	
Restionaceae	*Hypolaena fastigiata*	
Restionaceae	*Loxocarya cinerea*	
Rhamnaceae	*Spyridium globulosum*	
Rubiaceae	*Opercularia hispidula*	
Thymelaeaceae	*Pimelea longiflora*	
Thymelaeaceae	*Pimelea rosea*	
Xanthorrhoeaceae	*Xanthorrhoea platyphylla*	

9 APPENDIX D - Likelihood of Occurrence Analysis

A post-survey likelihood of occurrence of all conservation significant species (flora and fauna) was assessed based on the presence of suitable habitat and survey effectiveness (see section 3.7).

Table E1. Likelihood of occurrence of significant flora recorded in the vicinity of the survey area (<10 km). NM = Naturemap, PMST = Protected Matters Search Tool, WAHERB = Western Australia Herbarium Database, TPFL = Threatened and Priority Flora Database.

Taxon [FAMILY]	Status		Source	Description, Habitat & Distribution	Pre-survey	Post-survey
	EPBC Act	WC Act/ DBCA				
Banksia brownii [Proteaceae]	E	CR	PMST, NM	Bushy, non-lignotuberous shrub or tree (small), 1-6 m high. Flowers cream & brown/orange-red, Mar to Jul. Sand over laterite, gravel, loam over granite. In gullies.	Unlikely	Unlikely
Banksia goodii [Proteaceae]	V	V	NM	Lignotuberous, prostrate shrub, ca 0.2 m high. Flowers orange-brown-red, May or Nov. White or grey sand over laterite.	Unlikely	Unlikely
Banksia verticillata [Proteaceae]	V	CR	PMST, NM	Non-lignotuberous shrub or tree (rarely), 1.3-6 m high. Flowers yellow-orange, Jan to Apr. Sandy loam. On or beside granite outcrops.	Unlikely	Unlikely
Caladenia granitora [Orchidaceae]	E	E	PMST	Tuberous, perennial, herb, 0.2-0.35 m high. Fl. cream & white & red, Oct to Nov. Shallow soil crevices on granite. Coastal areas.	Possible	Unlikely
Caladenia harringtoniae [Orchidaceae]	V	V	PMST, NM	Tuberous, perennial, herb, 0.2-0.4 m high. Flowers pink, Oct to Nov. Sandy loam. Winter-wet flats, margins of lakes, creeklines, granite outcrops.	Possible	Unlikely
Calectasia cyanea [Dasypogonaceae]	CR	CR	PMST, NM	Rhizomatous, clump forming, woody perennial, herb, 0.1-0.6 m high, to 0.3 m wide. Flowers blue/purple, Jun to Oct. White, grey or yellow sand, gravel.	Possible	Unlikely
Chordifex abortivus [Restionaceae]	E	V	PMST	Rhizomatous, erect perennial, herb, to 0.5 m high. Flowers brown, Sep to Oct. Sand. Low rises & undulating areas.	Possible	Unlikely
Conostylis misera [Haemodoraceae]	E	V	NM	Rhizomatous, tufted perennial, grass-like or herb, 0.05-0.18 m high. Flowers yellow, Oct to Nov. White or grey sand, sandy loam. Winter-wet flats.	Unlikely	Unlikely
Diuris drummondii [Orchidaceae]	V	V	PMST, NM	Tuberous, perennial, herb, 0.5-1.05 m high. Flowers yellow, Nov to Dec or Jan. Low-lying depressions, swamps.	Unlikely	Unlikely
Drakaea micrantha [Orchidaceae]	V	E	PMST	Tuberous, perennial, herb, 0.15-0.3 m high. Flowers red & yellow, Sep to Oct. White-grey sand.	Unlikely	Unlikely
Isopogon uncinatus [Proteaceae]	E	CR	PMST, NM	Tufted spreading or prostrate, non-lignotuberous shrub, 0.05-0.4 m high. Flowers yellow/cream, Oct to Nov. Loam or sand on granite, peaty sand. Swampy depressions, hillslopes.	Unlikely	Unlikely
Kennedia glabrata [Fabaceae]	V	V	PMST	Prostrate shrub, 0.05-0.5 m high, to 5 m wide. Flowers red, Aug to Nov. Soil pockets, sandy soils. Granite outcrops.	Unlikely	Unlikely

Taxon [FAMILY]	Status		Source	Description, Habitat & Distribution	Pre-survey	Post-survey
	EPBC Act	WC Act/ DBCA				
Sphenotoma drummondii [Ericaceae]	E	E	PMST	Tufted shrub, 0.15-0.5 m high. Flowers white, Sep to Dec. Stony or shallow soils over granite or quartzite. Steep rocky slopes, crevices of rocks.	Unlikely	Unlikely
Caladenia evanescens [Orchidaceae]		P1	NM	Tuberous, perennial, herb, 0.15-0.2 m high. Flowers green-cream-yellow, Nov. Sand. Consolidated sand dunes.	Unlikely	Unlikely
Colenthera coelophylla [Ericaceae]		P1	NM	*Coleanthera coelophylla* (DC.) Benth. is more recently known as *Styphelia coelophylla* (DC.) Hislop, Crayn & Puente-Lel. and is not listed as threatened or priority flora.	na	Unlikely
Drosera paleacea [Droseraceae]		P1	NM	Fibrous-rooted, rosetted perennial, herb, to 0.03 m high, to 0.015 m wide. Fl. white-cream, Sep to Dec or Jan. White sand, sandy clay.	Possible	Unlikely
Thomasia multiflora [Malvaceae]		P1	NM	Spreading shrub, 0.3-1 m high, to 2 m wide. Flowers pink-purple, Sep to Oct. Black sand. Seasonally wet areas, granite outcrops.	Possible	Unlikely
Thomasia purpurea x solanacea [Malvaceae]		P1	NM	Shrub, 0.5-0.8 m high. Flowers pink-purple, Nov to Dec or Jan. Grey sand over limestone. Creek sides.	Possible	Unlikely
Agrostocrinum scabrum subsp. *littorale* [Heremocallidaceae]		P2	NM	Rhizomatous, perennial, herb, to 0.15 m high. Flowers blue, Oct to Nov. Shallow granite loams. Coastal slopes.	Unlikely	Unlikely
Conospermum quadripetalum [Proteaceae]		P2	NM	Diffuse, straggly shrub, 0.3-1 m high. Fl. blue/white, Sep to Nov. Sandy clay, grey sand. Flats behind coastal hills.	Possible	Unlikely
Conospermum spectabile [Proteaceae]		P2	NM	Erect, compact shrub, 0.5-0.8 m high. Flowers white & blue, Oct to Nov. Sandy soils.	Unlikely	Unlikely
Gyrostemon thesioides [Gyrostemonaceae]		P2	NM	Straggling, decumbent shrub, to 0.7 m high. Flowers red-orange-yellow/yellow-green, Nov. Sand over limestone. Consolidated coastal dunes.	Possible	Unlikely
Hydrocotyle serendiptida [Araliaceae]		P2	NM	Ephemeral, post-fire adventive herb. Petals white. Mallee woodland on grey sand.	Possible	Limitation: No recent fire
Isopogon buxifolius var. *buxifolius* [Proteaceae]		P2	NM	Upright shrub, 0.45-1 m high. Flowers pink-cream, Jul to Dec. Grey sand. Swampy areas.	Unlikely	Unlikely
Leucopogon bracteolaris [Ericaceae]		P2	NM	Shrub, 0.25-1 m high. Flowers white, Feb or May or Jul or Oct. Stony sand, gravelly loam.	Unlikely	Unlikely
Schoenus sp. Grassy (E. Gude & J. Harvey 250) [Cyperaceae]		P2	NM	Rhizomatous, perennial, grass-like or herb (sedge), to 0.7 m high. Fl. yellow. Black silt. Swamps	Unlikely	Unlikely
Stylidium articulatum [Stylidiaceae]		P2	NM	Rosetted perennial, herb, 0.15-0.25 m high, Leaves erect to spreading, oblanceolate, 3-8 cm long, 5-14 mm wide, apex subacute to acute, glabrous. Scape glandular in upper half. Inflorescence paniculate. Flowers pink, Nov to Dec. Sandy loam, granite. Hills, coastal heath.	Unlikely	Unlikely

Taxon [FAMILY]	Status		Source	Description, Habitat & Distribution	Pre-survey	Post-survey
	EPBC Act	WC Act/ DBCA				
Stylidium falcatum [Stylidiaceae]		P2	NM	Perennial, herb, 0.15-0.35(-0.6) m high. Flowers white, Oct to Nov. Sand, gravelly clay loam. Plains, lateritic ridges.	Unlikely	Unlikely
Thelymitra variegata [Orchidaceae]		P2	NM	Tuberous, perennial, herb, 0.1-0.35 m high. Flowers orange & red & purple & pink, Jun to Sep. Sandy clay, sand, laterite.	Possible	Limitation: Winter flowering
Acacia ataxiphylla subsp. *ataxiphylla* [Fabaceae]		P3	NM	Prostrate, sprawling shrub, 0.15-0.5 m high, to 1 m wide. Flowers yellow, Nov to Dec or Jan. Gravelly clay loam, white/grey sand. Flats, roadsides.	Unlikely	Unlikely
Andersonia setifolia [Ericaceae]		P3	NM	Decumbent to erect, cushion-forming shrub, 0.05-0.15 m high. Flowers red/white, Jun to Oct. Sandy & gravelly soils. Hillslopes & breakaways.	Unlikely	Unlikely
Austrostipa mundula [Poaceae]		P3	NM	Grass 35 cm high x 20 cm wide. Flowers brown. Grey sand over limestone.	Possible	Unlikely
Boronia crassipes [Rutaceae]		P3	NM	Erect, spindly shrub, 0.5-2 m high. Flowers red-pink, Aug to Sep. Sand, peaty sand. Winter-wet swamps, creeklines.	Unlikely	Unlikely
Chorizema carinatum [Fabaceae]		P3	NM	Erect or spreading shrub, 0.1-0.6 m high. Flowers yellow, Oct to Dec. Sand, sandy clay.	Unlikely	Unlikely
Juncus meianthus [Juncaceae]		P3	NM	Tufted perennial, herb, 0.05-0.2 m high, to 0.4 m wide. Flowers brown, Nov to Dec or Jan. Black sand, sandy clay. Creeks, seepage areas.	Unlikely	Unlikely
Lachnagrostis billardierei subsp. *billardierei* [Poaceae]		P3	NM	Annual, herb. Fl. purple/green, Dec. Saline Coastal woodland.	Possible	Unlikely
Lasiopetalum sp. Denmark (B.G. Hammersley 2012) [Malvaceae]		P3	NM	Open erect perennial shrub. Flowers cream/pink.	Possible	Unlikely
Leucopogon alternifolius [Ericaceae]		P3	NM	Erect or semi-erect, scrambling shrub, 0.1-1(-2) m high. Flowers white/white-pink, Aug to Dec. Grey/white sand. Swampy areas, seasonally wet areas.	Unlikely	Unlikely
Poa billardierei [Poaceae]		P3	NM	Tussock grass to 0.5 m. Foredunes, drift sands.	Unlikely	Unlikely
Synaphea preissii [Proteaceae]		P3	NM	Erect, low shrub, 0.15-0.4 m high. Flowers yellow, Jul to Nov. Sand, gravelly loam.	Unlikely	Unlikely
Verticordia endlicheriana var. *angustifolia* [Myrtaceae]		P3	NM	Erect shrub, 0.3-0.5 m high. Flowers yellow, Oct to Nov. Sandy clay. Granite outcrops.	Unlikely	Unlikely
Adenanthos x cunninghamii [Proteaceae]		P4	NM	Erect open shrub, 1-3 m high. Flowers red/pink-red, Mar or Sep to Oct. Grey sand. Coastal dunes & sandplains.	Possible	Present
Asplenium obtusatum subsp. *northlandica* [Aspleniaceae]		P4	NM	*Asplenium obtusatum subsp. northlandica* is more recently known as *Aspelnium decurrens* . A fern, found on islands, on cliffs/slopes of granite and gneiss.	Unlikely	Unlikely

Taxon [FAMILY]	Status		Source	Description, Habitat & Distribution	Pre-survey	Post-survey
	EPBC Act	WC Act/ DBCA				
Banksia serra [Proteaceae]		P4	NM	Erect, slender, non-lignotuberous shrub, 1-4(-7) m high. Flowers yellow/cream-green, Jul to Sep. Gravel, sand or clay loam over laterite. Hillslopes.	Unlikely	Unlikely
Eucalyptus x missilis [Myrtaceae]		P4	NM	Mallee, to 3 m high, bark smooth. Fl. yellow/cream-white, Jan to Apr. Sand over limestone or granite. Coastal sites.	Possible	Unlikely
Gahnia sclerioides [Cyperaceae]		P4	NM	Lax, slender rhizomatous, perennial, grass-like or herb (sedge), 0.3-0.9 m high. Loam, sandy soils. Moist shaded situations.	Possible	Unlikely
Gonocarpus pusillus [Haloragaceae]		P4	NM	Prostrate annual, herb, 0.05-1.2 m high. Flowers green/yellow-red, Nov to Dec. Grey sandy clay. Winter-wet swamps.	Unlikely	Unlikely
Kunzea pauciflora [Myrtaceae]		P4	NM	Erect, compact shrub, (0.35-)0.5-1.2(-1.5) m high. Fl. pink, Aug to Nov. Gravelly sandy or loamy soils over limestone, sandstone or spongolite. Hillsides, coastal slopes.	Unlikely	Unlikely
Lepidium pseudotasmanicum [Brassicaceae]		P4	NM	Erect annual or biennial, herb, 0.2-0.4(-1) m high. Flowers white-green, Feb or Dec. Loam, sand.	Unlikely	Unlikely
Microtis pulchella [Orchidaceae]		P4	NM	Tuberous, perennial, herb, 0.12-0.25 m high. Flowers white, Nov to Dec or Jan. Peaty sand. Winter-wet swamps.	Unlikely	Unlikely
Microtis quadrata [Orchidaceae]		P4	NM	Erect herb with tuber, 0.4 m high. Greenish flowers. Grey sandy clay. Wet areas.	Unlikely	Unlikely
Myosotis australis [Boraginaceae]		P4	NM	Erect or procumbent annual, herb, up to 0.3 m high. Flowers white/blue, Aug to Nov. Grey sand over limestone.	Possible	Unlikely
Spyridium spadiceum [Rhamnaceae]		P4	NM	Erect slender or weak semi-prostrate shrub, 0.15-3 m high. Flowers white, Aug to Dec or Jan to Feb or Apr. Sand or gravelly loam. Granitic hills.	Possible	Unlikely
Thomasia quercifolia [Malvaceae]		P4	NM	Shrub to 1 m high. Pink purple flowers in Apr, Aug, Oct, Nov or Dec. Karri loam or grey coastal sand.	Possible	Unlikely
Thomasia solanacea [Malvaceae]		P4	NM	Erect shrub, 0.5-3 m high. Flowers blue-purple-pink, Sep to Dec. Alluvium, sand over limestone, rocky loam. Coastal areas.	Possible	Unlikely
Thysanotus isantherus [Asparagaceae]		P4	NM	Caespitose perennial, herb (with tuberous roots), to 0.15 m high. Flowers purple, Nov to Dec. Granite.	Possible	Unlikely

10 APPENDIX E - Naturemap and PMST search results