Shire of Dandaragan: Gravel Pit Reserve R35593; Flora, Vegetation and Vertebrate Fauna Reconnaissance Surveys

Version 1

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March 31, 2020

CONTENTS

SUMMARY

The Shire of Dandaragan (the Shire) needs to extend an existing gravel pit located in Section 5(1)(g) Reserve R35593 north-east of Jurien Bay, Western Australia (WA). The reserve is vested in the Conservation Commission of WA for the designated purpose of "Gravel Resource Management, Restoration and Conservation" and the extraction of gravel from the reserve is covered by Gravel Lease 176, which is in the process of being renewed. A clearing permit is required as no exemption applies.

Maia Environmental Consultancy Pty Ltd (Maia) and Western Wildlife were engaged to carry out a flora, vegetation and fauna desktop study and reconnaissance survey over a section of the gravel pit reserve including the extension area. The area is referred to as the Survey Area in this report.

The Survey Area is in the Geraldton Sandplains IBRA bioregion and Lesueur Sandplain subregion. Currently, 44.78% of the native vegetation in the Geraldton Sandplains remains and 34.48% of the vegetation in the Lesueur Sandplain. The Survey Area is mapped as one pre-European vegetation association (VA) – 1031- and 34.48% of VA 1031 remains in the Geraldton Sandplains bioregion and Lesueur Sandplain subregion and 14.72% is protected in conservation tenure. The vegetation of the Survey Area is rated as having high susceptibility to dieback, however, no known positive *Phytophthora* species points are located within 2 km of the Survey Area.

A desktop assessment indicated that no threatened flora species and four priority flora species have been recorded in R35593 previously: *Lasiopetalum rutilans*, *Leucopogon plumuliflorus* (both Priority (P) 2), *Gompholobium gairdnerianum* and *Hensmania stoniella* (both P3).

The Survey Area does not lie in a Threatened Ecological Community (TEC) protected by federal or state law or within the boundaries of a currently known Priority Ecological Community (PEC). The closest TEC / PEC buffers are approximately 0.5 km west of the Survey Area.

The flora and vegetation survey was carried out over a 6.85 ha section of the gravel pit lease in mid-October 2019, and 106 species were recorded from 30 families and 66 genera. No threatened flora species were recorded in the Survey Area, while five priority flora species were recorded: *Synaphea lesueurensis* (P2), *Haemodorum loratum*, *Patersonia argyria*, *Verticordia rutilastra* (all P3) and *Xanthosia tomentosa* (P4).

One vegetation type (Mixed Heathland) in excellent condition occurs in the Survey Area. The vegetation type does not resemble any TEC or PEC currently listed for the Geraldton Sandplains bioregion and DBCA Midwest region respectively. The Survey Area is on the footslopes of lateritic uplands and the heathland vegetation type is similar to GFG 20-13, which is noted as occurring on uplands and well drained slopes of grey sandy lateritic gravel between Eneabba, Lesueur, Watheroo and Dandaragan. The vegetation of the Survey Area herefore occurs around and some distance from the Survey Area.

An impact assessment was carried out for the priority species and the vegetation located in the Survey Area. Impacts estimated for the plants known to Maia ranges from 0.45% (*Xanthosia tomentosa*) to 11.49% (*Haemodorum loratum*), while impact for the plant populations known to Maia ranges from 2.33% (*Haemodorum loratum*) to 9.09% (*Synaphea lesueurensis*). Ten of the 43 *Haemodorum loratum* populations (23.3%) are in protected lands and seven of the 11 *Synaphea lesueurensis* populations (63.6%). Given the number of priority plants located in the relatively small Survey Area, and that the vegetation type recorded in the Survey Area extends over quite a large area around and beyond the Survey Area, it is likely that each of these species occurs in similar numbers in the surrounding vegetation. Clearing of 5 ha of VA 1031 in the Survey Area would reduce its remaining extent in the Geraldton Sandplains bioregion (and the Lesueur Sandplain subregion) by 0.002%. The local area (the area within a 10 km radius of the centre of the Survey Area) will retain approximately 74.81% native vegetation extent (NVE) after clearing 5 ha at the gravel pit (a reduction of 0.02%), and NVE in R35593 will be reduced by 1.44% to 90.91%.

The flora and vegetation survey was carried out over the 6.85 ha area and the Shire then selected a 5 ha area to be cleared within the 6.85 ha area. The 5 ha area was selected to minimise impact to the conservation significant flora species located in the Survey Area.

One fauna habitat in excellent condition is present in the Survey Area – low heathland. As the habitat in the Survey Area is part of a relatively large area of continuous habitat it is unlikely to be of particular importance as an ecological linkage. The faunal assemblages of the Survey Area are likely to be typical of the heathlands of the region and relatively intact for the same reason.

The results of the fauna database searches were reviewed and given the habitat requirements of the conservation significant fauna species listed and the fauna habitat in the Survey Area, four conservation significant species could potentially occur in the Survey Area: Carnaby's Cockatoo (*Calyptorhynchus latirostris*), Malleefowl (*Leipoa ocellata*), the Fork-tailed Swift (*Apus pacificus*) (all threatened species), and the Western Brush Wallaby (*Notamacropus irma*), a P4 species. The Malleefowl is likely to be an occasional foraging visitor to the Survey Area, as the Survey Area would be a very small part of a much larger foraging range, the loss of 5 ha of possible foraging habitat is unlikely to have a significant impact on the species. Carnaby's Cockatoo is likely to be a foraging visitor to the Survey Area, but not likely to breed or roost in the Survey Area. Clearing will result in the loss of 5 ha of low value foraging habitat that may be used by breeding birds, as breeding is known to occur with 12 km of the Survey Area. The Fork-tailed Swift (*Apus pacificus*) may overfly the Survey Area but is not likely to use the low heathland habitat. Therefore, clearing 5 ha of habitat is not likely to have a significant impact on this species. The Western Brush Wallaby is likely to occur in the Survey Area, which is likely to represent the home-range of a single individual. Although some habitat for this species will be lost, clearing of 5 ha of low heathland is not likely to have a significant impact on the species. These four species were not seen in the Survey Area when the reconnaissance survey was carried out; however, Carnaby's Cockatoo were observed in the surrounding area.

Clearing of 5 ha of low heathland habitat will result in the loss of all native fauna habitat from the cleared area. However, populations of all species occurring in the Survey Area are likely to persist in the adjacent extensive area of habitat. The clearing is unlikely to result in an increase in habitat fragmentation in the area, as it is set within a large remnant of almost continuous vegetation.

When the 10 clearing principles are addressed, three are considered not to be at variance and seven are considered unlikely to be at variance.

Shire of Dandaragan: Gravel Pit Reserve R35593; Flora, Vegetation and Vertebrate Fauna Reconnaissance Surveys

DRAFT 1

1 INTRODUCTION

The Shire of Dandaragan (the Shire) needs to extend an existing gravel pit 18 km north-east of Jurien Bay, Western Australia (WA). The gravel pit is in Section 5(1)(g) Reserve R35593 (**Map 1, Section 11**). The reserve is vested in the Conservation Commission of WA for the designated purpose of "Gravel Resource Management, Restoration and Conservation" and the extraction of gravel from the reserve is covered by Gravel Lease 176: the lease expired in 2015 and is currently in the process of being renewed. A clearing permit is required as no exemption applies.

Maia Environmental Consultancy Pty Ltd (Maia) and Western Wildlife were engaged to carry out a flora and fauna desktop assessment, a flora and vegetation reconnaissance survey and a fauna reconnaissance survey over the extension area. The area surveyed is referred to as the Survey Area in this report and it covers approximately 6.85 hectares (ha). The Shire plans to clear 5 ha for the gravel pit and not the 6.85 ha surveyed (**Map 1, Section 11**).

This report includes background information relevant to a Native Vegetation Clearing Permit (NVCP) application, flora and fauna database search results, survey methods, survey results and a table addressing the NVCP 10 clearing principles.

2 BACKGROUND

Information on the bioregion, sub-region, soil landscape units, geology, pre-European vegetation associations, protected and significant areas, watercourses and wetlands and Phytophthora dieback is summarised in **Table 1**.

Table 1: Background Information

Background information on the Project Area	
IBRA bioregion and subregion (**Map 2A, Section 11**)	Geraldton Sandplains bioregion and Lesueur Sandplain subregion. Source: Department of the Environment and Energy (DotEE) (2012).
Geology (**Map 2B, Section 11**)	One surface geology unit has been mapped in the Survey Area: • Sand or gravel plains; quartz sand sheets commonly with ferruginous pisoliths or pebbles, minor clay; local calcrete, laterite, silcrete, silt, clay, alluvium, colluvium, aeolian sand (Czs). Source: Geoscience Australia (2012).
Soil landscape mapping units (**Map 2C, Section 11**)	One soil landscape unit has been mapped in the Survey Area: • Plateau residuals, very gently to gently inclined hillcrest and hillslopes; pale sandy gravels, shallow gravel over duricrust, gravelly pale deep sand, pale and yellow deep sands (222Ye_2). Source: Department of Agriculture and Food Western Australia (DAFWA) (2014).

Background information on the Project Area

Pre-European vegetation associations and system associations

(**Map 2D, Section 11**)

The Environmental Protection Authority's (EPA) broad principles for the protection of native terrestrial vegetation and flora indicate that biodiversity should be maintained at sustainable levels. This generally means that ecological communities should be retained at an overall level of at least 30% of the original extent of the ecological community in each region (EPA, 2000). This level is the threshold level below which species loss appears to accelerate exponentially at an ecosystem level. A level of 10% of the original extent is regarded as being a level representing "endangered" (EPA, 2000).

Currently 44.78% of the native vegetation in the Geraldton Sandplains remains, 34.48% in the Lesueur Sandplain and 44.21% in the Shire of Dandaragan (GoWA, 2019).

The Survey Area lies in one of the pre-European vegetation associations (VA) and system associations (VSA) mapped in the Geraldton Sandplains (Department of Primary Industries and Rural Development (DPIRD), 2018a):

- VA 1031; VSA 1031 (Mosaic: Shrublands; hakea scrub-heath / Shrublands; dryandra heath).

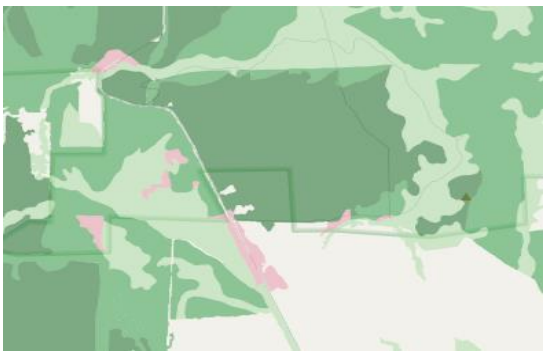
The pre-European extent of the VA and VSA in the Geraldton Sandplains bioregion and Lesueur Sandplain subregion (Gairdner System), and the current extent, the percentage remaining, and the current extent protected for conservation in the bioregion and subregion are listed in the following table.

Pre-European extent (ha)	Current extent (ha)	Remaining (%)	Current Extent Protected (IUCN 1-4) for Conservation (proportion of pre-European extent) (%)
Vegetation association 1031			
Geraldton Sandplains			
241,349.97	83,217.27	34.48	14.72
Lesueur Sandplain			
241,349.97	83,217.27	34.48	14.72
Vegetation system association 1031 (Gairdner System)			
Geraldton Sandplains			
16,486.70	9,759.97	59.20	47.10
Lesueur Sandplain			
16,486.70	9,759.97	59.20	47.10

Source: GoWA, 2019.

Currently, 34.48% of VA 1031 remains in the Geraldton Sandplains bioregion and in the Lesueur Sandplain subregion and 59.20% of VSA 1031 in both the bioregion and subregion; 14.72% of VA 1031 is protected in the bioregion and subregion and 47.10% of VSA 1031.

The Shire of Dandaragan retains 29.52% of the original extent of VA 1031 (14.86% of which is in protected areas) and 66.60% of the VSA of the Gairdner System (55.31% of which is in protected lands (GoWA, 2019)).

Background information on the Project Area	
Protected and Significant Areas (**Map 3, Section 11**)	• The Survey Area is located in DBCA Legislated Lands and Waters (Department of Biodiversity, Conservation and Attractions (DBCA), 2019a) i.e. in Section 5(1)(g) Reserve 35593. The Reserve is bounded by Nature reserve 35594 (adjacent to its western boundary) and Lesueur National Park (adjacent to northern and eastern boundaries). • The Survey Area is in an Environmentally Sensitive Area (Department of Water, Environment and Regulation (DWER), 2017a). • The Survey Area lies in a Schedule 1 Area – Geraldton Sandplains (DWER, 2017b). • The Survey Area lies in an EPA Redbook Recommended Conservation Reserves 1976-1991 area (including R35593, Nature Reserve R35594 and Lesueur National Park (DBCA, 2017b)). • None of the Survey Area occurs within a Ramsar Site (DBCA, 2017c). • None of the Survey Area occurs within a Directory of Important Wetlands in Australia (DIWA) wetland (DBCA, 2018a).
Watercourses and Wetlands (**Map 4, Section 11**)	• No watercourse areas and lines, lakes, waterholes, water points and springs cross or occur within the Survey Area (Geoscience Australia, 2006). • No Geomorphic Wetlands are mapped within the Survey Area (Cervantes Coastal (DBCA, 2017d) and Cervantes Eneabba (DBCA, 2017e)).
Phytophthora dieback	As the long-term annual average rainfall in Jurien Bay is greater than 400 mm (532 mm), it is in an area where dieback could occur. Project Dieback (PD) has created a publicly available map showing locations of soils samples with a positive reading for *Phytophthora cinnamomi* in the southwest of WA (PD, 2014a). No known positive *Phytophthora* species points are located within the Survey Area (to 30 June 2018); however, one *P. arenaria* positive sample point occurs approximately 3.5 km south-west of the Survey Area (PD, 2014a). VSA 1031 is rated as having high susceptibility to dieback. Priority Protection Areas (PPAs) are areas representing significant biodiverse ecosystems and communities vulnerable to dieback in the southwest of WA and identified for state level Dieback management and investment (PD, 2014b). The goal is to protect and conserve the most significant examples of biodiverse ecosystems and communities in the south-west, which are vulnerable to or threatened by dieback (PD, 2014b). Most of the Survey Area occurs within a PPA asset boundary and a PPA management boundary (**Figure 1**; PD, 2014a). It is also mapped in an Uninfested High Value Landscape. **Figure 2** is a disease confidence map current to 2008 for the Survey Area and surrounds (PD, 2014a). Cockleshell Gully Road leading to the Survey Area is in a low confidence infested with *P. cinnamomi* area and the Survey Area lies within a high confidence uninfested area.  **Figure 1**: Priority Protection Areas and the Survey Area (PD, 2014a; yellow hexagon outline = Uninfested High Value Landscape, orange dotted line = PPA Asset Boundaries Refined, black dotted line = PPA Management Boundaries Refined).  **Figure 2**: Disease (*Phytophthora cinnamomi*) confidence mapping to 2008 (PD, 2014a) Dark green = high confidence uninfested to 2008, mid green = moderate confidence, pink = low confidence infested.

3 SURVEY METHODS

EPA (2016a, 2016b) was used as a guide for the level of survey required. Flora, vegetation and fauna desktop studies were carried out followed by a flora and vegetation reconnaissance survey, a targeted flora survey and a fauna reconnaissance survey.

The flora and vegetation survey was carried out by three botanists on October 14 and 18, 2019. The botanists assessed three 10 m x 10 m quadrats in the Survey Area and also walked traverses at approximately 12 -13 m spacings over the Survey Area surveying a band of vegetation of approximately 6-10 m wide while walking (**Map 5, Section 11**).

The following parameters were recorded at the three quadrats assessed:

- Location details including Global Positioning System (GPS) co-ordinates (Geocentric Datum of Australia, 1994 (GDA94)).
- Site parameters such as soil description, topography and general habitat description, rock type and cover.
- Photographs of the site.
- Vegetation condition using the scale and criteria in EPA, 2016a.
- Notes on any disturbance to the vegetation.
- Fire history.
- A description of the vegetation structure including the height, percentage cover and dominant species within each stratum.
- The name, height, percentage cover and any other significant recording details for any other species located at the relevé.

Conservation significant species known to occur in the area and surrounds, any unknown and novel species and introduced species were targeted while walking traverses within the Survey Area. When known or suspected conservation significant species were located the botanists recorded their location on a GPS and their numbers were counted. While walking traverses the botanists also collected specimens of any taxa not already collected at quadrats.

The fauna reconnaissance survey was carried out by one zoologist on January 30, 2020.

4 DATABASE SEARCH RESULTS

Appendix 5 provides information on conservation significance of flora, fauna and vegetation and references for the relevant literature and current listings.

4.1 CONSERVATION SIGNIFICANT FLORA

Searches were made of the DBCA Threatened and Priority Flora List (TPFL) and DBCA WA Herbarium (WAHerb) databases (DBCA search reference #46-0919FL) (**Map 6, Section 11**), using the EPBC Act Protected Matters Search Tool (PMST) (DotEE, 2019a, search reference PMST NUXJIB, **Appendix 1**) and of NatureMap (Department of Biodiversity, Conservation and Attractions (DBCA), 2007-, **Appendix 1)** to gather information on conservation significant flora (CSF) species that could potentially occur in the Survey Area. The searches were carried out over a 10 km radius circle centred on the Survey Area. The search results are listed in **Table 12, Appendix 1**.

4.1.1 Threatened Flora

While 21 Threatened flora species (or their habitats) protected by the federal *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) or by the WA *Biodiversity Conservation Act 2016* (BC Act) were listed in the search results for the 10 km radius search area, none of them have been located in the Survey Area or in reserve R35593 previously (DBCA, 2007-; DBCA search reference #46-0919FL; **Table 12, Appendix 1**). The closest Threatened species record is a *Thelymitra stellata* record approximately 3 km east north-east of the Survey Area (**Map 6, Section 11**).

4.1.2 Priority Flora

Seventy-nine Priority (P) flora species have records in the 10 km radius search area (DBCA, 2007-; DBCA search reference #46-0919FL; **Table 12, Appendix 1**) – two P1 species, 29 P2 species, 32 P3 species and 16 P4 species. Four of the 79 Priority species have been located previously in gravel pit Reserve R35593 - *Lasiopetalum rutilans*, *Leucopogon plumuliflorus* (both P2), *Gompholobium gairdnerianum* and *Hensmania stoniella* (both P3) (DBCA, 2007-; **Appendix 1**); however, none of the records are within the Survey Area. The closest priority flora record to the Survey Area is *Hensmania stoniella* (approximately 0.4 km to the south) (**Map 6, Section 11**). It is possible that these four species could occur in the Survey Area as some of the records for each species are from similar habitats. They are perennial species and flowering specimens for each of them have been recorded in spring (they are recorded as flowering between August and December, depending on the species).

4.2 Conservation Significant Fauna (Western Wildlife)

The following databases were used to gather background information on conservation significant fauna (CSFa) species that could potentially occur in the Survey Area - the EPBC Act Protected Matters Search Tool (PMST) (DotEE, 2019a, search reference PMST NUXJIB, **Appendix 1**) and NatureMap (DBCA, 2007-, **Appendix 1**). A 10 km radius search was carried out using the following coordinates – 30.170492 S, 115.144191 E.

4.2.1 Threatened Fauna

Nine Threatened fauna species protected by the EPBC Act were listed in the PMST search results (**Table 13, Appendix 1**). The type of presence for *Calyptorhynchus latirostris* (Carnaby's Cockatoo) is listed as 'breeding is known to occur in the area'. The type of presence for the remaining species is either listed as 'species or species habitat likely to occur within area' (three species) or 'species or species habitat may occur within area' (five species) (DotEE, 2019a; **Table 13, Appendix 1**).

Three Threatened fauna species protected by the EPBC Act and BC Act have been located previously within the search area – *Calyptorhynchus latirostris* (Carnaby's Cockatoo), *Leipoa ocellata* (Malleefowl) and *Macroderma gigas* (Ghost Bat) (DBCA, 2007-; **Table 13, Appendix 1**). One Threatened fauna species protected by the BC Act and not the EPBC Act was also listed in the NatureMap results - *Cyclodomorphus branchialis* (Gilled Slender Blue-tongue Skink).

Of the listed Threatened species only Carnaby's Cockatoo and the Malleefowl potentially occur in the Survey Area. The remaining species are unlikely to occur due to lack of suitable habitat or local extinction. These species are discussed further in **Section 5.3**.

4.2.2 Migratory Fauna

Ten Migratory Fauna species protected by the EPBC Act and BC Act were listed in the PMST search results. Three of these species are listed as Threatened (DotEE, 2019a; **Table 13, Appendix 1**).

Eight Migratory Birds (protected under international agreement) have been located previously within the 10 km search area: *Calidris acuminata* (Sharp-tailed Sandpiper), *Calidris alba* (Sanderling), *Hydroprogne caspia* (Caspian Tern), *Plegadis falcinellus* (Glossy Ibis), *Pluvialis squatarola* (Grey Plover), *Puffinus pacificus* (Wedge-tailed

Shearwater), *Thalasseus bergii* (Crested Tern), *Tringa glareola* (Wood Sandpiper) and *Tringa nebularia* (Common Greenshank, Greenshank) (DBCA, 2007-; **Table 13, Appendix 1**).

Apart from the Fork-tailed Swift (*Apus pacificus*), the Migratory species are all associated with beaches, lakes and/or offshore islands, and would not occur in the Survey Area due to lack of suitable habitat. These species are discussed further in **Section 6.3**.

4.2.3 Specially Protected Fauna

No Specially Protected Fauna species have been located previously within 10 km of the Survey Area (DBCA, 2007-; **Appendix 1**).

4.2.4 Priority Fauna

One Priority fauna species has been located previously within 10 km of the Survey Area – *Notamacropus irma* (Western Brush Wallaby) (P4) (**Map 7, Section 11**; DBCA, 2007-, **Table 13, Appendix 1**). The nearest known record is 4.8 km north north-west of the Survey Area (DBCA, 2007-). This species is discussed further in **Section 6.3**.

4.3 Ecological Communities

The following databases were used to gather information on significant ecological communities that could potentially occur in the Survey Area - EPBC Act Protected Matters Search Tool (DotEE, 2019a), Australian Government (2019) and NatureMap (DBCA, 2007-). A 10 km radius search area was used from the centre of the Survey Area.

4.3.1 Threatened Ecological Communities

Two Threatened Ecological Communities (TECs) were listed in the PMST search results as 'may occur within the area' and 'likely to occur within the area', respectively – 'Tuart (*Eucalyptus gomphocephala*) Woodlands and Forests of the Swan Coastal Plain' ecological community (Critically Endangered) and 'Banksia Woodlands of the Swan Coastal Plain' ecological community (Endangered) (DotEE, 2019a). However, neither of these TECs is currently known to occur in the Survey Area (DBCA search reference, 53-0919EC; **Map 8, Section 11**). The closest buffer for one of these TECs is approximately 0.5 km west of the Survey Area - 'Banksia Woodlands of the Swan Coastal Plain'. This ecological community is listed as a TEC federally and listed as a Priority Ecological Community (PEC) in WA.

The most recent WA TEC list is correct to June 28, 2018 (DBCA, 2018e) and includes five TECs listed for the Geraldton Sandplains bioregion. The Survey Area does not lie within any of the current boundaries indicated for a known WA listed TEC (DBCA search reference, 53-0919EC; **Map 8, Section 11**).

4.3.2 Priority Ecological Communities

The most recent Priority Ecological Community (PEC) list is dated January 17, 2019 (DBCA, 2019e) and includes 109 PECs listed for the Midwest.

The Survey Area does not occur within the boundaries of a currently known PEC (DBCA search reference, 53-0919EC; **Map 8, Section 11**). The closest PECs to the Survey Area are located approximately 0.5 km to the west of the Survey Area and 5.4 km east of the Survey Area, respectively - 'Banksia dominated woodlands of the Swan Coastal Plain IBRA region' (P3(iii) PEC) and '*Petrophile chrysantha* low heath on Lesueur dissected uplands (Gp200-170)' (P2 PEC).

5 RAINFALL

The closest Bureau of Meteorology (BoM) weather station to the Survey Area is Jurien Bay (BoM station number 9131) located approximately 18 km south-west of the Survey Area. Long-term (1968 to 2019) and October 2018 to December 2019 monthly total rainfall data collected at Jurien Bay is listed in **Table 2** (BoM, 2020).

Most of the yearly rainfall is typically received from May to August at Jurien Bay (**Table 2**) (BoM, 2020).

Rainfall received between October 2018 and September 2019 (372.9 millimetres (mm)) was lower than the annual long-term mean (532.2 mm) (BoM, 2020).

Total rainfall in the four months before the October survey (June, July, August and September – 302.0 mm) was 40.4 mm lower than the long-term mean for those four months (342.4 mm) (BoM, 2020).

Based on the rainfall data recorded in the months before the survey and the long-term records, the vegetation in the Survey Area should have been in average to below average condition in October 2019.

Table 2: Actual (October 2018 to December 2019) and long-term (1968-2019) monthly rainfall (mm) at Jurien Bay (BoM, 2020)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Rainfall records (mm) from Jurien Bay (Station Number 9131, 1968 - 2019)													
L-t	8.1	14.0	14.4	29.5	75.0	105.2	113.2	80.4	43.6	25.1	17.2	6.5	532.2
2018										22.8	2.6	5.2	30.6 (Oct to Dec)
2019	1.0	1.0	1.0	23.0	14.3	140.0	80.2	69.8	12.0	14.4	8.0	1.0	365.7

Note: L-t= long-term.

6 SURVEY RESULTS

6.1 SURVEY COVERAGE ACHIEVED

Three 10 m x 10 m quadrats were assessed and approximately 5.64 km of traverses were walked over the Survey Area; survey coverage achieved is listed in **Table 3**. Coverage achieved along traverses was determined by buffering them by 10 m. The information collected at the three quadrats is provided in **Table 14, Appendix 2**. Two further quadrat sites were selected before the survey and they were visited, and photographs taken; however, a quadrat was not established and assessed at these sites because the vegetation was the same as that at the three quadrats already assessed. Quadrat and photo point site photographs are included in **Table 14 (Appendix 2)** and quadrat and photo point locations and traverses walked over the Survey Area are shown on **Map 5, Section 11**.

Table 3: Survey coverage achieved

Attribute	Survey coverage
Quadrats (ha)	0.03
Traverses (ha)	5.64
Total area surveyed (ha)	5.67
Coverage achieved (%)	82.77

6.2 FLORA

6.2.1 GENERAL FLORA

One hundred and six (106) taxa were collected from the Survey Area (**Table 15, Appendix 2**). The number of taxa recorded, the number of families and genera represented, the percentage of annual and perennial species and the percentage of the species list that was fertile when the survey was carried out is listed in **Table 4**.

Table 4: Flora information

Attribute	Number
Families	30
Genera	66
Taxa	106
Annual % / perennial %	1 / 99
Flowering % / fruiting % / flowering and fruiting % / fertile overall %	52 / 10 / 9 / 72

Species richness was 39, 40 and 38 at the three quadrats assessed in the Survey Area (**Table 14, Appendix 3**).

The Proteaceae (26 taxa), Fabaceae (15 taxa) and Myrtaceae (12 taxa) families accounted for just over half of the species list. The next most diverse families were the Haemodoraceae (6 taxa), Cyperaceae and Stylidiaceae (5 taxa each). The most diverse genera were *Banksia* (9 taxa), *Hakea* (8 taxa) and *Stylidium* (5 taxa).

Eight taxa could not be confirmed beyond genus - *Bossiaea* ?*ornata*, *Conostylis* sp. Indet., *Cryptandra* sp., *Gastrolobium* ?*retusum*, *Haemodorum* sp. Indet., *Hakea* ?*prostrata*, *Schoenus* aff. *pleiostemoneus* EAG 1991 and *Synaphea* sp. Indet.. One taxon could not be confirmed beyond family – Poaceae sp. Indet.. All taxa except *Hakea* ?*prostrata* (because *H. prostrata* was collected from the survey area) have been included in the counts.

The two priority *Bossiaea* species that occur in the Geraldton Sandplains bioregion do not occur in the habitat of the Survey Area; two of the three significant *Conostylis* species of the Geraldton Sandplains bioregion have not been located within 100 km of the Survey Area and the third has not been recorded west of Brand Highway; no significant *Cryptandra* species have been recorded in the Lesueur Sandplain subregion; the five significant *Gastrolobium* species of the bioregion do not occur close to the Survey Area, the closest is 20 km east; the only significant *Haemodorum* species is *H. loratum* and that was recorded in the Survey Area and *Haemodorum* sp. Indet. was not that species; *Hakea prostrata* has a different leaf shape from the three significant *Hakea* species that occur in the Geraldton Sandplains; *Schoenus pleiostemoneus* is not conservation significant and the six *Schoenus* species that occur in the Geraldton Sandplains have not been located within 20 km of the Survey Area; and, *Synaphea* sp. Indet. is most likely to be another *Synaphea lesueurensis* given that it was the only *Synaphea* species located in the Survey Area (the specimen could not be identified because it did not have flowers and they are needed for confirmation).

Apart from the *Synaphea* sp. Indet. it is unlikely that the other six taxa that could not be confirmed to species are conservation significant. In addition, no *Bossiaea*, *Conostylis*, *Gastrolobium*, or *Schoenus* species were listed in the NatureMap 10 km radius search results. The one *Hakea* species listed in the results (*Hakea neurophylla*) has a different leaf shape to *Hakea prostrata*.

6.2.2 Conservation Significant Flora

No Threatened flora species protected by the EPBC Act or the BC Act were recorded in the Survey Area.

Five Priority flora species were located in the Survey Area: *Synaphea lesueurensis* (P2), *Haemodorum loratum* (P3), *Patersonia argyrea* (P3), *Verticordia rutilastra* (P3) and *Xanthosia tomentosa* (P4) (**Map 9, Section 11**).

Table 6 lists the number of plants and populations of these species recorded in the Survey Area and an estimate of the number of plants and populations currently known in WA; it also provides information on the distribution of each species in WA and an estimate of the impact for each species with the clearing of the 5 ha for the gravel pit extension. Photographs of the five species are included in **Table 16 (Appendix 4)**.

One potentially significant taxon was collected during the survey – *Synaphea* sp. Indet.. It could not be identified because there were no flowers on the plant when the survey was carried out; however, based on the other *Synaphea* collections, which were all *Synaphea lesueurensis*, it is likely to be that species.

6.2.3 Regional Endemics

Regional endemics are plants that are geographically restricted to a particular locality or region. Five of the species recorded in the Survey Area are regional endemics:

- *Synaphea lesueurensis* (P2): occurs in a 25 km by 25 km area and all records are in the Lesueur Sandplain subregion.
- *Patersonia argyrea* (P3): occurs in a 65 km by 25 km area and all records in the Lesueur Sandplain subregion.
- *Banksia tridentata*: occurs in a 65 km by 60 km area and all records in the Lesueur Sandplain subregion (DBCA, 2007-).
- *Darwinia sanguinea*: occurs in a 80 km by 50 km area and most records in the Lesueur Sandplain subregion - some are in the Perth subregion that are close to the Lesueur Sandplain border (DBCA, 2007-).
- *Eremaea violacea* subsp. *raphiophylla*: occurs in a 80 km by 75 km area and most records are in the Lesueur Sandplain subregion – one is on the border of the Lesueur Sandplain and Perth subregions (DBCA, 2007-).

6.2.4 Range Extensions

Species have a typical range, which is indicated by their known distribution records. Sometimes species are recorded during a survey and they have not been located previously in the area; these species are described as range extensions. In many cases a range extension reflects a lack of survey effort in a particular area or lack of submissions of flora records to the WA Herbarium rather than a true range extension. Using 100 km as the minimum distance from an existing record to define a range extension species, two species were collected from the Survey Area that are range extensions (**Table 5**) (this list does not consider plant collections that could not be fully determined).

Table 5: Range extension species located in the Survey Area

Species	Closest WAH (1998 -) record from Survey Area	Distance and direction from Survey Area
Banksia bipinnatifida subsp. *bipinnatifida*	Bald Hill Lookout (Northern Jarrah Forest subregion)	191 km south south-east
Petrophile brevifolia subsp. *brevifolia*	Yanchep (Perth subregion)	151 km south

6.2.5 Weeds

No weed species listed on any of the national weed lists, listed as a declared pest in WA or indicated as an alien species on FloraBase were located in the Survey Area.

Table 6: Known records for and distribution of conservation significant flora species recorded in the Survey Area

Column 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Species	Rank	Assessment of currently known number of plants												Assessment of currently known number of populations				Closest record outside of and to the Survey Area (km)	Furthest record from Survey Area (max distance between records)
		Government sources - no duplicates					Other surveys*	Other known Maia surveys	JER	This Survey	Total	No. in 5 ha ext. area	Impact (%)	WA	Survey Area	Impact (%)	DBCA Legislated Lands and Waters (IUCN I-IV only)		
		FB	NM	TPFL	WAHERB	Total													
Synaphea lesueurensis	P2	284	1		5	290			43	17	350	5 (2*)	2.00	11	1	9.09	7	2.5 km	21 km (26 km)
Haemodorum loratum	P3	44	21	2	6	73	120	70	244	111	618	71	11.49	43	1	2.33	10	4.1 km	318 km (399 km)
Patersonia argyrea	P3	44	4		2	50			27	4	81	3	3.70	13	1	7.69	4	4.9 km	36 km (65 km)
Verticordia rutilastra	P3	891	14	3	0	908				8	916	7	0.76	34	1	2.94	11	3.6 km	166 km (166 km)
Xanthosia tomentosa	P4	4,047	4	-	0	4,051		392	239	36	4,718	22	0.47	32	1	3.13	14	2.2 km	294 km (323 km)
Synaphea sp. Indet.	PST	-	-	-	-	-			-	1	1	1	100.00	1	1	100.00	0	Not applicable	Not applicable

Notes: * 2 *Synaphea lesueurensis* are outside of but very close to a boundary of the 5 ha area to be cleared; as it is unlikely that they could be avoided they have been included in the impact calculations for S. *lesueurensis*. Column 1, *Synaphea* sp. Indet. is likely to be another record for *Synaphea lesueurensis*.

Column 2 = P2 – P4 = Priority 2 to Priority 4 species, PST = Potentially Significant Taxon.

Column 3 = FB = FloraBase (WAH, 1998-).

Column 4 = NM = NatureMap (DBCA, 2007-).

Columns 5 and 6 = DBCA searches carried out for Shire of Dandaragan - search references #46-0919FL and #12-0416FL.

Column 7 = Total of columns 3 to 6. Duplicate records removed from numbers in columns 3 to 12 (except for Woodman's (2015) 27 records as no coordinates are publicly available).

Column 8 = Publicly available literature - Mattiske (2009), Woodman (2013), Phoenix (2015), Woodman (2015), Astron (2016).

Column 9 = Data from surveys conducted by Maia for other clients.

Column 10 = Numbers from JER (Jurien East Road) survey (Maia, 2017).

Column 12 = Sum of columns 7 to column 11; ext. = extension.

Column 13 = Number (No.) of conservation significant flora species in 5 ha area proposed to be cleared (imp. = impact).

Column 14 = Impact to plants = column 11 / column 12 * 100.

Column 15 = All known records (except for Woodman (2015)) were buffered by 500 m using ArcGIS to discriminate populations. One population has been added to *Haemodorum loratum* data (from Woodman, 2015).

Column 16 = Number of populations in the Survey Area; Column 17 = impact to populations = column 15 / column 14 * 100.

Column 18 = Number of populations with IUCN I-IV DBCA Legislated Lands and Waters (DBCA, 2019a).

Column 19 = tThe closest record to the Survey Area using known records and measuring the distance in ArcGIS to the boundary of the Survey Area.

6.3 Fauna Desktop and Reconnaissance Survey (Western Wildlife)

6.3.1 Fauna Habitats

Based on the results of the vegetation survey and observations during the fauna reconnaissance survey, a single fauna habitat is present in the Survey Area:

- Low heathland.

The habitat is in excellent condition. As the habitat in the Survey Area is part of a relatively large area of continuous habitat it is unlikely to be particularly important as an ecological linkage.

6.3.2 Fauna Assemblages

The faunal assemblages of the Survey Area are likely to be typical of the heathlands of the region and relatively intact, as the Survey Area is set within a large tract of native vegetation. A total of nine frog, 48 reptile, 112 bird, nine native mammal and three introduced mammal species were recorded within 10 km of the Survey Area on NatureMap (excluding records not identified to species level, **Appendix 1**). This list is unlikely to be complete, as not all species known from the area are necessarily represented by records, and the list includes many species that would not occur in the Survey Area due to a lack of suitable habitat.

The Survey Area lacks breeding habitat for most frogs, so only the Turtle Frog (*Myobatrachus gouldii*) is likely to be present as a breeding species, as its breeding cycle is entirely terrestrial. Other frogs may breed nearby, including in man-made depressions that hold water, and forage in the Survey Area.

The Survey Area is likely to support a diverse reptile assemblage, with almost all of the listed species potentially occurring. The only exceptions are species that favour rocky habitats. The sandplains of the region are well known to be a centre of high reptile diversity.

The birds are likely to be less diverse, with waterbirds and those relying on a eucalypt canopy generally absent. The low heathland is likely to support a suite of honeyeaters and small insectivores, which are likely to fluctuate in abundance seasonally. Honeyeaters in particular are likely to move in response to the availability of nectar.

The mammal assemblage is likely to be similar to that in other heathlands and shrublands in the region. As the Survey Area is well connected with a larger area of native vegetation, the mammal fauna is likely to be relatively intact, missing only those species that are extinct in the bioregion. Several species of bat are likely to forage over the area, but the Survey Area lacks roosting habitat such as tree hollows or caves. Small mammals such as dunnarts, the Honey Possum (*Tarsipes rostratus*) and Bush Rat (*Rattus fuscipes*) are likely to dominate the mammal fauna.

6.3.3 Conservation Significant Fauna

Several species of conservation significant fauna have been identified as potentially occurring in the area on the basis of database searches and literature review (**Table 13, Appendix 1**). Of these, many are unlikely to occur as their habitat requirements are not met within the Survey Area. This includes almost all Migratory Birds protected under an International Agreement such as shorebirds, seabirds and waterbirds, as they are reliant on coastal beaches or wetlands. The Dibbler (*Parantechinus apicalis*) occurs only on islands in this region and is not known to occur on the mainland. The Ghost Bat (*Macroderma gigas*) is locally extinct, only known from subfossil material collected from caves in the region. The Chuditch (*Dasyurus geoffroii*) is generally considered to be locally extinct in the area, also known from subfossil material in caves. The Gilled Slender Blue-tongue Skink (*Cyclodomorphus branchialis*) is an uncommon inhabitant of semi-arid shrublands on heavy red soils or rocky areas (Wilson and Swan, 2010). Although the nearest known record is 3.8 km north north-east of the Survey Area (**Map 7, Section 10**; DBCA, 2007-), this species is not likely to occur due to lack of suitable habitat.

The following four species potentially could occur in the Survey Area.

Carnaby's Cockatoo (*Calyptorhynchus latirostris*)

Carnaby's Cockatoo is listed as Endangered under both the EPBC Act and BC Act. Carnaby's Cockatoo typically nests in large hollows in smooth-barked eucalypts (e.g. Salmon Gum or Wandoo) in the inland Wheatbelt region, however, their breeding range is shifting west and birds potentially nest in any suitably sized hollow in their range. During the non-breeding season, birds move to the west and south (Johnstone and Storr, 1998; DPaW, 2013; DSEWPaC, 2012). No confirmed breeding area for Carnaby's Cockatoo intersects the Survey Area or is likely to occur in the Survey Area, however, confirmed breeding areas occur within 12 km of the Survey Area (**Map 7, Section 10**) (DBCA, 2018b).

The Survey Area does not lie in vegetation identified as requiring investigation for Carnaby's Cockatoo feeding habitat – the closest is 0.8 km northwest of the Survey Area (**Map 7, Section 10**) (DBCA, 2018c). The low heathland in the Survey Area is likely to provide low-value Carnaby's Cockatoo foraging habitat as it includes species that may be used for foraging; *Banksia armata*, *Banksia sclerophylla* and *Hakea prostrata*. The foraging habitat is considered to be low value as the vegetation is very short and although proteaceous species are present, they are not the key species known to be favoured by Carnaby's Cockatoo such as *Banksia menziesii* or *Banksia prionotes*, which occur in taller proteaceous shrublands and woodlands in the region. As the foraging habitat is within 12 km of confirmed breeding habitat, it is potentially used by breeding birds, however, no evidence of foraging was recorded during the site visit.

Carnaby's Cockatoo generally roost in tall native or introduced eucalypts or pines in riparian habitats or near permanent water (DSEWPaC, 2012). The Survey Area does not intersect with and is not close to a confirmed roosting site for Carnaby's Cockatoo (**Map 7, Section 10**) (DBCA, 2018d) and the vegetation of the Survey Area would not provide roosting habitat for Carnaby's Cockatoo.

Malleefowl (*Leipoa ocellata*)

The Malleefowl is listed as Vulnerable under both the EPBC Act and BC Act. Malleefowl are largely confined to woodlands of mallee eucalypts on sandy soils (Department of Environment and Conservation (DEC), 2012), shrublands dominated by acacias and woodlands dominated by eucalypts (e.g. Wandoo, Marri, Mallet) (Benshemesh, 2007). Malleefowl may also be found on coastal heath where shrubs produce sufficient leaf litter for use in nest mounds (DEC, 2012). The closest known record is 4.4 km north-west of the Survey Area (**Map 7, Section 10**; DBCA, 2007-). The Survey Area is unlikely to provide breeding habitat, as the vegetation is too low and litter-forming shrublands are absent. If Malleefowl still persist in the region they may occur as foraging visitors to the Survey Area, however, the likelihood is low.

Fork-tailed Swift (*Apus pacificus*)

The Fork-tailed Swift is listed under both the EPBC Act and the BC Act as a Migratory Bird protected under an International Agreement. The Fork-tailed Swift is a non-breeding visitor to Australia between September and April, and though it can be common further north, in south-west Australia this species is generally scarce (Boehm 1962, Johnstone and Storr 1998). Although a migratory species, the Fork-tailed Swift has a large range and a large population that appears to be stable (Birdlife International 2019). In Western Australia, the Fork-tailed Swift is a largely aerial species and unlikely to use terrestrial habitats in Survey Area, although it may overfly the area.

Western Brush Wallaby (*Notamacropus irma*)

The Western Brush Wallaby is listed as Priority 4 by DBCA. In the Action Plan for Australian Mammals 2012 it is listed as of Least Concern (Woinarski *et al*., 2014), as although this species has decreased in range its abundance has increased within its remaining range due to fox control. The Western Brush Wallaby is endemic to the south-west of WA, favouring open forest and woodland, as well as seasonally wet flats with grasses and thickets (Van Dyck and Strahan, 2008). The home-range size of this species has been estimated at about 9.9 ha for males and

5.3 ha for females (Bamford and Bamford, 1999), so the Survey Area is likely to represent the home-range of a single individual. There are nearby database records for this species **(Map 7, Section 10)**, and the Western Brush Wallaby is likely to occur in the Survey Area.

6.4 VEGETATION TYPE

One vegetation type (Mixed Heathland, MHL) was recorded in the Survey Area and is described in **Table 7.** The species associated with the vegetation type and a photograph are also included. The data collected on the flora in the quadrats assessed and the photographs taken are presented in **Table 14, Appendix 2**.

Vegetation type MHL does not resemble any TEC or PEC currently listed for the Geraldton Sandplains bioregion and DBCA Midwest Region, respectively.

As only one vegetation type occurs in the Survey Area a vegetation type map is not included in this report.

Table 7: Vegetation type recorded in the Survey Area

Vegetation type code (broad floristic formation) **Full description** **Area mapped (ha) (percent of Survey Area)**	**Associated species**
MHL (Mixed Heathland) Low mixed Heathland mainly of *Isopogon dubius*, *Banksia armata* var. *armata* and *Xanthorrhoea* sp. Lesueur (G.J. Keighery 16404) with an Open Sedgeland of *Caustis dioica* and *Mesomelaena pseudostygia*. 6.85 ha (100% of the Survey Area)	*Allocasuarina microstachya, Astroloma glaucescens, Babingtonia grandiflora, Banksia sclerophylla*, *Calothamnus sanguineus*, *Eremaea violacea* subsp. *raphiophylla*, *Georgeantha hexandra,* ***Haemodorum loratum*** **(Priority 3),** *Hibbertia aurea, Isopogon inconspicuus, Scaevola canescens, Schoenus* aff. *pleiostemoneus* EAG 1991, *Stylidium cygnorum.*
	

Note: aff. = affinity with, sp. = species, subsp. = subspecies, var = variety,

6.5 Vegetation Condition

Vegetation condition was assessed using the vegetation condition scale for the South West and Interzone Botanical Provinces (**Table 8**) (EPA, 2016a).

Vegetation condition in the Survey Area was rated as Excellent – there are several old gravel piles scattered throughout the Survey Area, but no weeds were recorded and there was no evidence of dieback or heavy grazing.

As only one vegetation condition occurs in the Survey Area a vegetation condition map is not included in this report.

Table 8: Vegetation condition scale (EPA, 2016a)

Vegetation condition	South West and Interzone Botanical Provinces
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
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.
Poor	
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.

7 Impacts and Clearing Principles

7.1 Impacts

7.1.1 Flora

Impact for the plants and populations of the five priority flora species that were recorded in the Survey Area (*Synaphea lesueurensis* (P2), *Haemodorum loratum, Patersonia argyria, Verticordia rutilastra* (all P3) and *Xanthosia tomentosa* (P4)) are estimated in **Table 6**. The impacts have been estimated using publicly available information accessible to Maia. It is likely that more records for these species have been found but the information is not publicly available. The current WA distribution of the five species is shown on **Map 10 (Section 11)**. Potential impacts have been calculated using the 5 ha of vegetation proposed to be cleared for the gravel pit extension (**Maps 1 and 9, Section 11**). Impact estimates for plants known to Maia for the five species range from 0.47% (*Xanthosia tomentosa*) to 11.49% (*Haemodorum loratum*), while impact for plant populations known to Maia ranges from 2.33% (*Haemodorum loratum*) to 9.09% (*Synaphea lesueurensis*).

Seven of the 11 (63.6%) currently known populations of *Synaphea lesueurensis* occur within DBCA IUCN I-IV Legislated Lands. Maia recorded this species in the Jurien East Road reserve and in this gravel pit Survey Area and it is therefore likely that more records occur in similar habitat between these records and in the surrounding area.

Ten of the 43 (23.3%) currently known populations of *Haemodorum loratum* occur within DBCA IUCN I-IV Legislated Lands. As this species' records span 399 km, it is highly likely that the impact will be much lower than estimated because more records are likely to occur within the 399 km spread. As Maia located this species in the Jurien East Road reserve and in this gravel pit Survey Area it is likely that more plants occur in similar habitat in the surrounding local area.

Four of the 13 (30.8%) currently known populations of *Patersonia argyrea* occur within DBCA IUCN I-IV Legislated Lands. Records for this species occur up to 36 km from the Survey Area and as Maia also located it in the Jurien East Road reserve as well as the gravel pit Survey Area it is likely that more plants occur in similar habitat in the surrounding local area.

Eleven of the 34 (32.4%) *Verticordia rutilastra* populations known to Maia occur within DBCA IUCN I-IV Legislated Lands. The records for this species span over 166 km and they are in three subregions – Lesueur Sandplain, Katanning and Dandaragan Plateau. Given the span of records for this species it is likely that it occurs in similar habitat in areas between the Survey Area and the furthest record.

Fourteen of the 32 (43.8%) populations of *Xanthosia tomentosa* known to Maia occur within DBCA IUCN I-IV Legislated Lands. The records for this species span 323 km and it has been located in the Lesueur Sandplain and Perth subregions. Maia also recorded this species in the Jurien East Road reserve, and it is likely to occur in similar habitat in areas between the Survey Area and the furthest record.

Given the number of priority plants located in the relatively small area surveyed and that the vegetation type recorded in the Survey Area extends over quite a large area around and beyond the Survey Area, it is likely that each of these species will occur in similar numbers in the surrounding vegetation.

7.1.2 VEGETATION

The Shire proposes to clear 5 ha of the vegetation in the 6.85 ha Survey Area.

One pre-European vegetation association (VA) and vegetation system association (VSA, Gairdner System) are mapped in the Survey Area – 1031 - and 34.48% of VA 1031 remains in the Geraldton Sandplains bioregion and Lesueur Sandplain subregion and 14.72% of it is protected in conservation tenure. Similarly, 59.20% of VSA 1031 remains in the bioregion and subregion and 47.10% is protected in the bioregion and subregion (GoWA, 2019). Clearing of 5 ha of the VA in the Survey Area would reduce its remaining extent in the Geraldton Sandplains bioregion and the Lesueur Sandplain subregion by 0.002%, while clearing of 5 ha of the VSA would reduce its remaining extent in the Geraldton Sandplains bioregion and the Lesueur Sandplain subregion by 0.030%.

Native vegetation extent in the local area (i.e. the area within a circle of 10 km radius centred on the middle of the Survey Area) is currently 74.83% and this would be reduced by 0.02% with the 5 ha of clearing for the gravel pit.

Native vegetation extent in gravel reserve R35593 is currently 92.35% and this would decrease by 1.44% after 5 ha of clearing for the gravel pit extension.

One vegetation type (Mixed Heathland, MHL) was mapped over the whole of the 6.85 ha surveyed and it was rated as being in Excellent condition. The Survey Area is on the footslopes of lateritic uplands, and vegetation type MHL is similar to Griffin's GFG 20-13 (Griffin, 1994), which is noted as occurring on uplands and well drained slopes of grey sandy lateritic gravel between Eneabba, Lesueur, Watheroo and Dandaragan i.e. the vegetation type is mapped in the surrounding local and wider areas. The vegetation type is not the same as any TEC (DotEE, 2019a; DBCA,

2018e) or PEC (DBCA, 2019e) currently listed for the Geraldton Sandplains bioregion and Midwest region respectively.

7.1.3 Fauna (Western Wildlife)

Clearing of 5 ha of low heathland habitat will result in the loss of all habitat for native fauna in the clearing area. Populations of all species in the Survey Area are likely to persist in the adjacent extensive area of habitat. The clearing is unlikely to result in an increase in habitat fragmentation in the area, as it is set within a tract of continuous vegetation.

Two species of Threatened fauna potentially occur in the Survey Area – Malleefowl and Carnaby's Cockatoo. The Malleefowl (*Leipoa ocellata*) is likely to be an occasional foraging visitor to the Survey Area and the Survey Area would be a very small part of a much larger foraging range. The loss of 5 ha of possible foraging habitat is unlikely to have a significant impact on the Malleefowl. Carnaby's Cockatoo (*Calyptorhynchus latirostris*) is likely to be a foraging visitor to the Survey Area, but not likely to breed or roost in the Survey Area. Clearing will result in the loss of 5 ha of low value foraging habitat. This may include foraging habitat that is used by breeding birds, as breeding is known to occur with 12 km of the Survey Area. Loss of foraging habitat within 6 – 12 km of breeding sites is considered a threat to Carnaby's Cockatoo.

One Migratory species potentially occurs in the Survey Area. The Fork-tailed Swift (*Apus pacificus*) may overfly the Survey Area but is not likely to use the low heathland habitat. Therefore, clearing 5 ha of habitat is not likely to have a significant impact on this species.

One Priority species potentially occurs in the Survey Area. The Western Brush Wallaby (*Notamacropus irma*) is likely to occur. The Survey Area is likely to represent the home-range of a single individual, as home-range size has been estimated at about 9.9 ha for males and 5.3 ha for females (Bamford and Bamford, 1999). Therefore, although some habitat for this species will be lost, clearing of 5 ha of low heathland is not likely to have a significant impact on this species.

7.1.4 Impact Limitation

Avoidance

The Shire needs to quarry gravel from its R35593 gravel lease to use for local road upgrade works planned for mid-2020 onwards (e.g. the northern section of Sandy Cape Road). The Shire has no other gravel source available within 25 km of the Sandy Cape Road upgrade area. Whenever possible the Shire sources gravel from already cleared areas to avoid clearing native vegetation. Existing pits in cleared areas are too far from Sandy Cape Road to be economically feasible and therefore the Shire needs to extract gravel from its gravel lease area for these works.

The flora and vegetation survey was carried out over a 6.85 ha area and the Shire then selected a 5 ha area to be cleared within the 6.85 ha area. The 5 ha area was selected to minimise impact to the conservation significant flora species located in the Survey Area. Two *S. lesueurensis* which are close to but outside the boundary of the impact area have been included as being impacted, as it will be difficult for the Shire to avoid them when clearing the vegetation.

Minimisation

The 5 ha area needed by the Shire has been reduced to the minimum area possible to supply adequate gravel for the future works proposed in the local area.

Mitigation

The Shire plans to mitigate any impacts associated with the proposed vegetation clearing and gravel extraction by revegetating the area once the gravel has been extracted. The Shire will progressively rehabilitate the cleared area. Vegetation will not be permanently lost from the site and, with time, there should be no net loss of vegetation from the 5 ha area. Rehabilitating a section of the gravel pit each year will reduce the potential for long-term wind and water erosion, reduce the time the topsoil piles are exposed to weed seeds and ensure that the seed bank in the topsoil is not old.

The rehabilitation methods used by the Shire will ensure that water drains adequately, infiltrates into the rehabilitated areas and does not pond. The Shire will adopt good weed management practices when extracting the gravel, when trucking it from the gravel pit and also when carrying out the rehabilitation to minimize the potential for the spread of weeds into a weed free area. Weed control will also be carried out as necessary post rehabilitation. No fill will be brought into the area to ensure that weed and non-provenance species are not introduced with fill.

The Shire will ensure that it uses appropriate dieback management measures when carrying out the gravel extraction and when rehabilitating the area. Access will be from Jurien East Road onto Cockleshell Gully Road and into the gravel pit. There are no known dieback records along Cockleshell Gully Road; however, there is one disease positive sample point for *Phytophthora arenaria* along Jurien East Road between Indian Ocean Drive and Cockleshell Gully Road. The vegetation along Cockleshell Gully Road south for approximately 2.5 km from about the junction with Gairdner Road is in an area that was classified as low confidence infested in 2008. The section of vegetation on the north-eastern corner of the junction of Jurien East Road and Cockleshell Gully Road was also classified as low confidence infested in 2008. Clearing and extracting activities will be scheduled for low rainfall months and they will not be carried out in wet or muddy conditions. Vehicles will be cleaned before accessing the gravel pit area.

7.2 Clearing Principles

Under the *Environmental Protection Act 1986* (EP Act), clearing of native vegetation requires a permit unless its purpose is exempt. Any vegetation clearing requiring a NVCP needs to address 10 clearing principles as part of the permitting process. The 10 clearing principles are addressed with respect to the Survey Area in **Table 9**.

Table 9: Clearing principles and the Survey Area

	Clearing principle	Proposed gravel extraction – Gravel Pit Reserve 35593, Shire of Dandaragan
A	**Native vegetation should not be cleared if it comprises a high level of biological diversity.**	**Unlikely to be at variance to this principle** The Survey Area lies in an area of moderate plants species richness (DBCA, 2007-; Hopper and Gioia, 2004). It is on the Peron Slopes of the Lesueur Area (Martinick and Associates, 1988) and a mean species richness has been calculated for that area varying from 82.5 species on Sand Heath to 95.3 species on one of the three Laterite Heath vegetation types (from 10 m x 10 m quadrats or similar sized relevés). Species richness at the three 10 m x 10 m quadrats assessed in the Survey Area was 39, 40 and 38.
B	**Native vegetation should not be cleared if it comprises the whole or part of, or is necessary for the maintenance of, a**	**Unlikely to be at variance to this principle** Two threatened fauna species potentially occur in the Survey Area: *Calyptorhynchus latirostris* (Carnaby's Cockatoo) and *Leipoa ocellata* (Malleefowl). Other Threatened fauna species are known from the region (**Table 13**) but are not likely to occur in the Survey Area due to lack of suitable habitat or local extinction. • Carnaby's Cockatoo: No confirmed breeding area for Carnaby's Cockatoo occurs in the Survey Area (DBCA, 2018b), and no breeding habitat is present.

	Clearing principle	Proposed gravel extraction – Gravel Pit Reserve 35593, Shire of Dandaragan
	significant habitat for fauna indigenous to Western Australia.	No confirmed Carnaby's Cockatoo roosting sites occur in the Survey Area (DBCA, 2018d) and no roosting trees are present in the Survey Area. Based on the vegetation recorded in the Survey Area it is likely that Carnaby's Cockatoo foraging habitat is present, as potential food-plants (*Banksia armata* and *Banksia sclerophylla*) are present; although, more favoured food-plants that occur in the region are absent. No evidence of foraging activity was observed in the Survey Area during the reconnaissance survey. • Malleefowl: Typically, the Malleefowl is found in woodlands of mallee eucalypts on sandy soils (DEC, 2012), shrublands dominated by acacias and woodlands dominated by eucalypts (Benshemesh, 2007). Malleefowl may also be found on coastal heath where shrubs produce sufficient leaf litter for use in nest mounds (DEC, 2012). It is unlikely the Survey Area contains important habitat for Malleefowl. The nearest known record is 4.4 km north-west of the Survey Area (DBCA, 2007-). Ten Migratory Fauna (protected under international agreement) have been located previously within the local area (DBCA, 2007-). The 10 Mmigratory species are largely associated with marine and/or aquatic environments, which do not occur in the Survey Area. Only the Fork-tailed Swift (*Apus pacificus*) may occur. As this species is entirely aerial in WA it is not likely to use the terrestrial habitat present in the Survey Area. No Specially Protected Fauna species have been located previously in the local area (DBCA, 2007-). One priority fauna species could occur in the Survey Area – *Notamacropus irma* (Western Brush Wallaby) (P4) (DBCA, 2007-). • The Survey Area is likely to represent the home-range of a single individual, as home-range size has been estimated at about 9.9 ha for males and 5.3 ha for females (Bamford and Bamford, 1999). Therefore, although some habitat for this species will be lost, clearing of 5 ha of low heathland is not likely to have a significant impact on this species. Based on the information above, the relatively small area to be cleared, the habitat and vegetation described in the Survey Area and the fact that the vegetation is well represented in the surrounding area, clearing of 5 ha of vegetation in the Survey Area is unlikely to impact on significant habitat for most fauna species indigenous to Western Australia. Clearing of 5 ha of low value foraging habitat may impact on Carnaby's Cockatoo, however, there is uncertainty around the value of that habitat for foraging, and an extensive area of habitat will remain in the surrounding and local area.
		Unlikely to be at variance to this principle
c	**Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, rare flora.**	No Threatened flora species were recorded in the Survey Area. Five priority species were located within the Survey Area: *Synaphea lesueurensis* (P2), *Haemodorum loratum*, *Patersonia argyrea*, *Verticordia rutilastra* (all P3) and *Xanthosia tomentosa* (P4). The current distribution of these species is discussed below. *Synaphea lesueurensis* (P2) – 17 plants were recorded in the Survey Area (one population). Seven of the 11 currently known populations are protected in DBCA IUCN I-IV Legislated Lands (63.6%). A maximum of 2.0% of the plants known to Maia and 9.1% of the populations would be impacted by the 5 ha of clearing in the Survey Area.

	Clearing principle	Proposed gravel extraction – Gravel Pit Reserve 35593, Shire of Dandaragan
		Haemodorum loratum (P3) – 111 plants (one population) were recorded in the Survey Area. Ten of the 43 currently known populations are protected in DBCA IUCN I-IV Legislated Lands (23.3%). A maximum of 11.5% of the plants known to Maia and 2.3% of the populations would be impacted by the 5 ha of clearing in the Survey Area. As there is a span of 399 km between records for this species, it is likely that the actual impact to this species would be much lower than that estimated because more records will likely occur within the 399 km. As Maia also recorded this species in the Jurien East Road reserve it is likely to occur in other, non-surveyed areas in the locality. *Patersonia argyrea* (P3) – four plants (one population) were recorded in the Survey Area. Four of the 13 currently known populations are protected within DBCA IUCN I-IV Legislated Lands (30.8%). A maximum of 3.7% of the plants known to Maia and 7.7% of the populations would be impacted by the 5 ha of clearing in the Survey Area. As Maia also recorded this species along Jurien East Road it is highly likely to occur in other, non-surveyed areas in the locality. *Verticordia rutilastra* (P3) – eight plants (one population) were recorded in the Survey Area. Eleven of the 34 known populations (32.4%) are protected within DBCA IUCN I-IV Legislated Lands. A maximum of 0.8% of the plants known to Maia and 2.9% of the populations would be impacted by clearing of the 5 ha of the Survey Area. The records span 166 km and they are in three subregions – Lesueur Sandplain, Katanning and Dandaragan Plateau. *Xanthosia tomentosa* (P4) – 36 plants (one population) were recorded in the Survey Area. Fourteen of the 32 currently known populations (43.8%) are protected within DBCA IUCN I-IV Legislated Lands. The species' records span 323 km and they are in two subregions – Lesueur Sandplain and Perth. A maximum of 0.5% of the plants known to Maia and 3.1% of the populations would be impacted by the clearing of 5 ha of the Survey Area. As Maia also recorded this species along Jurien East Road it is likely to occur in other, non-surveyed areas in the locality. No threatened flora species were recorded in the Survey Area and the vegetation is unlikely to include or be necessary for the continued existence of rare flora. Between 23.3% (*Haemodorum loratum*) and 63.6% (*Synaphea lesueurensis*) of the currently known populations of the five priority flora species located in the Survey Area occur in IUCN I-IV protected lands. The areas adjacent to (R35594) and north and east of (Lesueur National Park) R35593 are a Nature Reserve and National Park respectively and any so far unrecorded plants and populations of these species occurring in these areas would be protected. Based on the information above, there are no threatened flora species known in the Survey Area and, while five priority flora species were located within it, it is not necessary for their continued existence.

	Clearing principle	Proposed gravel extraction – Gravel Pit Reserve 35593, Shire of Dandaragan
D	**Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of a TEC.**	**Not at variance to this principle** The vegetation of the Survey Area does not comprise the whole or part of a TEC. The Mixed Heathland vegetation type mapped in the Survey Area is not similar to any of the currently listed TECs. The closest occurrence of a conservation significant ecological community is the 'Banksia Woodlands of the Swan Coastal Plain' Endangered TEC, located approximately 0.5 km west of the Survey Area. This ecological community is listed as a TEC under the EPBC Act and as a 'Priority 3(iii)' PEC by DBCA (Banksia dominated woodlands of the Swan Coastal plain IBRA region). Therefore, the vegetation type mapped within the Survey Area does not comprise the whole or a part of a TEC and it is not necessary for the maintenance of a TEC.
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.**	**Unlikely to be at variance to this principle** The Survey Area is in the Geraldton Sandplains IBRA bioregion and Lesueur Sandplains subregion and one pre-European vegetation association (VA)- 1031 – is mapped in it. Currently, 34.48% of VA 1031 remains in the Geraldton Sandplains and the Lesueur Sandplain and 14.72% of the remaining extent of VA 1031 is protected for conservation in the bioregion and subregion. With the clearing of an additional 5 ha in the Survey Area the current extent of VA 1031 in the Geraldton Sandplains and Lesueur Sandplains would be reduced by 0.002%. The local area retains 74.83% native vegetation cover (when the local area is intersected with Native Vegetation Extent (NVE) layer (DPIRD, 2019a)). When the 5 ha of proposed clearing is removed from current NVE in the local area the retained percentage reduces by 0.02%. When similar intersects are carried out for R35593 with NVE (excluding a section shown as NVE that has been cleared for gravel and rehabilitated), R35593 currently retains 92.35% of the native vegetation, and when the 5 ha of vegetation proposed to be cleared for the gravel pit extension is included in the current disturbance the NVE in R35593 would be reduced by 1.44%. Therefore, locally, the Survey Area is not significant as a remnant in an area that has been extensively cleared because approximately 75% of the NVE still remains in the local area and 90.91% of the native vegetation in R35593 when the proposed 5 ha gravel pit extension is included. [Note: local area = 10 km buffered search area around central coordinate 30° 10' 14" S, 115° 08' 39" E. The local area then intersected with Native Vegetation Extent (DPIRD, 2019a).]
F	**Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.**	**Not at variance to this principle** There are no defined watercourses or wetlands in or close to the Survey Area. The closest is a paluslope wetland and a creek located approximately 1.2 km to the south-west (DBCA, 2017d). The proposed clearing will not impact on these areas. A lower previously cleared and sandier area occurs to the south of and adjacent to the southern boundary of the Survey Area (where gravel appears to have been extracted previously).

	Clearing principle	Proposed gravel extraction – Gravel Pit Reserve 35593, Shire of Dandaragan
G	**Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.**	**Unlikely to be at variance to this principle** One soil landscape unit is mapped in the Survey Area – 222Ye_2 (described as pale sandy gravels, shallow gravel over duricrust, gravelly pale deep sand, pale and yellow deep sands) (DAFWA, 2014). The unit has a high to extreme wind erosion risk. Wind erosion could occur if the soil is left exposed, particularly if subject to strong prevailing winds. The proposed clearing may therefore cause land degradation in the form of soil erosion. However, given the extent of the proposed clearing and the fact that the Shire of Dandaragan will progressively rehabilitate the cleared area (Pers. Comm. Brad Pepper Shire of Dandaragan, January 24 2020), degradation will be kept to a minimum. Clearing and gravel extraction already carried out in this reserve does not appear to have caused appreciable land degradation around the existing pit area.
H	**Native vegetation should not be cleared if the clearing of vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.**	**Unlikely to be at variance to this principle** The Survey Area is located within the Section 5(1)(g) Gravel Reserve R35593, which is listed as IUCN VI (a protected area with sustainable use of natural resources). Nature Reserve R35594 abuts the western boundary of R35593. R35594 is an IUCN I-IV listed reserve (IUCN IA) and the boundary is 0.3 km west of the Survey Area at its closest. Lesueur National Park (R42032, IUCN II) abuts the northern and eastern boundaries of R35593 and the Survey Area is 0.6 km at its closest to the west of the eastern boundary. The proposed works should not affect the environmental values of R42032. The access road from Cockleshell Gully Road to the gravel pit area goes through a section of R35594; however, the gravel pit has been in use since the late 1970s, gravel has been extracted from both sides of the access road in the past, and only one small section close to Cockleshell Gully Road has intact native vegetation either side of it. This intact vegetation does not appear to have been impacted by use of the access track to date. The vegetation association of the Survey Area is rated as having high susceptibility to dieback (Project Dieback, 2014a) but no known positive *Phytophthora* species points are located within or close to the Survey Area (30 June 2018) (Project Dieback, 2014a). No weed species were located in the Survey Area. The Shire will use appropriate weed and dieback management practices to address the risk of the spread of weeds and dieback to adjacent areas while carrying out the works. No fill will be brought to the area once the gravel has been extracted to lessen the chance of introducing weed species. Access will be via Cockleshell Gully Road and Jurien East Road and both are existing roads.
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.**	**Unlikely to be at variance to this principle** Given that the clearing depth will be shallow (approximately 1 m), the absence of wetlands and watercourses in the area and the relatively small area to be cleared, the proposed clearing is unlikely to cause long-term deterioration in the quality of surface or underground water.

	Clearing principle	Proposed gravel extraction – Gravel Pit Reserve 35593, Shire of Dandaragan
J	**Native vegetation should not be cleared if the clearing of the vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding.**	**Not at variance to this principle** Given the sandy/gravelly soils in the area, the proposed clearing should not cause or exacerbate the incidence or intensity of flooding. In addition, there are no watercourses or wetlands in the Survey Area (DBCA, 2017d) and less than 3% of the one soil landscape unit that occurs in the Survey Area (222Ye_2) is rated as having a moderate to high hazard for flood risk (DPIRD, 2019d).

8 PROJECT PERSONNEL, LICENCES AND LIMITATIONS

8.1 PROJECT PERSONNEL

The survey was carried out and the report prepared by the personnel listed in **Table 10**. A Regulation 4 Permit was applied for through DBCA and the botanical survey on 5(1)(g) Reserve R35593 was carried out under authority number CE005992.

Table 10: Project personnel and licences

Botanist	Flora licence number
Christina Cox (survey and report)	FB62000152
Scott Hitchcock (report)	Not applicable
Rochelle Haycock (survey and report)	TFL 72-1920 and FB62000153
Michael Pezzaniti (survey and report)	FB62000065
Jen Wilcox, Western Wildlife (survey and report)	Not applicable
Cate Tauss (plant identifications)	Not applicable

8.2 LIMITATIONS

Technical Guidance, Flora and Vegetation Surveys for Environmental Impact Assessment (EPA, 2016a) and Technical Guidance, Terrestrial Fauna Surveys (EPA, 2016b), state that any survey-specific issues / limitations should be addressed in a limitations section and that the limitations should be addressed as standard, whether they were a limitation of survey or not. **Table 11** addresses any survey-specific issues / limitations.

Table 11: Limitations

Limitation	Comment
Availability of contextual information at a regional and local scale	**No limitation**
	A desktop study was carried out to gather contextual information at a regional and local scale. The EPBC Act Protected Matters search tool, NatureMap and NationalMap were used to gather information. Relevant environmental GIS layers were downloaded and Beard's pre-European vegetation mapping, soil landscape mapping units and GoWA's vegetation statistics were used to provide context. Some information was available on other flora and vegetation surveys conducted for the Shire of Dandaragan within 10 km of the Survey Area. The databases and results of the flora and vegetation information were used to inform the fauna desktop study along with the results of a fauna reconnaissance survey. The Survey Area was digitised by Maia using Landgate's Locate Imagery uploaded through ESRI ArcGIS and the Shire of Dandaragan approved the digitised area.
Competency /experience of the team carrying out the survey, including experience in the bioregion surveyed	**No limitation**
	Christina Cox and Rochelle Haycock have more than 11 years of experience in carrying out botanical surveys in WA, including in the Geraldton Sandplains bioregion. Michael Pezzaniti is a trainee botanist with a year's experience in botanical surveys in WA. Christina and Michael either worked together or close to each other. One or more specimens for each of the species encountered during the survey were collected for formal identification using the resources of the WA Herbarium in Perth. The specimens were identified by Cate Tauss, a botanist with more than 25 years of experience in the taxonomy of the flora of WA. Jen Wilcox has more than 20 years of experience in carrying out fauna surveys in WA, including in the Geraldton Sandplains bioregion.
Proportion of flora or fauna recorded and/or collected, any identification issues	**No limitation**
	One hundred and six taxa from 30 families and 66 genera were recorded from the 6.85 ha Survey Area: 1% of the 106 taxa were annual species and 99% perennial; 72% of the species list was identified from fertile specimens (flowers/fruit). As 240 specimens were collected, and 106 taxa identified, more than one specimen was collected for some taxa. Eight taxa could not be confirmed beyond genus (*Bossiaea* ?*ornata*, *Conostylis* sp. Indet, *Cryptandra* sp., *Gastrolobium* ?*retusum*, *Haemodorum* sp. Indet., *Hakea* ?*prostrata*, *Schoenus* aff. *pleiostemoneus* EAG 1991 and *Synaphea* sp. Indet..) and one taxon could not be confirmed beyond family (Poaceae sp. Indet.). *Bossiaea ornata*, *Gastrolobium retusum* and *Hakea prostrata* are not conservation significant species. It is likely that *Synaphea* sp. Indet. (no flowers on the specimen collected) is *Synaphea lesueurensis* because the four other *Synaphea* collections were this species. Eight *Haemodorum* species were listed in the 10 km radius search results and only one is conservation significant (*H. loratum*). It is likely that the *Haemodorum* sp. Indet. was one of the non-conservation significant species because the confirmed *Haemodorum* specimens collected were *H. loratum* and *H. venosum* and it was neither of these. No other conservation significant *Haemodorum* species occur in the Lesueur Sandplains subregion. No conservation significant Poaceae species have been recorded within 10 km of the Survey Area and Poaceae sp. Indet. is unlikely to be conservation significant. *Schoenus* aff. *pleiostemoneus* EAG 1991 is not conservation significant. The only conservation significant *Conostylis* listed for the Lesueur Sandplain subregion is *Conostylis* sp. Eneabba (P2) and the closest record is approximately 36 km to the northeast of the Survey Area, and it is unlikely to be this species. No significant *Cryptandra* species have been recorded in the Lesueur Sandplain subregion. The proportion of the flora collected and identified based on sampling, survey time, area surveyed, and intensity of survey effort was good.

Limitation	Comment
Was the appropriate area fully surveyed (effort and extent)	**No limitation**
	A flora and vegetation reconnaissance survey and a targeted flora survey were conducted over the Survey Area by three botanists over one day. The botanists walked traverses at approximately 12-13 m spacings and surveyed a band of vegetation approximately 6-10 m wide. The flora was also sampled at three 10 m x 10 m quadrats. Approximately 83% of the Survey Area was assessed (via the three quadrats and 5.64 ha surveyed while walking traverses). Plants of known and suspected conservation significance were targeted and counted, and their locations recorded on a GPS. Samples were also collected from any unknown or unusual species encountered. The fauna reconnaissance survey was conducted by one zoologist for one hour. As only a single habitat was present, this allowed sufficient time to traverse the habitat and search for evidence of cockatoo foraging.
Access restrictions within the survey area	**No limitation**
	There were no access problems. The Survey Area is within an existing gravel pit lease adjacent to Cockleshell Gully Road with a track or cleared gravel pit area leading to the Survey Area.
Survey timing, rainfall, season of survey	**No limitation**
	The flora and vegetation survey was conducted in October 2019 (spring). The spring survey was timed to coincide with flowering times of threatened flora (particularly annual species) that had been recorded in the surrounding area previously. Rainfall at Jurien Bay over the four months before the survey was 40.4 mm less than the long-term (1968 to 2019) average. Therefore, the flora and vegetation could have been in below average condition in October 2019. Approximately 1% of the species recorded were annual species and approximately 73% of the flora taxa recorded were fertile when the survey was carried out (flowering, fruiting or both flowering and fruiting). The fauna reconnaissance survey was undertaken in January 2020 (summer). This coincides with the end of the Carnaby's Cockatoo breeding season and, while foraging birds were not seen in the Survey Area when the reconnaissance survey was carried out, they were seen in the local area.
Disturbances (fire, flood, accidental human intervention etc.)	**No limitation**
	No disturbances were evident or noted by the botanists or zoologist while carrying out the surveys. No floods, severe storms or fires had occurred in the weeks or months before the survey was carried out. The Survey Area is adjacent to a disturbed area - the existing gravel extraction area.

9 CONCLUSIONS

The Survey Area is located in the Lesueur Sandplain subregion of the Geraldton Sandplains bioregion. Currently, 34.48% of pre-European vegetation association 1031 remains in both the Geraldton Sandplains bioregion and Lesueur Sandplain subregion and 14.72% of its current extent is protected in the conservation estate. Vegetation system association 1031 is rated as having high susceptibility to dieback; however, no known positive *Phytophthora* species points are located within 2 km of the Survey Area.

The Survey Area is in the Section 5(1)(g) reserve R35593. R35593 is bounded by Nature Reserve 35594 (adjacent to the reserve's western boundary) and Lesueur National Park (adjacent to the reserve's northern and eastern boundaries). The designated purpose of the R35593 is "Gravel Resource Management, Restoration and

Conservation". The reserve is in an environmentally sensitive area and a Schedule 1 area. It is not in a Ramsar Site, or in a Directory of Important Wetlands in Australia wetland, Geomorphic Wetlands wetland or in or close to any other watercourses or wetlands.

The Survey Area is in an area of moderate plant species richness (DBCA, 2007-; Hopper and Gioia, 2004). It is in the Peron Slopes landform and species richness in the three 10 m x 10 m quadrats assessed in the Survey Area was lower than that recorded elsewhere on this landform.

No Threatened flora species protected by the federal EPBC Act or by the WA BC Act were recorded in the Survey Area.

Five Priority flora species were located during the survey: *Synaphea lesueurensis* (P2), *Haemodorum loratum*, *Patersonia argyrea*, *Verticordia rutilastra* (all P3) and *Xanthosia tomentosa* (P4). One potentially significant taxon was collected during the survey – *Synaphea* sp. Indet. It could not be identified because there was no reproductive material on the plant when the survey was carried out; however, based on the other *Synaphea* collections, which were all *Synaphea lesueurensis*, it is likely to be *S. lesueurensis*.

Five regional endemic species were collected from the Survey Area, two confirmed range extension species and no weed species.

One vegetation type in excellent condition was mapped over the Survey Area – Mixed Heathland. The vegetation type does not resemble any of the TECs or PECs currently listed for the Geraldton Sandplains bioregion and DBCA Midwest Region respectively.

An impact assessment was carried out for the priority species located in the Survey Area, and impacts estimated for the plants located in the Survey Area ranges from 0.47% (*Xanthosia tomentosa*) to 11.49% (*Haemodorum loratum*), while impact to the plant populations known to Maia ranges from 2.33% (*Haemodorum loratum*) to 9.09% (*Synaphea lesueurensis*). Ten of the 43 *Haemodorum loratum* populations known to Maia (23.3%) are in protected lands and seven of the 11 *Synaphea lesueurensis* populations (63.6%). Given the number of priority plants located in the relatively small area surveyed, and that the vegetation type recorded in the Survey Area extends over quite a large area around and beyond the Survey Area, it is likely that the five species recorded occur in similar numbers in the surrounding vegetation.

The flora and vegetation survey was carried out over the 6.85 ha area and the Shire then selected a 5 ha area to be cleared within the 6.85 ha area. The 5 ha area was selected to minimise impact to the conservation significant flora species located in the Survey Area.

Clearing of 5 ha of vegetation association 1031 in the Survey Area would reduce its remaining extent in the Geraldton Sandplains bioregion (and the Lesueur Sandplain subregion) by 0.002%. The local area (the area within a 10 km radius of the centre of the Survey Area) will retain approximately 74.81% native vegetation extent cover after the 5 ha of proposed clearing in the gravel pit (a reduction of 0.02%), and native vegetation extent in R35593 will be reduced by 1.44% to 90.91%.

Clearing of 5 ha of low heathland habitat will result in the loss of all native fauna habitat from that cleared area. Populations of all fauna species in the Survey Area are likely to persist in the adjacent extensive area of habitat. The clearing is unlikely to result in an increase in habitat fragmentation in the area, as it is set within a tract of continuous vegetation.

Two species of threatened fauna potentially occur in the Survey Area. The Malleefowl (*Leipoa ocellata*) is only likely to be an occasional foraging visitor to the Survey Area, and the Survey Area would be a very small part of a much larger foraging range, and the loss of 5 ha of possible foraging habitat is unlikely to have a significant impact on the

Malleefowl. Carnaby's Cockatoo (*Calyptorhynchus latirostris*) is likely to be a foraging visitor to the Survey Area, but not likely to breed or roost in the Survey Area. The foraging habitat may be used by breeding birds, as breeding is known to occur within 12 km of the Survey Area. Loss of foraging habitat within 6 – 12 km of breeding sites is considered a threat to Carnaby's Cockatoo. Clearing will result in the loss of 5 ha of low value foraging habitat.

One Migratory species potentially occurs in the Survey Area. The Fork-tailed Swift (*Apus pacificus*) may overfly the Survey Area but is not likely to use the low heathland habitat. Therefore, clearing 5 ha of habitat is not likely to have a significant impact on this species.

One P4 fauna species is likely to occur in the Survey Area - the Western Brush Wallaby (*Notamacropus irma*). The Survey Area is likely to represent the home-range of a single individual, as home-range size has been estimated at about 9.9 ha for males and 5.3 ha for females. Therefore, although some habitat for this species will be lost, clearing of 5 ha of low heathland is not likely to have a significant impact on the species.

None of these fauna species were seen at the Survey Area, no evidence of Carnaby's Cockatoo foraging was observed in the Survey Area during the reconnaissance survey, although Carnaby's Cockatoo were observed in the surrounding area.

When the 10 clearing principles are addressed, three are considered not to be at variance and seven are considered unlikely to be at variance.

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11 MAPS

Location Map

Karatha
Newman
Wiluna
Geraldton
Kalgoorlie
Perth

Localities (Geoscience Australia, 20020101)
Road Network (Main Roads, 20190516)

The Survey Area

maia

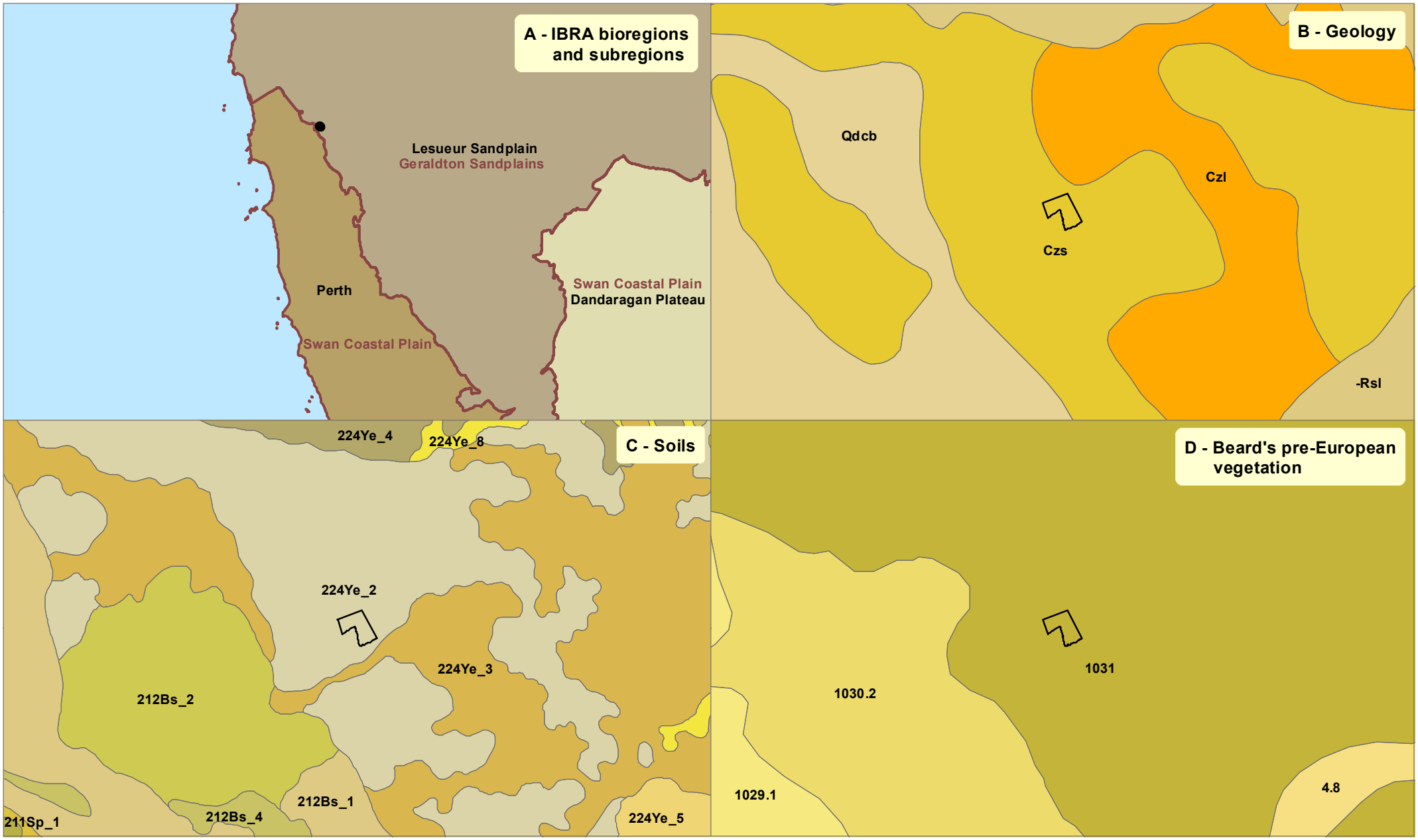
N

0 0.1

Kilometres

Datum: GDA 1994, MGA 50

Map: 1
Prepared for: SofD
Drawn by: RH
Date: 19/11/2019
Version: 1 **Size:** A4



Location Map

Karatha
Newman
Wiluna
Geraldton
Kalgoorlie
Perth

Survey Area

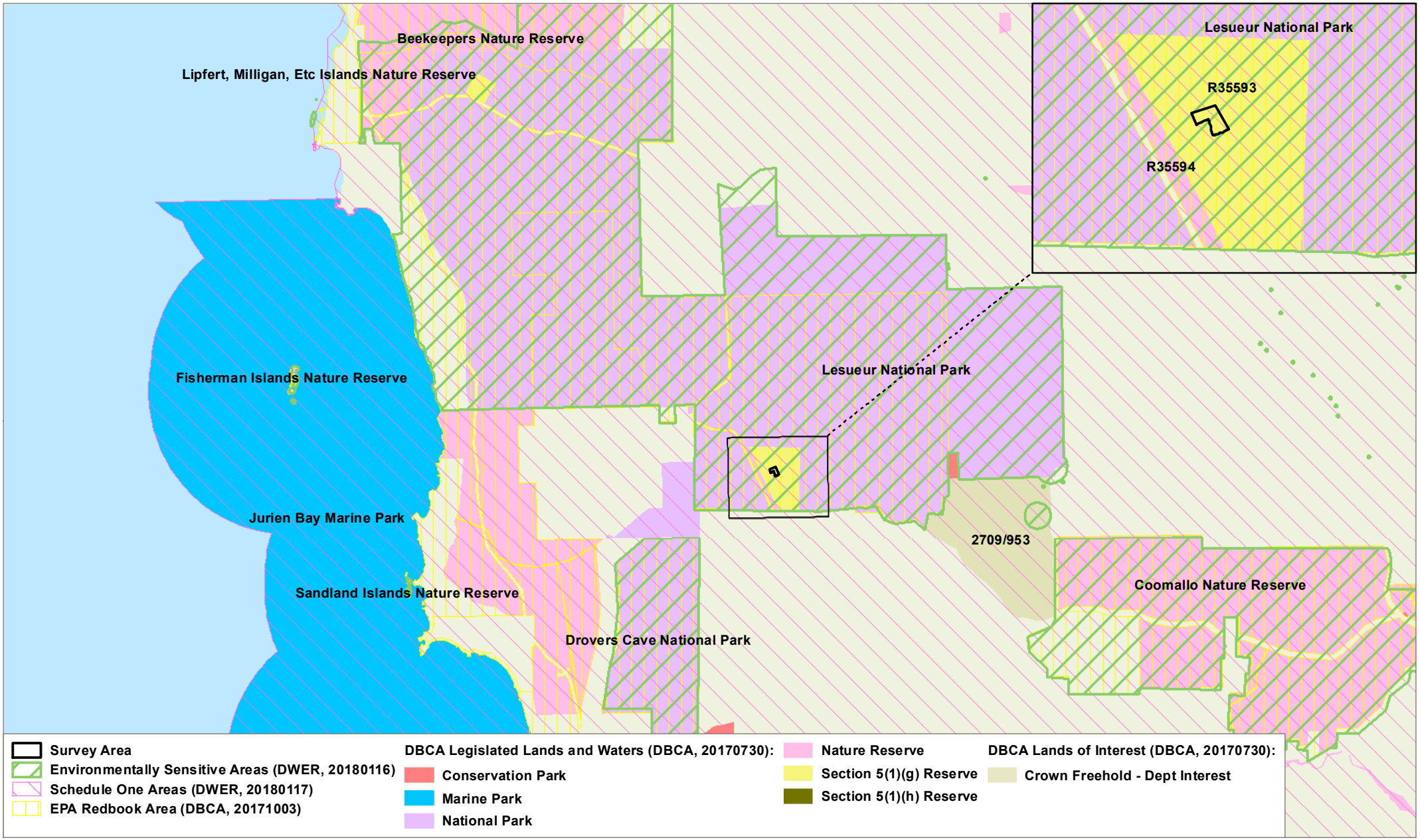
IBRA Bioregions and Subregions, Geology, Soil Landscape Units and Beard's Pre-European Vegetation (Vegetation System Associations)

maia

N

Datum: GDA 1994, MGA 50

Map: 2	
Prepared for: SofD	
Drawn by: RH	
Date: 19/11/2019	
Version: 1	**Size:** A4



Protected and Significant Areas

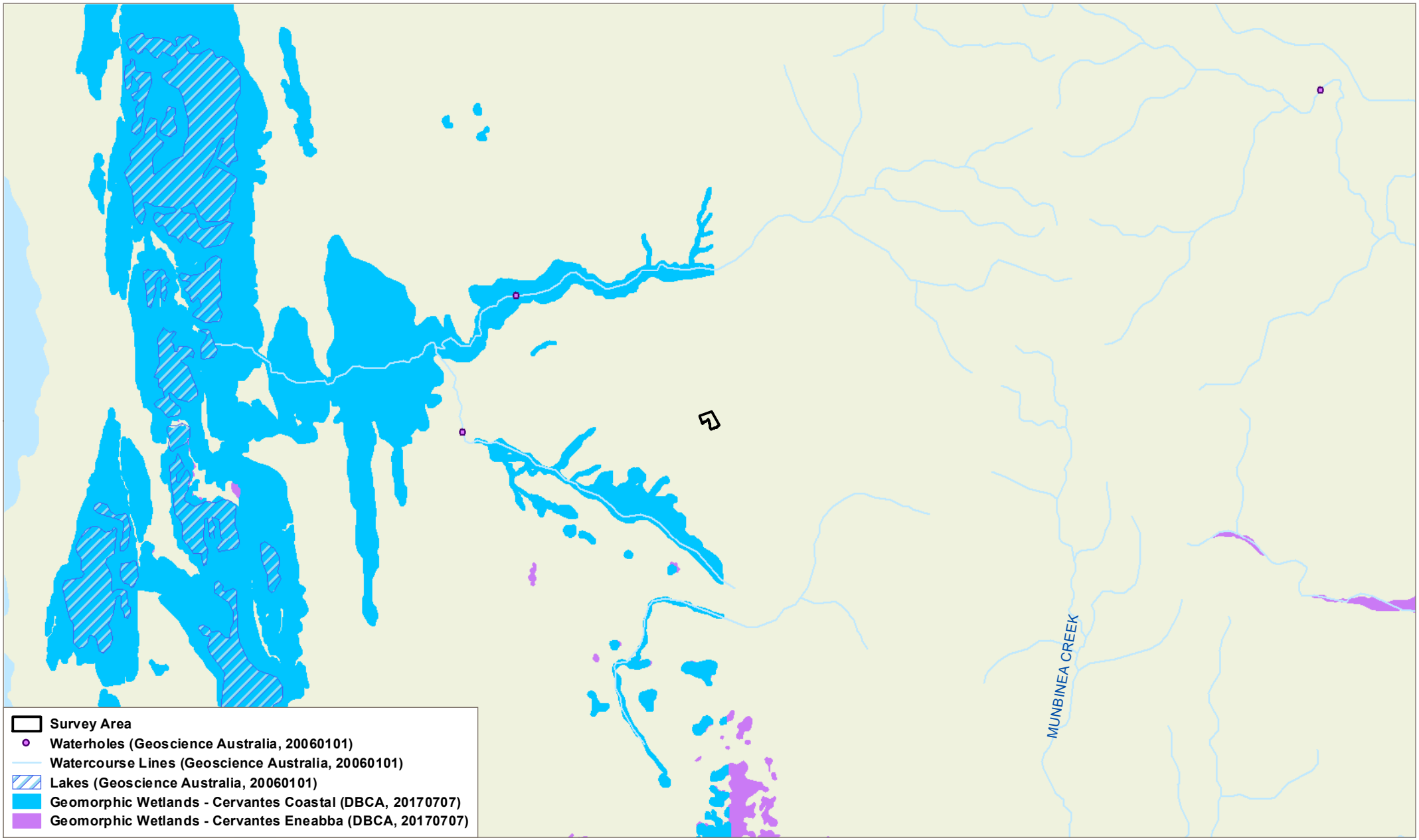
N

0 4.25

Kilometres

Datum: GDA 1994, MGA 50

Map: 3
Prepared for: SofD
Drawn by: RH
Date: 1911/2019
Version: 1 **Size:** A4



Location Map

Watercourses and Wetlands

maia

N

0 2

Kilometres

Datum: GDA 1994, MGA 50

Map: 4
Prepared for: SofD
Drawn by: RH
Date: 1911/2019
Version: 1 **Size:** A4

Location Map

Quadrats and Traverses

maia

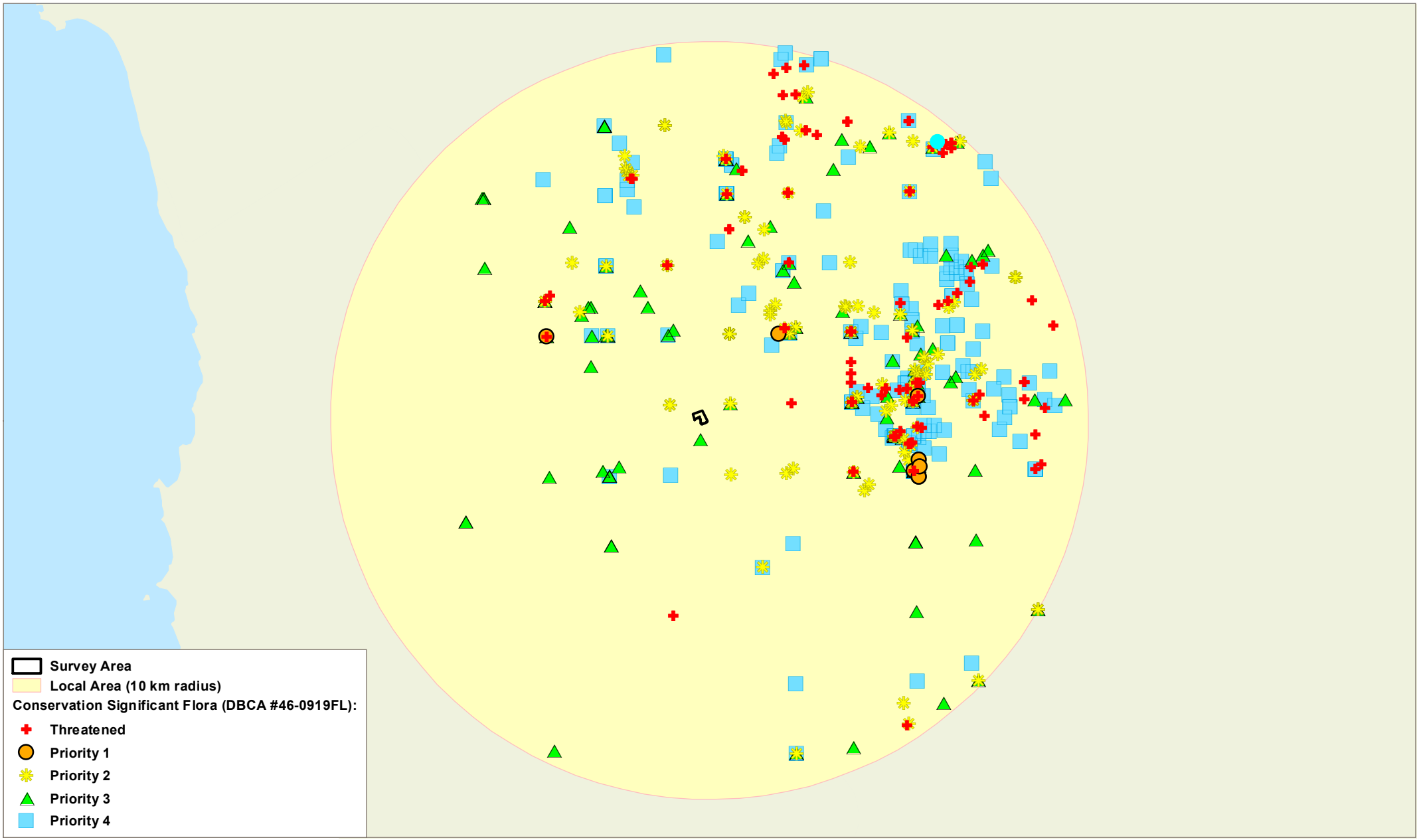
N

0 0.05

Kilometres

Datum: GDA 1994, MGA 50

Map: 5
Prepared for: SofD
Drawn by: RH
Date: 9/03/2020
Version: 3 **Size:** A4



Conservation Significant Flora - DBCA (search reference #46-0919FL)

maia

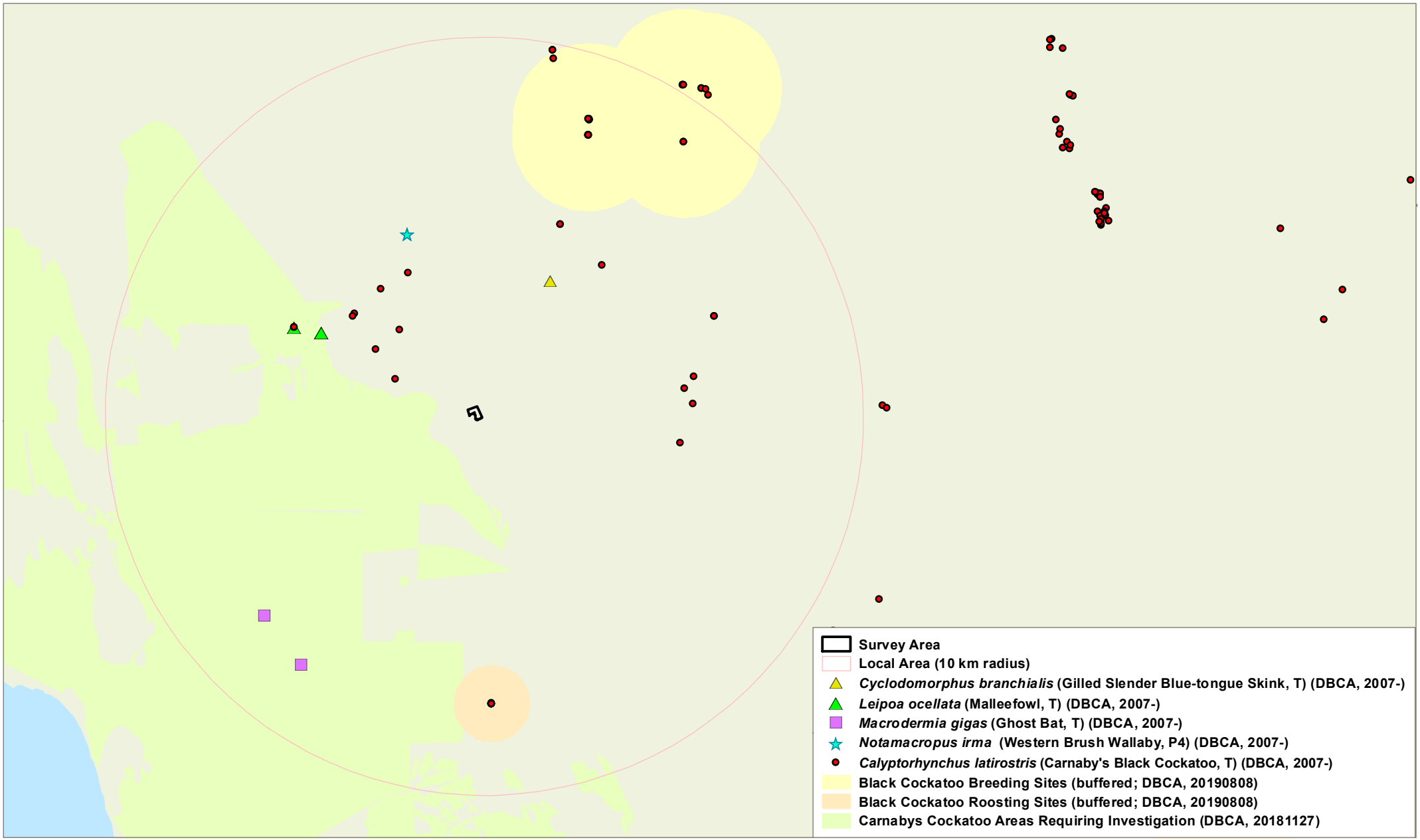
N

0 3

Kilometres

Datum: GDA 1994, MGA 50

Map: 6
Prepared for: SofD
Drawn by: RH
Date: 19/11/2019
Version: 1 **Size:** A4



Conservation Significant Fauna - DBCA and NatureMap Records

maia

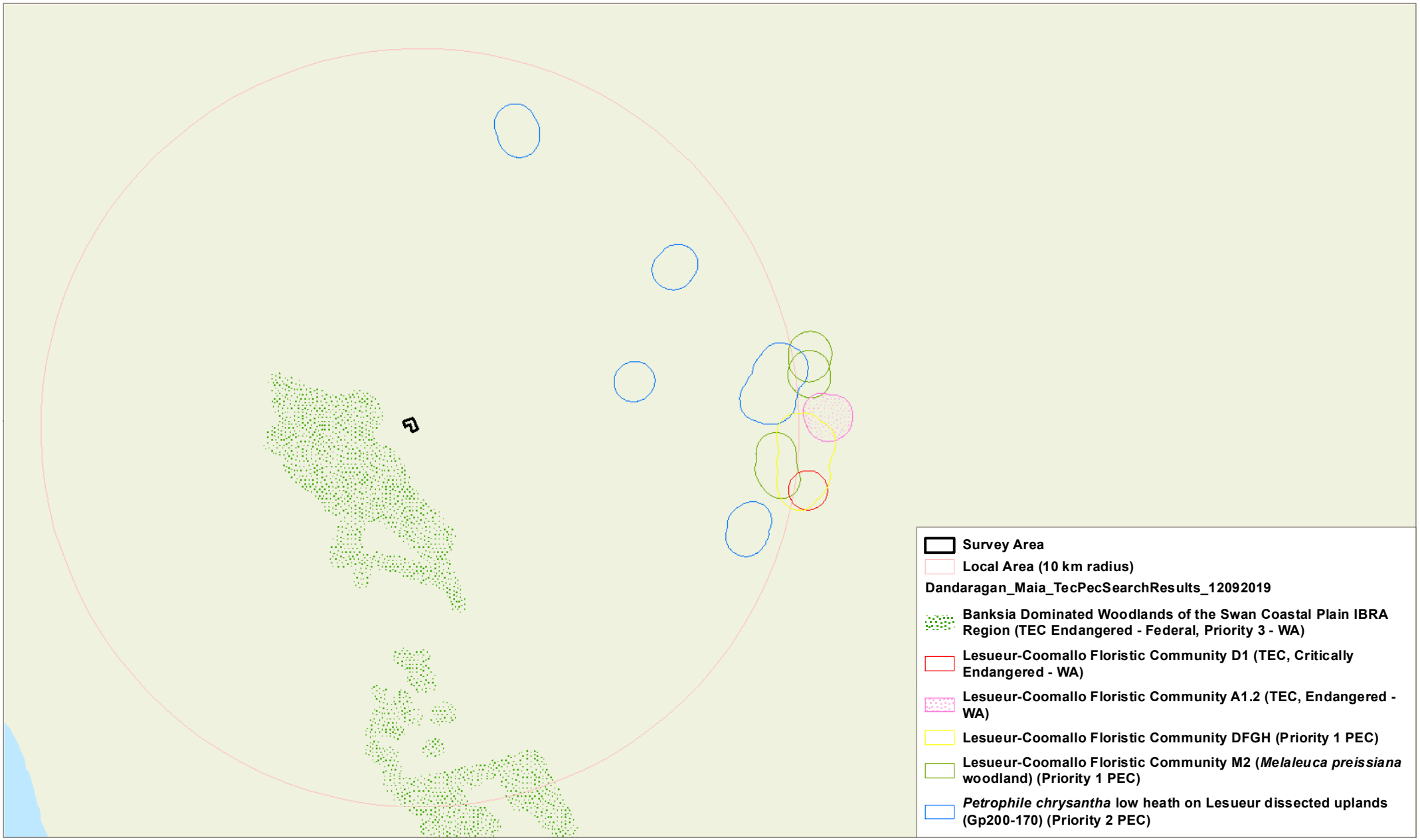
N

0 3

Kilometres

Datum: GDA 1994, MGA 50

Map: 7
Prepared for: SofD
Drawn by: RH
Date: 1911/2019
Version: 1 **Size:** A4



Threatened and Priority Ecological Communities (DBCA search reference #53-0919EC)

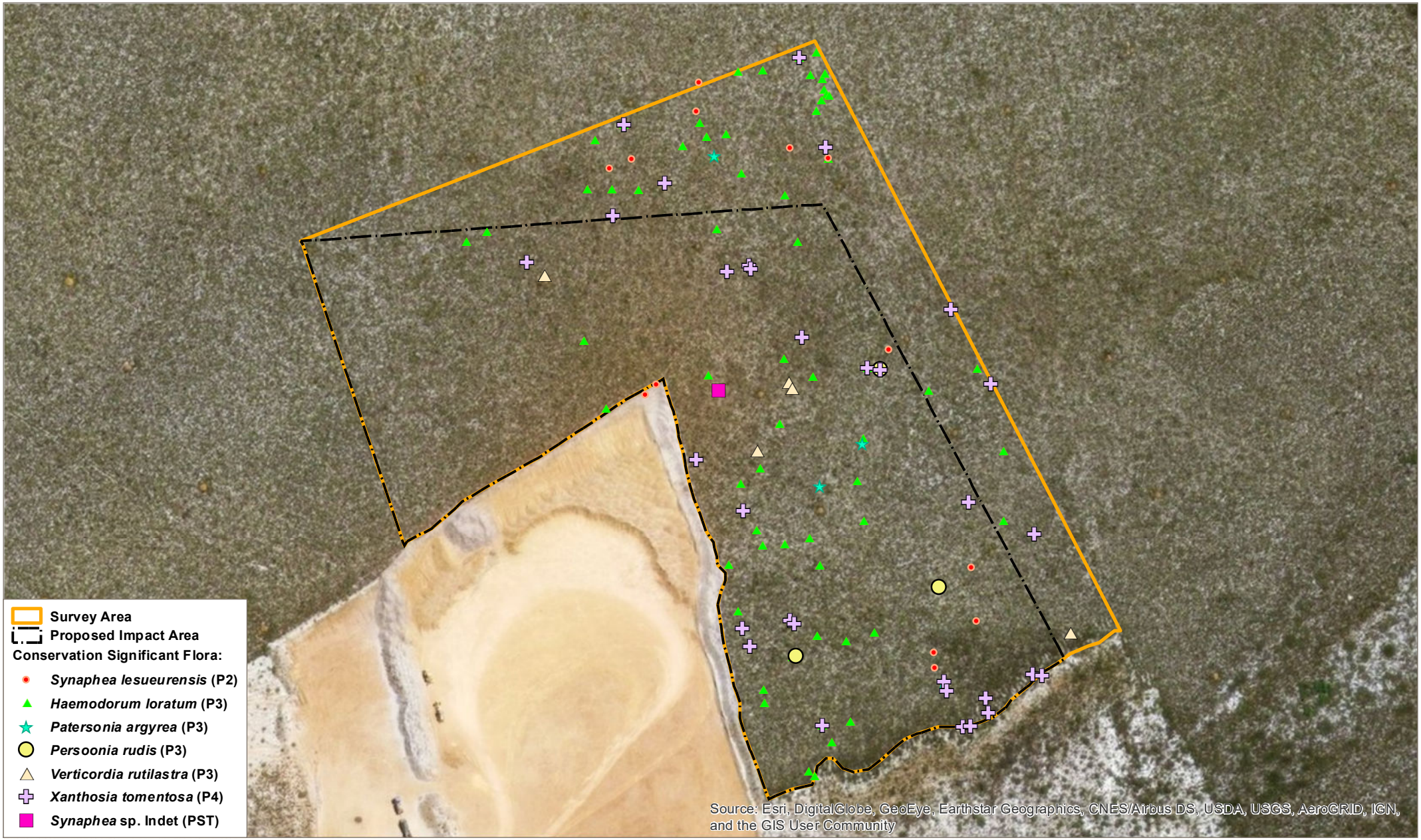
N

0 3

Kilometres

Datum: GDA 1994, MGA 50

Map: 8
Prepared for: SofD
Drawn by: RH
Date: 19/11/2019
Version: 1 **Size:** A4



Location Map

Conservation Significant Flora (Survey Results)

maia

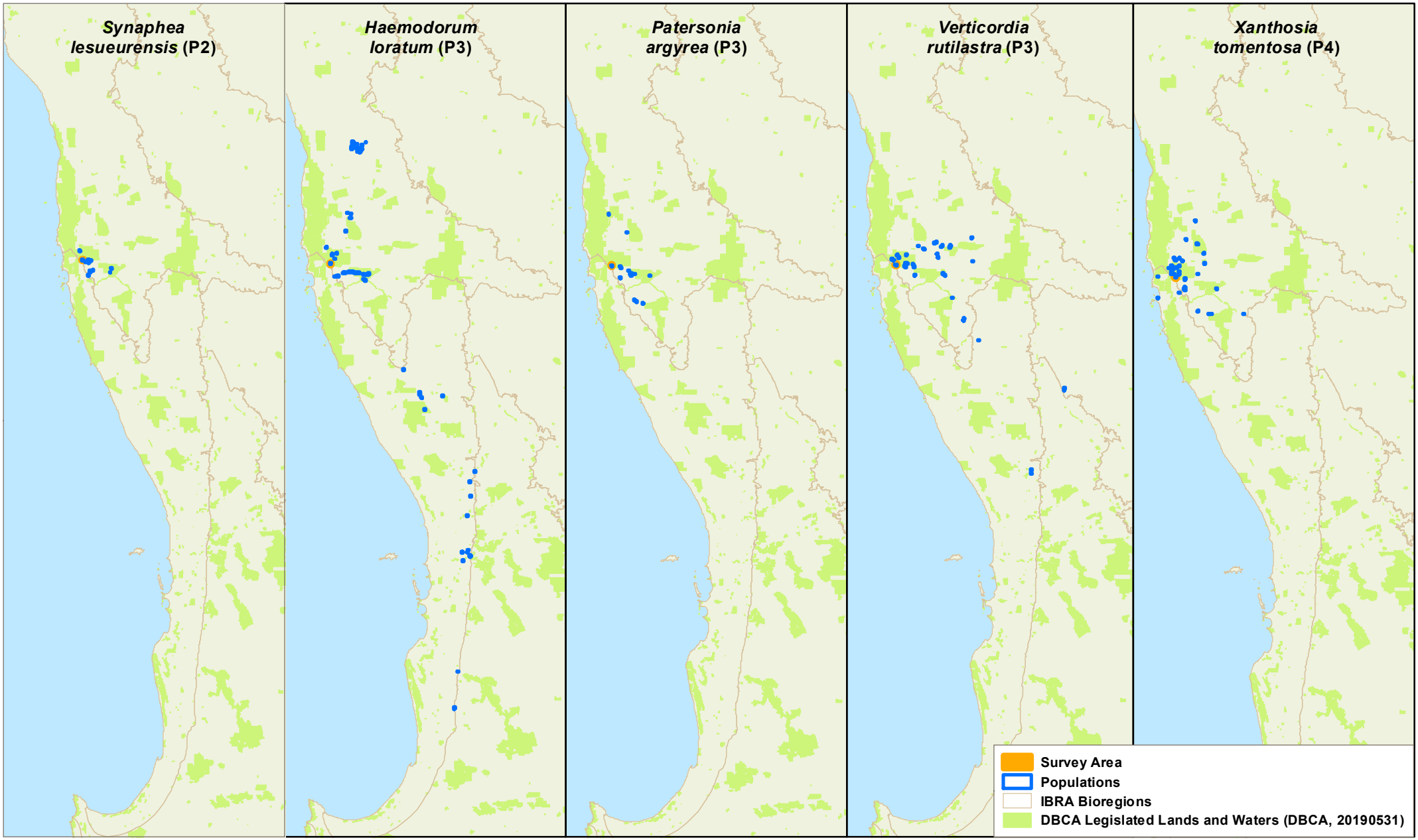
N

0 0.05

Kilometres

Datum: GDA 1994, MGA 50

Map: 9
Prepared for: SofD
Drawn by: RH
Date: 2/12/2019
Version: 1 **Size:** A4



Distribution of Conservation Significant Flora in WA

maia

N

0 50

Kilometres

Datum: GDA 1994, MGA 50

Map: 10
Prepared for: SofD
Drawn by: RH
Date: 9/03/2020
Version: 2 **Size:** A4

APPENDIX 1: SEARCH RESULTS

EPBC PMST search results (PMST NUXJIB) – flora and fauna 10 km buffer

Australian Government
Department of the Environment and Energy

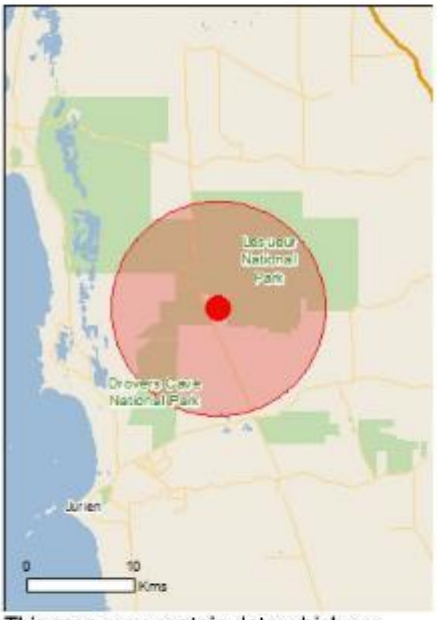
EPBC Act Protected Matters Report

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: 29/10/19 16:02:59



This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2010

Coordinates
Buffer: 10.0Km

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.

World Heritage Properties:	None
National Heritage Places:	1
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	2
Listed Threatened Species:	30
Listed Migratory Species:	10

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.

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	17
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

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

State and Territory Reserves:	7
Regional Forest Agreements:	None
Invasive Species:	18
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

National Heritage Properties		[Resource Information]
Name	State	Status
Natural		
Lesueur National Park	WA	Listed place

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
Banksia Woodlands of the Swan Coastal Plain ecological community	Endangered	Community likely to occur within area
Tuart (Eucalyptus gomphocephala) Woodlands and Forests of the Swan Coastal Plain ecological community	Critically Endangered	Community may occur within area

Listed Threatened Species		[Resource Information]
Name	Status	Type of Presence
Birds		
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 may occur within area
Calyptorhynchus latirostris Carnaby's Cockatoo, Short-billed Black-Cockatoo [59523]	Endangered	Breeding known to occur within area
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat likely to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Rostratula australis Australian Painted-snipe, Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Species or species habitat may occur within area
Mammals		
Dasyurus geoffroii Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat likely to occur within area
Parantechinus apicalis Dibbler [313]	Endangered	Species or species habitat may occur within area

Name	Status	Type of Presence
Plants		
Acacia forrestiana Forest's Wattle [17235]	Vulnerable	Species or species habitat known to occur within area
Andersonia gracilis Slender Andersonia [14470]	Endangered	Species or species habitat may occur within area
Anigozanthos viridis subsp. terraspectans Dwarf Green Kangaroo Paw [3435]	Vulnerable	Species or species habitat likely to occur within area
Banksia catoglypta [85021]	Vulnerable	Species or species habitat known to occur within area
Caladenia hoffmanii Hoffman's Spider-orchid [56719]	Endangered	Species or species habitat may occur within area
Drakaea elastica Glossy-leafed Hammer Orchid, Glossy-leaved Hammer Orchid, Warty Hammer Orchid [16753]	Endangered	Species or species habitat may occur within area
Eleocharis keigheryi Keighery's Eleocharis [64893]	Vulnerable	Species or species habitat known to occur within area
Eucalyptus impensa Eneabba Mallee [56711]	Endangered	Species or species habitat likely to occur within area
Eucalyptus johnsoniana Johnson's Mallee [14516]	Vulnerable	Species or species habitat known to occur within area
Eucalyptus lateritica Laterite Mallee [6271]	Vulnerable	Species or species habitat likely to occur within area
Eucalyptus leprophloia Scaly Butt Mallee, Scaly-butt Mallee [56712]	Endangered	Species or species habitat likely to occur within area
Eucalyptus suberea Cork Mallee, Mount Lesueur Mallee [5529]	Vulnerable	Species or species habitat known to occur within area
Eucalyptus x balanites Cadda Road Mallee, Cadda Mallee [87816]	Endangered	Species or species habitat may occur within area
Grevillea batrachioides Mt Lesueur Grevillea [21735]	Endangered	Species or species habitat known to occur within area
Grevillea humifusa Spreading Grevillea [61182]	Endangered	Species or species habitat known to occur within area
Hakea megalosperma Lesueur Hakea [10505]	Vulnerable	Species or species habitat known to occur within area
Hemiandra gardneri Red Snakebush [7945]	Endangered	Species or species habitat known to occur within area
Leucopogon obtectus Hidden Beard-heath [19614]	Endangered	Species or species habitat may occur within area

Name	Status	Type of Presence
Paracaleana dixonii		
Sandplain Duck Orchid [86882]	Endangered	Species or species habitat known to occur within area
Tetratheca nephelioides		
[83217]	Critically Endangered	Species or species habitat likely to occur within area
Thelymitra stellata		
Star Sun-orchid [7060]	Endangered	Species or species habitat known to occur within area

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
Migratory Marine Birds		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Motacilla cinerea		
Grey Wagtail [642]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat may occur within area
Calidris acuminata		
Sharp-tailed Sandpiper [874]		Species or species habitat may 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 may occur within area
Calidris melanotos		
Pectoral Sandpiper [858]		Species or species habitat may occur within area
Numenius madagascariensis		
Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pandion haliaetus		
Osprey [952]		Species or species habitat likely to occur within area
Tringa nebularia		
Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

Other Matters Protected by the EPBC Act

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		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may 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 may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Chrysococcyx osculans Black-eared Cuckoo [705]		Species or species habitat likely to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat likely to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area
Thinornis rubricollis Hooded Plover [59510]		Species or species habitat may occur within

Name	Threatened	Type of Presence
		area
Tringa nebularia		
Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

Extra Information

State and Territory Reserves	[Resource Information]
Name	State
Beekeepers	WA
Drovers Cave	WA
Lesueur	WA
Unnamed WA35593	WA
Unnamed WA35594	WA
Unnamed WA43786	WA
Unnamed WA51272	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 Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Columba livia		
Rock Pigeon, Rock Dove, Domestic Pigeon [803]		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
Mammals		
Canis lupus familiaris		
Domestic Dog [82654]		Species or species habitat likely to occur within area
Capra hircus		
Goat [2]		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
Feral deer		
Feral deer species in Australia [85733]		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

Name	Status	Type of Presence
Sus scrofa Pig [6]		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 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
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Olea europaea Olive, Common Olive [9160]		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
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

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

-30.17049 115.14419

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 search results – flora 10 km buffer

NatureMap

Gravel Pit 10 km Buffer - Flora

Created By Scott Hitchcock on 29/10/2019

Kingdom Plantae
Core Datasets Only Yes
Method By Circle
Centre 115° 08' 39" E,30° 10' 14" S
Buffer 10km
Group By Conservation Status

Conservation Status	Species	Records
Non-conservation taxon	845	2916
Priority 1	5	16
Priority 2	27	174
Priority 3	33	157
Priority 4	16	214
Rare or likely to become extinct	12	128
TOTAL	**936**	**3606**

	Name ID	Species Name	Naturalised	Conservation Code	Endemic To Query Area
Rare or likely to become extinct					
1.	3341	*Acacia forrestiana (Forrest's Wattle)*		T	
2.	32822	*Banksia catoglypta*		T	
3.	17805	*Eleocharis keigheryi*		T	
4.	5880	*Eucalyptus johnsoniana (Johnson's Mallee)*		T	
5.	5891	*Eucalyptus latentica (Latente Mallee)*		T	
6.	5781	*Eucalyptus suberea (Mount Lesueur Mallee)*		T	
7.	1960	*Grevillea batrachioides*		T	
8.	16987	*Grevillea nuxiflora*		T	
9.	2180	*Hakea megalosperma (Lesueur Hakea)*		T	
10.	6835	*Hemiandra gardneri (Red Snakebush)*		T	
11.	13867	*Paracaleana dixonii*		T	
12.	10862	*Thelymitra stellata (Star Orchid)*		T	
Priority 1					
13.	19922	*Drosera pedicellaris*		P1	
14.	30715	*Stylidium carnosum subsp. Narrow leaves (J.A. Wege 490)*		P1	
15.	4542	*Tetratheca retrorsa*		P1	
Priority 2					
16.	14095	*Acacia carens*		P2	
17.	14931	*Acacia lasiocarpa var. lasiocarpa Cockleshell Gully variant (E.A. Griffin 2039)*		P2	
18.	3518	*Acacia retrorsa*		P2	
19.	17842	*Andersonia sp. Mt Lesueur (E.A. Griffin 3536)*		P2	Y
20.	32526	*Banksia fraseri var. effusa*		P2	Y
21.	4600	*Beyeria similis*		P2	
22.	16625	*Boronia ramosa subsp. foliosiflora*		P2	
23.	16837	*Boronia scabra subsp. condensata*		P2	
24.	35837	*Crotonia bifolia subsp. pubescens*		P2	
25.	18441	*Dampiera sp. Jurien (G. Lullfitz s.n. 10/7/1998)*		P2	
26.	11562	*Daviesia debilior subsp. debilior*		P2	
27.	12898	*Eucalyptus sicilia*		P2	
28.	7566	*Goodenia xanthosiphon (Yellow-haired Goodenia)*		P2	
29.	15815	*Grevillea delta*		P2	
30.	31412	*Hypocalymma sp. Gardner Range (C.A. Gardner 8097)*		P2	Y
31.	16179	*Hypocalymma tenuatum*		P2	
32.	48347	*Lasiopetalum rufiflore*		P2	
33.	16241	*Leptoceda curvescens*		P2	
34.	6432	*Leucopogon plumuliflorus*		P2	
35.	11906	*Philotheca pilosissima subsp. linearifolia*		P2	
36.	44802	*Pityrodia civicola*		P2	
37.	14236	*Stenanthemum limbatum*		P2	
38.	20531	*Stylidium diplostichum*		P2	

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Mapping Western Australia's Biodiversity

	Name ID	Species Name	Naturalised	Conservation Code	Endemic To Query Area
39.	15590	*Synaphea lesueurensis*		P2	
40.	20734	*Thelymitra pulcherrima*		P2	
41.	13783	*Thysanotus sp. Badgingarra (E.A. Griffin 2511)*		P2	
42.	2792	*Walteranthus erectus*		P2	
Priority 3					
43.	3319	*Acacia epacantha*		P3	
44.	3493	*Acacia plicata*		P3	
45.	1729	*Allocasuarina grevilleoides*		P3	
46.	32027	*Banksia fraseri var. crebra*		P3	
47.	32216	*Banksia kippistiana var. paenepeccata*		P3	
48.	19980	*Calytrix ecalycata subsp. brevis*		P3	
49.	14201	*Daviesia pteroclada*		P3	
50.	45709	*Drosera prophylla*		P3	
51.	23409	*Gompholobium gairdnerianum*		P3	
52.	13900	*Grevillea uniformis*		P3	
53.	13233	*Guichenotia alba*		P3	
54.	1469	*Haemodorum loratum*		P3	
55.	12230	*Hakea longiflora*		P3	
56.	1292	*Hensmania stoniella*		P3	
57.	20851	*Hypocalymma gardneri*		P3	
58.	29775	*Isopogon drummondii*		P3	
59.	13775	*Lepidobolus quadratus*		P3	
60.	1541	*Patersonia argyrea*		P3	
61.	14563	*Persoonia filiformis*		P3	
62.	2271	*Persoonia rudis*		P3	
63.	43540	*Stackhousia sp. Red-blotched corolla (A. Markey 911)*		P3	
64.	13127	*Stylidium maritimum*		P3	
65.	7786	*Stylidium nonscandens*		P3	
66.	7771	*Stylidium periscelianthum (Pantaloon Triggerplant)*		P3	
67.	17414	*Stylidium torticarpum*		P3	
68.	45297	*Styphelia filifolia*		P3	
69.	23982	*Tetratheca angulata*		P3	
70.	4543	*Tetratheca retrorsa*		P3	
71.	1317	*Thysanotus anceps*		P3	
72.	1359	*Thysanotus vernalis*		P3	
73.	12380	*Verticordia amphigia*		P3	
74.	12434	*Verticordia insignis subsp. eomagis*		P3	
75.	12456	*Verticordia rutilastra*		P3	
Priority 4					
76.	4387	*Asterolasia drummondii (Gardner Range Starbush)*		P4	
77.	1810	*Banksia chamaephyton (Fishbone Banksia)*		P4	
78.	1816	*Banksia elegans (Elegant Banksia)*		P4	
79.	1853	*Banksia incana (Pine Banksia)*		P4	
80.	3115	*Drosera occidentalis (Western Sundew)*		P4	
81.	5642	*Eucalyptus exilis (Boyagin Mallee)*		P4	
82.	13631	*Eucalyptus macrocarpa subsp. elachantha (Small-leaved Mottlecah)*		P4	
83.	2054	*Grevillea olivacea (Olive Grevillea)*		P4	
84.	2186	*Hakea neurophylla*		P4	
85.	14595	*Hemiandra sp. Watheroo (S. Hancocks 4)*		P4	
86.	17622	*Hypolaena robusta*		P4	
87.	7680	*Stylidium aeonioides*		P4	
88.	7743	*Stylidium inversiflorum*		P4	
89.	11032	*Thelymitra apiculata*		P4	
90.	1334	*Thysanotus glaucus*		P4	
91.	6284	*Xanthosia tomentosa (Lesueur Southern Cross)*		P4	
Non-conservation taxon					
92.	3207	*Acacia alata (Winged Wattle)*			
93.	15430	*Acacia alata var. tetrantha*			
94.	3231	*Acacia auronitens*			
95.	14061	*Acacia clydonophora*			
96.	3303	*Acacia dilatata*			
97.		*Acacia drummondii subsp. drummondii (Large leaf variant)*			
98.	3323	*Acacia ericifolia*			
99.	3382	*Acacia incrassata*			
100.	3409	*Acacia lasiocarpa (Panjang)*			
101.		*Acacia lasiocarpa var. **			
102.	11611	*Acacia lasiocarpa var. lasiocarpa*			
103.	3412	*Acacia latipes*			
104.	3451	*Acacia multispicata*			

NatureMap
Mapping Western Australia's Biodiversity

	Name ID	Species Name	Naturalised	Conservation Code	Endemic To Query Area
105.	3484	*Acacia obovata*			
106.	15481	*Acacia pulchella var. glaberrima*			
107.	3525	*Acacia rostellifera (Summer-scented Wattle)*			
108.		*Acacia rostellifera x xanthina*			
109.	3527	*Acacia saligna (Orange Wattle, Kudjong)*			
110.	30033	*Acacia saligna subsp. lindleyi*			
111.		*Acacia sp.*			
112.	3549	*Acacia spathulifolia*			
113.	15486	*Acacia sphacelata subsp. verticillata*			
114.	3557	*Acacia stenoptera (Narrow Winged Wattle)*			
115.	3574	*Acacia teretifolia*			
116.	3604	*Acacia xanthina (White-stemmed Wattle)*			
117.	1205	*Acanthocarpus canaliculatus*			
118.	6205	*Actinotus leucocephalus (Flannel Flower)*			
119.	11837	*Adenanthos cygnorum subsp. cygnorum (Common Woollybush)*			
120.	1066	*Alexgeorgea nitens*			
121.	1067	*Alexgeorgea subterranea*			
122.	1721	*Allocasuarina campestris*			
123.	1732	*Allocasuarina humilis (Dwarf Sheoak)*			
124.	1734	*Allocasuarina microstachya*			
125.	4906	*Alyogyne huegelii (Lilac Hibiscus)*			
126.	15459	*Alyogyne huegelii var. wrayae*			
127.	43023	*Alyogyne sp. Hutt River (B.J. Lepschi & T.R. Lally 2316)*			
128.	12025	*Amphipogon caricinus var. caricinus*			
129.	20184	*Amphipogon laguroides subsp. laguroides*			
130.	200	*Amphipogon turbinatus*			
131.	6480	*Anagallis arvensis (Pimpernel)*	Y		
132.		*Anarthria gracilis x humilis*			Y
133.	1059	*Anarthria humilis*			
134.	1060	*Anarthria laevis*			
135.		*Anarthria sp.*			Y
136.	6311	*Andersonia heterophylla*			
137.	6312	*Andersonia involucrata*			
138.	6314	*Andersonia lehmanniana*			
139.	11471	*Andersonia lehmanniana subsp. lehmanniana*			
140.	41738	*Andersonia sp. Myacoma (E.A. Griffin 2213)*			
141.	40906	*Androcalva pulchella*			
142.	1409	*Anigozanthos humilis (Catspaw)*			
143.	11434	*Anigozanthos humilis subsp. humilis*			
144.	11565	*Anigozanthos manglesii subsp. quadrans*			
145.	1414	*Anigozanthos pulcherrimus (Yellow Kangaroo Paw)*			
146.		*Anigozanthos sp.*			
147.	11725	*Anthocercis ilicifolia subsp. ilicifolia*			
148.	7836	*Arctotheca calendula (Cape Weed, African Marigold)*	Y		
149.	7840	*Arctotis stoechadifolia (White Arctotis, Silver Arctotis)*	Y		
150.	1284	*Arnocrinum preissii*			
151.		*Arthropodium sp.*			
152.	7851	*Asteridea pulverulenta (Common Bristle Daisy)*			
153.	6323	*Astroloma ciliatum (Candle Cranberry)*			
154.	6328	*Astroloma glaucescens*			
155.	6332	*Astroloma microdonta (Sandplain Cranberry)*			
156.	42144	*Astroloma oblongifolium*			
157.	6337	*Astroloma stomarrhena (Red Swamp Cranberry)*			
158.	6339	*Astroloma xerophyllum*			
159.		*Austrodanthonia aff. racemosa*			Y
160.	17946	*Austrodanthonia racemosa*			Y
161.	17237	*Austrostipa elegantissima*			
162.	17240	*Austrostipa flavescens*			
163.	17244	*Austrostipa macalpinei*			
164.	17264	*Austrostipa tenuifolia*			
165.	233	*Avena barbata (Bearded Oat)*	Y		
166.	45398	*Babingtonia erecta*			
167.	45416	*Babingtonia grandiflora (Large-flowered Babingtonia)*			
168.	5350	*Baeckea grandiflora (Large-flowered Baeckea)*			
169.	32081	*Banksia armata (Prickly Dryandra)*			
170.	32082	*Banksia armata var. armata*			
171.	1800	*Banksia attenuata (Slender Banksia, Piara)*			
172.	32679	*Banksia bipinnatifida subsp. multifida*			
173.	1809	*Banksia candolleana (Propeller Banksia)*			
174.	32623	*Banksia carlinoides (Pink Dryandra)*			

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	Name ID	Species Name	Naturalised	Conservation Code	Endemic To Query Area
175.	32578	*Banksia dallanneyi subsp. media*			
176.	1819	*Banksia grandis (Bull Banksia, Pulgarla)*			
177.	1820	*Banksia grossa*			
178.	32518	*Banksia hewardiana*			
179.	1822	*Banksia ilicifolia (Holly-leaved Banksia)*			
180.	1823	*Banksia incana*			
181.	32215	*Banksia kippistiana var. kippistiana*			
182.	1828	*Banksia leptophylla*			
183.	1830	*Banksia littoralis (Swamp Banksia, Pungura)*			
184.	1834	*Banksia menziesii (Firewood Banksia)*			
185.	1835	*Banksia micrantha*			
186.	1842	*Banksia prionotes (Acorn Banksia)*			
187.	32086	*Banksia sclerophylla*			
188.	32077	*Banksia sessilis var. cygnorum*			
189.	32074	*Banksia shuttleworthiana (Bearded Dryandra)*			
190.		*Banksia sp.*			
191.	32043	*Banksia stenoprion*			
192.	32042	*Banksia strictifolia*			
193.	1852	*Banksia telmatiaea (Swamp Fox Banksia)*			
194.	32033	*Banksia tortifolia*			
195.	32032	*Banksia tridentata (Yellow Honeypot)*			
196.	741	*Baumea articulata (Jointed Rush)*			
197.	743	*Baumea juncea (Bare Twigrush)*			
198.	17761	*Beaufortia aestiva (Kalbarri Beaufortia)*			
199.	45793	*Beaufortia kwongkanicola (Lesueur Beaufortia)*			
200.	25785	*Billardiera fraseri (Elegant Pronaya)*			
201.	1417	*Blancoa canescens (Winter Bell)*			
202.	4405	*Boronia busselliana*			
203.	4411	*Boronia crassifolia*			
204.	4414	*Boronia cymosa (Granite Boronia)*			
205.	4435	*Boronia ramosa*			
206.	11381	*Boronia ramosa subsp. anethifolia*			
207.	11584	*Boronia ramosa subsp. ramosa*			
208.	1272	*Borya scirpoidea*			
209.	1273	*Borya sphaerocephala (Pincushions)*			
210.	3710	*Bossiaea eriocarpa (Common Brown Pea)*			
211.	3719	*Bossiaea spinescens*			
212.	7867	*Brachyscome bellidioides*			
213.	7878	*Brachyscome iberidifolia*			
214.	244	*Briza maxima (Blowfly Grass)*	Y		
215.	245	*Briza minor (Shivery Grass)*	Y		
216.	249	*Bromus diandrus (Great Brome)*	Y		
217.	253	*Bromus rubens (Red Brome)*	Y		
218.	1383	*Burchardia bairdiae*			
219.	12770	*Burchardia congesta*			
220.	1385	*Burchardia multiflora (Dwarf Burchardia)*			
221.	15445	*Caesia alfordii*			
222.	1276	*Caesia micrantha (Pale Grass Lily)*			
223.	29439	*Caesia sp. Wongan (K.F. Kenneally 8820)*			
224.		*Caladenia arenicola x longicauda subsp. borealis*			Y
225.	44893	*Caladenia denticulata subsp. denticulata*			
226.	15348	*Caladenia flava subsp. flava*			
227.	15502	*Caladenia footeana*			
228.	15354	*Caladenia hirta subsp. hirta*			
229.	15356	*Caladenia longicauda subsp. albella*			
230.	15360	*Caladenia longicauda subsp. borealis*			
231.		*Caladenia longicauda subsp. borealis x lorea*			
232.	15389	*Caladenia lorea*			
233.	17589	*Caladenia occidentalis*			
234.	44184	*Calandrinia baccata*			
235.	2848	*Calandrinia corrigioloides (Strap Purslane)*			
236.	2861	*Calandrinia polyandra*			
237.	16365	*Calandrinia sp. Kenwick (G.J. Keighery 10905)*			
238.	19309	*Calectasia narragara*			
239.	36520	*Callitris acuminata (Dwarf Cypress)*			
240.	5401	*Calothamnus blepharospermus*			
241.	35856	*Calothamnus glaber*			
242.	5411	*Calothamnus hirsutus*			
243.		*Calothamnus quadrifidus subsp. angustifolius / quadrifidus subsp. quadrifidus*			
244.	35816	*Calothamnus quadrifidus subsp. quadrifidus*			

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Department of Biodiversity, Conservation and Attractions
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NatureMap

	Name ID	Species Name	Naturalised	Conservation Code	Endemic To Query Area
245.	5429	*Calothamnus sanguineus (Silky-leaved Blood flower, Pindak)*			
246.		*Calothamnus sp.*			
247.	5431	*Calothamnus torulosus*			
248.	5441	*Calytrix aurea*			
249.	5450	*Calytrix depressa*			
250.	5458	*Calytrix flavescens (Summer Starflower)*			
251.	5460	*Calytrix fraseri (Pink Summer Calytrix)*			
252.	5465	*Calytrix leschenaultii*			
253.	5476	*Calytrix sapphirina*			
254.	5479	*Calytrix strigosa*			
255.	1182	*Cardamine phylicoides*			
256.	12075	*Cassytha aurea var. aurea*			
257.	2961	*Cassytha flava (Dodder Laurel)*			
258.	2962	*Cassytha glabella (Tangled Dodder Laurel)*			
259.	11206	*Cassytha glabella forma dioalboa*			
260.	2966	*Cassytha pomiformis (Dodder Laurel)*			
261.	2967	*Cassytha racemosa (Dodder Laurel)*			
262.	11799	*Cassytha racemosa forma racemosa*			
263.	760	*Casuta dioica*			
264.	7916	*Centaurea melitensis (Maltese Cockspur, Malta Thistle)*	Y		
265.	8542	*Centaurium tenuiflorum*	Y		
266.	5214	*Centella asiatica*			
267.	1125	*Centrolepis drummondiana*			
268.	1133	*Centrolepis pilosa*			
269.	17685	*Chaetanthus aristatus*			
270.	5785	*Chamaescilla versicolor*			
271.	5495	*Chamelaucium uncinatum (Geraldton Wax)*			
272.	31	*Cheilanthes austrotenuifolia*			
273.	17706	*Chordifex sinuosus*			
274.	17826	*Chordifex stenandrus*			
275.	5971	*Chorizema cordatum*			
276.	4553	*Clematocissus angustissima*			
277.	10604	*Clematis linearifolia*			
278.	2778	*Codonocarpus cotinifolius (Native Poplar, Kurrajongup)*			
279.	4549	*Comesperma acerosum*			
280.	4550	*Comesperma calymega (Blue-spike Milkwort)*			
281.	4551	*Comesperma ciliatum*			
282.	4553	*Comesperma drummondii (Drummond's Milkwort)*			
283.	4561	*Comesperma scoparium (Broom Milkwort)*			
284.	4566	*Comesperma volubile (Love Creeper)*			
285.	40872	*Commersonia bonensis*			
286.	15511	*Conospermum boreale*			
287.	15512	*Conospermum boreale subsp. ascendens*			
288.	15513	*Conospermum boreale subsp. boreale*			
289.		*Conospermum boreale x wycherleyi*			
290.	15041	*Conospermum canaliculatum*			
291.	15516	*Conospermum canaliculatum subsp. canaliculatum*			
292.	1864	*Conospermum crassinervium (Summer Smokebush)*			
293.	1874	*Conospermum glumaceum (Hooded Smokebush)*			
294.	1878	*Conospermum nervosum*			
295.	15511	*Conospermum stoechadis subsp. stoechadis (Common Smokebush)*			
296.	1885	*Conospermum triphernum (Tree Smokebush)*			
297.	15523	*Conospermum wycherleyi*			
298.	6346	*Conostephium pendulum (Pearl Flower)*			
299.	6349	*Conostephium preissii*			
300.	11414	*Conostylis aculeata subsp. breviflora*			
301.	12109	*Conostylis aculeata subsp. preissii*			
302.	1420	*Conostylis androstemma (Trumpets)*			
303.	1423	*Conostylis aurea (Golden Conostylis)*			
304.	1427	*Conostylis candicans (Grey Cottonhead)*			
305.	12027	*Conostylis candicans subsp. calcicola*			
306.	11435	*Conostylis candicans subsp. candicans*			
307.	1428	*Conostylis centrata*			
308.	45452	*Conostylis crassinerva subsp. absens*			
309.	45453	*Conostylis crassinerva subsp. crassinerva*			
310.	1435	*Conostylis hiemalis*			
311.	1437	*Conostylis lepta*			
312.	1446	*Conostylis prolifera (Wet Cottonheads)*			
313.	1454	*Conostylis setigera (Bristly Cottonhead)*			
314.	11870	*Conostylis tenuifolia subsp. tenuifolia*			

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315.	1455	*Conostylis teretiuscula*			
316.	5502	*Conothamnus trichorhis*			
317.	5614	*Convolvulus remotus*			
318.	7941	*Conyza parva*	Y		
319.	20074	*Conyza sumatrensis*	Y		
320.	17104	*Corymbia calophylla (Marri)*			
321.		*Corymbia calophylla x chlorolampra*			Y
322.	16755	*Corymbia chlorolampra*			Y
323.	17105	*Corymbia haematoxylon (Mountain Marri)*			
324.	13354	*Craspedia variabilis*			
325.	11709	*Crassula colorata var. acuminata*			
326.	31571	*Crystallaria intermedia*			
327.	9076	*Crystallaria inyantha*			
328.	4809	*Crystallaria pungens*			
329.	15114	*Cyanicula gemmata*			
330.	768	*Cyathochaeta avenacea*			
331.	40661	*Cyclogeton kleere*			
332.	283	*Cynodon dactylon (Couch)*	Y		
333.	816	*Cyperus tenuiflorus (Scaly Sedge)*	Y		
334.	7451	*Dampiera lavandulacea*			
335.	7453	*Dampiera linderi*			
336.	7454	*Dampiera linearis (Common Dampiera)*			
337.	7459	*Dampiera oligophylla (Sparse-leaved Dampiera)*			
338.		*Dampiera sp.*			
339.	7475	*Dampiera spicigera (Spiked Dampiera)*			
340.	7482	*Dampiera teres (Terete-leaved Dampiera)*			
341.	5511	*Darwinia helichrysoides*			
342.		*Darwinia helichrysoides x neildiana*			Y
343.		*Darwinia helichrysoides x sanguinea*			Y
344.	5518	*Darwinia neildiana (Fringed Bell)*			
345.		*Darwinia neildiana x sanguinea*			Y
346.	5522	*Darwinia pauciflora*			
347.	5525	*Darwinia sanguinea*			
348.	1220	*Daviesia obliquifolia*			
349.	5218	*Daucus glochidiatus (Australian Carrot)*			
350.	3793	*Daviesia angulata*			
351.	14199	*Daviesia chapmanii*			
352.	19747	*Daviesia decurrens subsp. decurrens*			
353.	15560	*Daviesia divaricata subsp. divaricata*			
354.	3809	*Daviesia epiphyllum*			
355.	3819	*Daviesia longifolia*			
356.	15585	*Daviesia nudiflora subsp. nudiflora*			
357.	3831	*Daviesia pedunculata*			
358.	3833	*Daviesia podophylla*			
359.	3845	*Daviesia triflora*			
360.	17683	*Desmocladus asper*			
361.	15831	*Desmocladus oxelmeus*			
362.	17691	*Desmocladus fasciculatus*			
363.	17662	*Desmocladus flavidus*			
364.	15455	*Desmocladus virgatus*			
365.	1287	*Dichopogon capillipes*			
366.	311	*Digitaria ciliaris (Summer Grass)*	Y		
367.	29078	*Dillwynia sp. Northern Sandplains (M. Hislop 3278)*			
368.	1509	*Dioscorea hastifolia (Warrine, Weiram)*			
369.	15272	*Diplolaena cinerea*			
370.	4455	*Diplolaena ferruginea*			
371.	15275	*Diplolaena obovata*			
372.	4746	*Diplopeltis huegelii*			
373.	15641	*Diplopeltis huegelii subsp. huegelii*			
374.		*Diplopeltis huegelii subsp. huegelii / subintegra*			
375.	1635	*Diuris setacea (Bristly Donkey Orchid)*			
376.		*Diuris sp.*			
377.	44162	*Diuris tricolor*			
378.	4761	*Dodonaea ericoides*			
379.	3080	*Drosera barbigera*			
380.	45751	*Drosera drummondii*			
381.	13282	*Drosera echinoblastus*			
382.	13281	*Drosera enantia*			
383.	3085	*Drosera erythrorhiza (Red Ink Sundew)*			
384.	13212	*Drosera erythrorhiza subsp. magna*			Y

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385.	3097	*Drosera gigantea* (Giant Sundew)			
386.	3098	*Drosera glanduligera* (Pimpernel Sundew)			
387.	3101	*Drosera heterophylla* (Swamp Rainbow)			
388.	45768	*Drosera hirsuta*			
389.	5910	*Drosera humilis*			
390.	3106	*Drosera macrantha* (Bridal Rainbow)			
391.	14286	*Drosera macrantha subsp. macrantha*			
392.	45767	*Drosera magna*			
393.	3109	*Drosera menziesii* (Pink Rainbow)			
394.	3110	*Drosera microphylla* (Golden Rainbow)			
395.	15710	*Drosera miniata* (Orange Sundew)			
396.	3118	*Drosera pallida* (Pale Rainbow)			
397.	3119	*Drosera parvula* (Small Sundew)			
398.	29178	*Drosera porrecta*			
399.	13185	*Drosera spilos*			
400.	5915	*Drosera thysanosepala* (Fringed Rainbow)			
401.	16666	*Dryandra armata var. armata*			Y
402.	16676	*Dryandra lindleyana subsp. media*			Y
403.	1066	*Eodeiocolea monostachya*			
404.	349	*Ehrharta longiflora* (Annual Veldt Grass)	Y		
405.	822	*Eleocharis acuta* (Common Spikerush)			
406.	1643	*Elythranthera brunonis* (Purple Enamel Orchid)			
407.	1644	*Elythranthera emarginata* (Pink Enamel Orchid)			
408.	2089	*Embingia calceoliflora*			
409.	13949	*Eremaea asterocarpa*			
410.	13950	*Eremaea asterocarpa subsp. asterocarpa*			
411.	14097	*Eremaea asterocarpa subsp. brachyclada*			
412.	13952	*Eremaea asterocarpa subsp. histoclada*			
413.	5537	*Eremaea beaufortioides*			
414.	14088	*Eremaea beaufortioides var. beaufortioides*			
415.	14089	*Eremaea beaufortioides var. lachnosanthe*			
416.	13955	*Eremaea ectadioclada*			
417.	14103	*Eremaea pauciflora var. calyptra*			
418.		*Eremaea sp.*			
419.	5543	*Eremaea violacea* (Violet Eremaea)			
420.	17459	*Eremaea violacea subsp. raphiophylla*			
421.	13963	*Eremaea x codonocarpa*			
422.	13966	*Eremaea x phoenicea*			
423.	17175	*Eremophila glabra subsp. albicans*			
424.	45263	*Ericomyrtus sp. Mt Lesueur (E.A. Griffin 2325)*			
425.	12740	*Erymophyllum tenellum*			
426.	6219	*Eryngium pinnatifidum* (Blue Devils)			
427.	15446	*Eryngium pinnatifidum subsp. pinnatifidum*			
428.		*Eryngium sp.*			
429.	5645	*Eucalyptus accedens* (Powderbark Wandoo)			
430.		*Eucalyptus accedens x arachnaea*			
431.	5678	*Eucalyptus calophylla* (Marri)			
432.		*Eucalyptus camaldulensis / rudis*			
433.		*Eucalyptus camaldulensis subsp. arida x rudis subsp. rudis*			Y
434.	35345	*Eucalyptus camaldulensis subsp. obtusa* (Blunt-budded River Red Gum)			
435.		*Eucalyptus camaldulensis subsp. obtusa / rudis*			
436.	15684	*Eucalyptus conveniens*			
437.	5628	*Eucalyptus drummondii* (Drummond's Gum)			
438.	5635	*Eucalyptus erythrocorys* (Illyarrie)			
439.	5658	*Eucalyptus gittinsii* (Northern Sandplain Mallee)			
440.	15282	*Eucalyptus gittinsii subsp. illucida*			
441.		*Eucalyptus hybrid*			
442.	5690	*Eucalyptus lane-poolei* (Salmon White Gum)			
443.	13547	*Eucalyptus marginata subsp. marginata* (Jarrah)			
444.	5722	*Eucalyptus obtusiflora* (Dongara Mallee)			
445.	19815	*Eucalyptus obtusiflora subsp. dongarraensis*			
446.	12866	*Eucalyptus pluricaulis subsp. pluricaulis*			
447.	5763	*Eucalyptus rudis* (Flooded Gum, Kulurda)			
448.	5790	*Eucalyptus todtiana* (Coastal Blackbutt)			
449.	12905	*Eucalyptus wandoo subsp. pulverea*			
450.	12906	*Eucalyptus wandoo subsp. wandoo*			
451.	10785	*Exocarpos sparteus* (Broom Ballart, Djuk)			
452.	32488	*Fissidens curvatus var. curvatus*			
453.	32387	*Fissidens megalotis*			
454.	32480	*Fissidens taylorii var. taylorii*			

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455.	2089	Fumaria capreolata (Whiteflower Fumitory)	Y		
456.	32370	Funaria hygrometrica			
457.	901	Gahnia australis			
458.	907	Gahnia trifida (Coast Saw-sedge)			
459.	7323	Galium murale (Small Goosegrass)	Y		
460.	20515	Gastrolobium axillare			
461.	20475	Gastrolobium capitatum			
462.	20473	Gastrolobium ebracteolatum			
463.	3906	Gastrolobium ilicifolium			
464.	20483	Gastrolobium linearifolium			
465.	20482	Gastrolobium nervosum			
466.	3910	Gastrolobium obovatum (Boat-leaved Poison)			
467.	3912	Gastrolobium oxylobioides (Champion Bay Poison)			
468.	3915	Gastrolobium plicatum			
469.	3916	Gastrolobium polystachyum (Horned Poison)			
470.	3924	Gastrolobium spinosum (Prickly Poison)			
471.	16311	Gazania linearis	Y		
472.	15404	Georgeantha hexandra			
473.	6143	Glischrocaryon aureum (Common Popflower)			
474.	3945	Gompholobium aristatum			
475.	3950	Gompholobium knightianum			
476.	3951	Gompholobium marginatum			
477.	3955	Gompholobium preissii			
478.		Gompholobium sp.			
479.	3957	Gompholobium tomentosum (Hairy Yellow Pea)			
480.	6169	Gonocarpus nodulosus			
481.	7495	Goodenia berardiana			
482.	29362	Goodenia coerulea			
483.	7513	Goodenia hassallii			
484.	19286	Goodenia pulchella subsp. Coastal Plain A (M. Hislop 534)			
485.	1966	Grevillea argyrophylla (Silvery-leaved Grevillea)			
486.	15783	Grevillea biformis subsp. biformis			
487.	2001	Grevillea eriostachya (Flame Grevillea, Kaliny-kalinye)			
488.	15835	Grevillea preissii subsp. glabrilimba			
489.	14420	Grevillea synapheae subsp. pachyphylla			
490.	2115	Grevillea umbellulata			
491.	19231	Grevillea uncinulata subsp. Coomallo (S.J. Patrick 719)			
492.	5011	Guichenotia ledifolia			
493.	5012	Guichenotia macrantha (Large-flowered Guichenotia)			
494.	5014	Guichenotia sarotes			
495.	2783	Gyrostemon racemiger			
496.	1464	Haemodorum brevisepalum			
497.	1465	Haemodorum discolor			
498.	1470	Haemodorum paniculatum (Mardja)			
499.	1472	Haemodorum simplex			
500.	1473	Haemodorum simulans			
501.	1475	Haemodorum spicatum (Mardja)			
502.	1476	Haemodorum venosum			
503.	17670	Hakea anadenia			
504.	2131	Hakea auriculata			
505.	12225	Hakea brownii			
506.	2143	Hakea conchifolia (Shell-leaved Hakea)			
507.	2146	Hakea costata (Ribbed Hakea)			
508.	16906	Hakea eneabba			
509.	2155	Hakea erinacea (Hedge-hog Hakea)			
510.	2161	Hakea flabellifolia (Fan-leaved Hakea)			
511.	2166	Hakea incrassata (Marble Hakea)			
512.	2175	Hakea lissocarpha (Honey Bush)			
513.	2179	Hakea marginata			
514.	45335	Hakea neospathulata			
515.	2197	Hakea prostrata (Harsh Hakea)			
516.	2203	Hakea ruscifolia (Candle Hakea)			
517.	2206	Hakea stenocarpa (Narrow-fruited Hakea)			
518.	2214	Hakea trifurcata (Two-leaf Hakea)			
519.	2216	Hakea varia (Variable-leaved Hakea)			
520.	3961	Hardenbergia comptoniana (Native Wisteria)			
521.	5027	Helichrysum macranthum			Y
522.	6838	Hemiandra linearis (Speckled Snakebush)			
523.	6839	Hemiandra pungens (Snakebush)			
524.	6840	Hemiandra rubriflora			

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525.	38320	*Hemiandra* sp. Jurien (B.J. Conn & M.E. Turner BJC 3885)			
526.	33766	*Hemigenia apressa*			
527.	5849	*Hemigenia dielsiana*			
528.	5856	*Hemigenia incana* (Silky Hemigenia)			
529.	5871	*Hemigenia sericea* (Silky Hemigenia)			
530.	41020	*Hemiphora bartlingii* (Woolly Dragon)			
531.	5105	*Hibbertia acerosa* (Needle Leaved Guinea Flower)			
532.	5112	*Hibbertia aurea*			
533.	5116	*Hibbertia crassifolia*			
534.	20046	*Hibbertia hibbertioides var. hibbertioides*			
535.	5134	*Hibbertia huegelii*			
536.	5135	*Hibbertia hypericoides* (Yellow Buttercups)			
537.	45634	*Hibbertia hypericoides subsp. hypericoides*			
538.	45633	*Hibbertia hypericoides subsp. septentrionalis*			
539.	35620	*Hibbertia leucocrossa*			
540.		*Hibbertia montana / ovata*			
541.	5148	*Hibbertia mylnei*			
542.	5157	*Hibbertia polystachya*			
543.	5162	*Hibbertia racemosa* (Stalked Guinea Flower)			
544.	44609	*Hibbertia robur*			
545.	43280	*Hibbertia sericosepala*			
546.		*Hibbertia* sp.			
547.	5171	*Hibbertia spicata*			
548.	11481	*Hibbertia spicata subsp. spicata*			
549.	45696	*Hibbertia squamosa*			
550.	45381	*Hibbertia striata*			
551.	5173	*Hibbertia subvaginata*			
552.	4927	*Hibiscus drummondii* (Drummond's Hibiscus)			
553.		*Hibiscus* sp.			
554.	5222	*Homalocalyx homalocarpum*			
555.	3966	*Hovea pungens* (Devil's Pins, Puyenak)			
556.		*Hovea* sp.			
557.	3967	*Hovea stricta*			
558.	12741	*Hyalosperma cotula*			
559.	5216	*Hybanthus calycinus* (Wild Violet)			
560.	5221	*Hybanthus floribundus*			
561.	15563	*Hybanthus floribundus subsp. Hill River (E.M. Bennett 2252)*			
562.	5226	*Hydrocotyle callicarpa* (Small Pennywort)			
563.	5817	*Hypocalymma angustifolium* (White Myrtle, Kudjid)			
564.	35070	*Hypocalymma angustifolium subsp. Swan Coastal Plain (G.J. Keighery 16777)*			
565.	20044	*Hypocalymma hirsutum*			
566.	5829	*Hypocalymma xanthopetalum*			
567.	5086	*Hypochaeris glabra* (Smooth Catsear)	Y		
568.	9830	*Ipomoea indica* (Morning Glory)	Y		
569.	20080	*Isolepis cernua var. setiformis*			
570.	912	*Isolepis cyperoides*			
571.	917	*Isolepis marginata* (Coarse Club-rush)			
572.	2219	*Isopogon adenanthoides* (Spider Coneflower)			
573.	2221	*Isopogon asper*			
574.	2229	*Isopogon dubius* (Pincushion Coneflower)			
575.	15873	*Isopogon inconspicuus*			
576.	2232	*Isopogon knarrs*			
577.	2237	*Isopogon sphaerocephalus* (Drumstick Isopogon)			
578.	2239	*Isopogon trilens* (Three-toothed Coneflower)			
579.	7386	*Isotoma hypocrateriformis* (Woodbridge Poison)			
580.	3982	*Isotropis cuneifolia* (Granny Bonnets)			
581.	19700	*Isotropis cuneifolia subsp. cuneifolia*			
582.	3985	*Jacksonia angulata*			
583.	14783	*Jacksonia calcicola*			
584.	4005	*Jacksonia condensata*			
585.	4010	*Jacksonia floribunda* (Holy Pea)			
586.	4015	*Jacksonia hakeoides*			
587.	4018	*Jacksonia lemannii*			
588.	14778	*Jacksonia nutans*			
589.	4025	*Jacksonia restioides*			
590.	4029	*Jacksonia sternbergiana* (Stinkwood, Kapur)			
591.	1285	*Johnsonia pubescens* (Pipe Lily)			
592.	19632	*Johnsonia pubescens subsp. pubescens*			
593.	11922	*Juncus kraussii subsp. australiensis*			
594.	1185	*Juncus pallidus* (Pale Rush)			

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895.	4044	*Kennedia prostrata (Scarlet Runner)*			
896.	5835	*Kunzea micrantha*			
897.	3664	*Lachnaea cassioides*			
898.	3669	*Lachnaea punctata (Lance-leaved Cassia)*			
899.	19965	*Lachnagrostis plebeia*			
900.	15585	*Lagenophora huegelii*			
901.	15625	*Lamberta multiflora var. multiflora*			
902.	5031	*Leiopetalum drummondii*			
903.	4869	*Lawrencia squamata*			
904.	1305	*Laxmannia ornithella*			
905.	11679	*Laxmannia sessiliflora subsp. drummondii*			
906.	7585	*Lechenaultia biloba (Blue Lechenaultia)*			
907.	7574	*Lechenaultia floribunda (Free-flowering Lechenaultia)*			
908.	7577	*Lechenaultia hirsuta (Hairy Lechenaultia)*			
909.	7580	*Lechenaultia linarioides (Yellow Lechenaultia)*			
910.	7586	*Lechenaultia stenosepala (Narrow-sepaled Lechenaultia)*			
911.	1075	*Lepidobolus preissianus*			
912.	42741	*Lepidosperma apricola*			
913.	929	*Lepidosperma carphoides (Black Rapier Sedge)*			
914.	937	*Lepidosperma longitudinale (Pithy Sword-sedge)*			
915.		*Lepidosperma sp.*			
916.	945	*Lepidosperma squamatum*			
917.	947	*Lepidosperma tenue*			
918.	1077	*Leptocarpus canus (Hoary Twine-rush)*			
919.	1078	*Leptocarpus coangustatus*			
920.	2344	*Leptomeria empetriformis*			
921.	2352	*Leptomeria preissiana*			
922.	5853	*Leptospermum oligandrum*			
923.	5857	*Leptospermum spinescens*			
924.	6374	*Leucopogon conostephioides*			
925.	6379	*Leucopogon crassiflorus*			
926.	6420	*Leucopogon obtriatis*			
927.	6430	*Leucopogon pleiolotus*			
928.	6436	*Leucopogon propinquus*			
929.		*Leucopogon sp.*			
930.	34182	*Leucopogon sp. Cockleshell Gully (J.M. Powell 1749)*			
931.	39501	*Leucopogon sp. Coomalbi (R.J. Cranfield 1457)*			
932.	34186	*Leucopogon sp. short style (S. Barrett 1378)*			
933.	45184	*Leucopogon stenophyllus*			
934.	39820	*Leventhoakia murfetii*			
935.	7672	*Leventhoakia octomaculata (Eight-spotted Stylewort)*			
936.	7400	*Lobelia alata (Angled Lobelia)*			
937.	9289	*Lobelia anceps (Angled Lobelia)*			
938.	7403	*Lobelia heterophylla (Wing-seeded Lobelia)*			
939.	7407	*Lobelia rhytidosperma (Wrinkled-seeded Lobelia)*			
940.	1223	*Lomandra caespitosa (Tufted Mat Rush)*			
941.	1227	*Lomandra hastilis*			
942.	1228	*Lomandra hermaphrodita*			
943.	1239	*Lomandra preissii*			
944.	1243	*Lomandra sericea (Silky Mat Rush)*			
945.	1246	*Lomandra suaveolens*			
946.	1097	*Lyginia barbata*			
947.	15049	*Lyginia imberbis*			
948.		*Lyginia sp.*			
949.	38375	*Lysimachia arvensis (Pimpernel)*	Y		
950.	34738	*Lysinema pentapetalum*			
951.	2839	*Macarthuria australis*			
952.	1477	*Macropidia fuliginosa (Black Kangaroo Paw)*			
953.	15119	*Macrozamia fraseri*			
954.	85	*Macrozamia riedlei (Zamia, Djiridji)*			
955.	19421	*Mahanthus brevior (Pointed Mahanthus)*			
956.	17636	*Mahanthus coeruleopunctatus (Blue-spotted Mahanthus)*			
957.	37580	*Melaleuca acutifolia*			
958.	17982	*Melaleuca cardii*			
959.	19387	*Melaleuca clavifolia*			
960.	5883	*Melaleuca concreta*			
961.	15125	*Melaleuca delta*			
962.	19652	*Melaleuca dichroma*			
963.	13273	*Melaleuca incana subsp. incana*			
964.	5926	*Melaleuca lateritia (Robin Redbreast Bush)*			

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NatureMap

	Name ID	Species Name	Naturalised	Conservation Code	Endemic To Query Area
665.	5930	*Melaleuca leiopyxis*			
666.	15112	*Melaleuca leucopoma*			
667.	15435	*Melaleuca longistaminea*			
668.	41120	*Melaleuca marginata*			
669.	5936	*Melaleuca megacephala*			
670.		*Melaleuca megacephala x tricophylla*			Y
671.	5949	*Melaleuca platycalyx*			
672.	5955	*Melaleuca radula (Graceful Honeymyrtle)*			
673.	5959	*Melaleuca rhaphiophylla (Swamp Paperbark)*			
674.	19385	*Melaleuca ryanii*			
675.		*Melaleuca sp.*			
676.	15595	*Melaleuca systena*			
677.	15278	*Melaleuca tinkei*			
678.	5983	*Melaleuca trichophylla*			
679.	5986	*Melaleuca urceolaris*			
680.		*Melaleuca urceolaris x zonalis*			
681.	19611	*Melaleuca zonalis*			
682.	963	*Mesomelaena graciliceps*			
683.	15496	*Microcorys sp. Coomallo (L. Haegi 2877)*			
684.	485	*Microlaena stipoides (Weeping Grass)*			
685.	1657	*Microtis alba (White Mignonette Orchid)*			
686.	15419	*Microtis media subsp. media*			
687.	5105	*Mitella myosotidifolia*			
688.	14344	*Mitella tenuifolia var. tenuifolia (Soft Mitella)*			
689.	4100	*Mirbelia spinosa*			
690.	4104	*Mirbelia trichocalyx*			
691.	7410	*Monopsis debilis*	Y		
692.	4662	*Monotaxis grandiflora (Diamond of the Desert)*			
693.	19585	*Monotaxis grandiflora var. grandiflora*			
694.	2412	*Muehlenbeckia adpressa (Climbing Lignum)*			
695.	2415	*Muehlenbeckia polybotrya*			
696.	7289	*Myoporum caprariodes (Slender Myoporum)*			
697.	14187	*Myriocephalus occidentalis*			
698.	492	*Neurachne alopecuroidea (Foxtail Mulga Grass)*			
699.	2401	*Nuytsia floribunda (Christmas Tree, Mudja)*			
700.	2365	*Olax benthamiana*			
701.		*Olax latifolia*			Y
702.	2367	*Olax scalariformis*			
703.	32716	*Olearia lehmanniana*			
704.	5143	*Olearia paucidentata (Autumn Scrub Daisy)*			
705.	5149	*Olearia rudis (Rough Coleybush)*			
706.	42024	*Olearia sp. Kennedy Range (G. Byrne 65)*			
707.	15255	*Opercularia vagrata (Dog Weed)*			
708.	45255	*Orianthera campanulata*			
709.	45254	*Orianthera spermacoces*			
710.	7122	*Orobanche minor (Lesser Broomrape)*	Y		
711.	11749	*Orthrosanthus laxus var. laxus (Morning Iris)*			
712.	30375	*Oxalis exilis*			
713.	4395	*Oxalis perennans*			
714.	1762	*Parietaria debilis (Pellitory)*			
715.	627	*Paspalum dilatatum*	Y		
716.	1560	*Patersonia occidentalis (Purple Flag, Koma)*			
717.	30476	*Patersonia occidentalis var. latifolia*			
718.	43764	*Paurida glabella var. leptantha*			
719.	43760	*Paurida occidentalis*			
720.	43761	*Paurida occidentalis var. occidentalis*			
721.	4343	*Pelargonium capitatum (Rose Pelargonium)*	Y		
722.	40424	*Pentameris airoides subsp. airoides*	Y		
723.	2268	*Persoonia comata*			
724.	2272	*Persoonia ruffiora*			
725.	2286	*Petrophile brevifolia*			
726.		*Petrophile brevifolia x linearis*			Y
727.	2288	*Petrophile chrysantha*			
728.	2289	*Petrophile linearis (Pixie Mops)*			
729.	2301	*Petrophile macrostachya*			
730.	2306	*Petrophile rigida*			
731.	2305	*Petrophile semimuda*			
732.	2312	*Petrophile shuttleworthiana*			
733.	19525	*Petrorhagia dubia*	Y		
734.	20480	*Pheladenia deformis*			

NatureMap
Mapping Western Australia's Biodiversity

	Name ID	Species Name	Naturalised	Conservation Code	Endemic To Query Area
735.	15535	Philotheca pinoides			
736.	15529	Philotheca spicata (Pepper and Salt)			
737.	1173	Philydrella pygmaea (Butterfly Flowers)			
738.	1478	Phlebocarya ciliata			
739.	1479	Phlebocarya filifolia			
740.	15825	Phyllangium divergens			
741.		Phymatocarpus sp.			
742.	8009	Pileanthus filifolius (Summer Coppercups)			
743.	5231	Pimelea angustifolia (Narrow-leaved Pimelea)			
744.	5232	Pimelea argentea (Silvery Leaved Pimelea)			
745.	5244	Pimelea floribunda			
746.	11402	Pimelea imbricata var. piligera			
747.	5254	Pimelea leucantha			
748.	12041	Pimelea suaveolens subsp. suaveolens			
749.	5268	Pimelea sulphurea (Yellow Banjine)			
750.	5272	Pimelea villifera			
751.	15353	Pithocarpa pulchella var. pulchella			
752.		Pithocarpa sp.			
753.	19745	Pittosporum ligustrifolium			
754.	6255	Platysace juncea			
755.	6262	Platysace xerophila			
756.	573	Poa drummondiana (Knotted Poa)			
757.	578	Poa porphyroclados			
758.	45237	Podolepis aristata subsp. aristata			
759.	8173	Podolepis capillaris (Wiry Podolepis)			
760.	8175	Podolepis gracilis (Slender Podolepis)			
761.	8177	Podolepis lessonii			
762.	8183	Podotheca chrysantha (Yellow Podotheca)			
763.	8184	Podotheca gnaphalioides (Golden Long-heads)			
764.	29919	Polianthion wichurae			
765.	1671	Prasophyllum elatum (Tall Leek Orchid)			
766.	1672	Prasophyllum fimbria (Fringed Leek Orchid)			
767.	1680	Prasophyllum parvifolium (Autumn Leek Orchid)			
768.	1682	Prasophyllum sargentii			
769.		Pterostylis sp.			
770.	2718	Ptilotus drummondii (Narrowleaf Mulla Mulla)			
771.	2742	Ptilotus manglesii (Pom Poms, Mulamula)			
772.	4172	Pultenaea ericifolia			
773.		Pultenaea sp.			
774.	23460	Pultenaea sp. Mt Lesueur (L.A. Orthia 86)			Y
775.	41080	Quoya verbascina (Golden Bush)			
776.	32480	Racopilum cuspidigerum var. convolutaceum			
777.	2584	Rhagodia preissii			
778.		Rhodanthe corymbiflora			
779.	15035	Rhodanthe corymbosa			
780.	4689	Ricinocarpos psilocladus			
781.	1558	Romulea rosea (Guildford Grass)	Y		
782.	40425	Rytidosperma caespitosum			
783.	40426	Rytidosperma occidentale			
784.	5483	Samolus junceus			
785.	7595	Scaevola anchusifolia			
786.	7603	Scaevola canescens (Grey Scaevola)			
787.	7613	Scaevola glandulifera (Viscid Hand-flower)			
788.	7614	Scaevola globulifera			
789.	7619	Scaevola lanceolata (Long-leaved Scaevola)			
790.	7634	Scaevola phlebopetala (Velvet Fanflower)			
791.	7635	Scaevola pilosa (Hairy Fan-flower)			
792.	29356	Scaevola repens subsp. Northern Sandplains (R.J. Cranfield & P.J. Spencer 8445)			
793.	13182	Scaevola repens var. repens			
794.	13162	Scaevola thesioides subsp. thesioides			
795.	41660	Schenkia australis			
796.	17066	Schinus molle var. areira	Y		
797.	978	Schoenus brevisetis			
798.	982	Schoenus clandestinus			
799.	984	Schoenus curvifolius			
800.	1007	Schoenus pedicellatus			
801.	17614	Schoenus plumosus			
802.	1013	Schoenus sculptus (Gimlet Bog-rush)			
803.		Schoenus sp.			
804.	15184	Schoenus sp. smooth culms (K.R. Newbey 7823)			

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	Name ID	Species Name	Naturalised	Conservation Code	Endemic To Query Area
905.	1018	*Schoenus subfasciculatus*			
906.	1019	*Schoenus subflavus (Yellow Bog-rush)*			
907.	1026	*Schoenus unispiculatus*			
908.	5033	*Scholtzia involucrata (Spiked Scholtzia)*			
909.	5034	*Scholtzia laxiflora*			
910.		*Scholtzia sp.*			
911.	20379	*Scholtzia sp. Jurien (R. Cranfield & P. Spencer RJC 9443)*			
912.	20382	*Scholtzia sp. Wongondenah (M.E. & M.R. Trudgen MET 12600)*			
913.	5041	*Scholtzia umbellifera*			
914.	6	*Selaginella gracilima (Tiny Clubmoss)*			
915.	20883	*Senecio multicaulis subsp. multicaulis*			
916.	20181	*Senecio pinnatifolius*			
917.	25884	*Senecio pinnatifolius var. latilobus*			
918.		*Senecio sp.*			
919.	4980	*Sida fibrosa*			
920.	2909	*Silene gallica (French Catchfly)*	Y		
921.	5225	*Siloxerus humifusus (Procumbent Siloxerus)*			
922.	14583	*Siloxerus multiflorus*			
923.	7037	*Solanum symonii*			
924.	936	*Sonchus hydrophilus (Native Sowthistle)*			
925.	5231	*Sonchus oleraceus (Common Sowthistle)*	Y		
926.	1312	*Soweretia latifolia (Purple Tassels)*			
927.	17561	*Sphaerolobium drummondii*			
928.	4207	*Sphaerolobium medium*			
929.	4733	*Stackhousia monogyna*			
930.	9070	*Stackhousia pubescens (Downy Stackhousia)*			
931.		*Stackhousia sp.*			
932.	15065	*Stenanthemum notatum subsp. notatum*			
933.	14240	*Stenanthemum reisseki*			
934.		*Stenanthemum sp.*			
935.	12886	*Stirlingia latifolia*			
936.	2316	*Stirlingia latifolia (Blueboy)*			
937.	2319	*Stirlingia simplex (Fraser Stirlingia)*			
938.	7679	*Stylidium adpressum (Trigger-on-stilts)*			
939.	12848	*Stylidium albolilacinum*			
940.	30275	*Stylidium andrewsianum*			
941.	25831	*Stylidium araeophyllum (Slit Walker)*			
942.	30276	*Stylidium bicolor*			
943.	17187	*Stylidium burbidgeanum*			
944.	7709	*Stylidium crossocephalum (Posy Triggerplant)*			
945.	7710	*Stylidium cygnorum*			
946.	40944	*Stylidium decipiens*			
947.	7712	*Stylidium despectum (Dwarf Triggerplant)*			
948.	7713	*Stylidium dichotomum (Pins-and-needles)*			
949.	11605	*Stylidium diuroides subsp. diuroides*			
950.	12845	*Stylidium diuroides subsp. pseudoteretifolium*			
951.	7719	*Stylidium ecorne (Post Triggerplant)*			
952.	7720	*Stylidium elongatum (Tall Triggerplant)*			
953.	19251	*Stylidium eriopodum*			
954.	15420	*Stylidium flagellum*			
955.	25801	*Stylidium hesperium*			
956.	17412	*Stylidium kalbarriense*			
957.	7760	*Stylidium maitlandianum (Fountain Triggerplant)*			
958.	25837	*Stylidium purpureum (Purple Fountain Triggerplant)*			
959.	7783	*Stylidium pycnostachyum (Downy Triggerplant)*			
960.	7785	*Stylidium repens (Matted Triggerplant)*			
961.	20521	*Stylidium rigidulum*			
962.	25808	*Stylidium scandulum*			
963.	7798	*Stylidium schoenoides (Cow Kicks)*			
964.		*Stylidium sp.*			
965.	20605	*Stylidium stenosepalum*			
966.	17078	*Stylidium adustum*			
967.	3181	*Stylobasium australe*			
968.	49141	*Stypheliasp. Eneabba (N. Marchant s.n. PERTH 01291777)*			
969.	2329	*Synaphea spinulosa*			
970.	15532	*Synaphea spinulosa subsp. spinulosa*			
971.	2781	*Tetratheca cuthbertsonii (Button Creeper)*			
972.	1036	*Tetraria octandra*			
973.	35579	*Tetraria sp. Jarrah Forest (R. Davis 7397)*			
974.	4528	*Tetratheca confertifolia*			

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	Name ID	Species Name	Naturalised	Conservation Code	Endemic To Query Area
875.	4539	*Tetratheca paucifolia*			
876.	1701	*Thelymitra antennifera (Vanilla Orchid)*			
877.	1716	*Thelymitra villosa (Custard Orchid)*			
878.	5084	*Thomasia grandiflora (Large Flowered Thomasia)*			
879.	42040	*Thomasia sp. Lesueur (M. Hislop 4217)*			
880.		*Thrypticomene sp.*			
881.	1318	*Thysanotus arbuscula*			
882.	1319	*Thysanotus arenarius*			
883.	1320	*Thysanotus asper (Hairy Fringe Lily)*			
884.	1335	*Thysanotus manglesianus (Fringed Lily)*			
885.	1343	*Thysanotus patersonii*			
886.		*Thysanotus sp.*			
887.	29466	*Thysanotus sp. Twining Wheatbelt (N.H. Brittan 81.03)*			
888.	1361	*Thysanotus speciosus*			
889.	1366	*Thysanotus tetrafolius*			
890.	1357	*Thysanotus thyrsoideus*			
891.	1358	*Thysanotus triandrus*			
892.	5268	*Trachymene cyanopetala*			
893.	5280	*Trachymene ornata (Native Parsnip)*			
894.	1481	*Tribonanthes australis (Southern Tribonan)*			
895.		*Trichocline sp.*			
896.	1381	*Tricoryne elatior (Yellow Autumn Lily)*			
897.	29481	*Tricoryne sp. Ensatae (E.A. Griffin 1206)*			
898.	43400	*Triodiastarte sp. Origarup (L. Sinclair 409)*			
899.	4292	*Trifolium campestre (Hop Clover)*	Y		
900.	17763	*Trifolium campestre var. campestre (Hop Clover)*	Y		
901.	4295	*Trifolium dubium (Suckling Clover)*	Y		
902.	35276	*Triglochin longipetala*			
903.	15587	*Triglochin nana*			
904.	4737	*Triperiococcus brunonis (Winged Stackhousia)*			
905.	4839	*Tripterodendron angustifolium*			
906.	15142	*Tripterodendron filifolium subsp. filifolium*			
907.	33416	*Tripterodendron oblanceolatum subsp. oblanceolatum*			
908.	98	*Typha domingensis (Bulrush, Djandjid)*			
909.	5254	*Urospermum picroides (False Hawkbit)*	Y		
910.	35385	*Ursinia anthemoides subsp. anthemoides*	Y		
911.	7145	*Utricularia multifida*			
912.	7665	*Vellala trinervis*			
913.	7666	*Verreauxia reinwardtii (Common Verreauxia)*			
914.	12396	*Verticordia blepharophylla*			
915.	12402	*Verticordia chrysanthella*			
916.	12411	*Verticordia densiflora var. cespitosa*			
917.	15432	*Verticordia densiflora var. densiflora*			
918.	12422	*Verticordia eriocephala (Common Cauliflower)*			
919.	9083	*Verticordia grandis (Scarlet Featherflower)*			
920.	15433	*Verticordia huegelii var. huegelii*			
921.	10822	*Verticordia nobilis*			
922.	6103	*Verticordia ovalifolia*			
923.	6107	*Verticordia pennigera*			
924.	6109	*Verticordia picta (Painted Featherflower)*			
925.	4325	*Viminaria juncea (Swishbush, Kowada)*			
926.	13330	*Waitzia acuminata var. albicans*			
927.	13333	*Waitzia suaveolens var. suaveolens*			
928.	32455	*Weissia controversa*			
929.	12072	*Wurmbea dioica subsp. alba*			
930.	1401	*Wurmbea pygmaea*			
931.	1249	*Xanthorrhoea acanthostachya*			
932.	1256	*Xanthorrhoea preissii (Grass Tree, Balga)*			
933.	20658	*Xanthorrhoea sp. Lesueur (G.J. Keighery 16404)*			
934.	5287	*Xanthosia fruticulosa*			
935.	5289	*Xanthosia huegelii*			
936.	44361	*Xerochrysum macranthum*			

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

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NatureMap

Name ID	Species Name	Naturalised	Conservation Code	Endemic To Query Area

[1] For NatureMap's purposes, species flagged as endemic are those whose records are wholely contained within the search area. Note that only those records complying with the search criteria 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 search results – fauna 10 km buffer

NatureMap

NatureMap Species Report

Created By Guest user on 12/12/2019

Kingdom	Animalia
Core Datasets Only	Yes
Species Group	All Animals
Method	'By Circle'
Centre	115° 08' 39" E,30° 10' 14" S
Buffer	10km
Group By	Species Group

Species Group	Species	Records
Alga	1	1
Amphibian	10	83
Bird	114	506
Fish	3	3
Invertebrate	106	159
Mammal	12	335
Reptile	48	869
TOTAL	294	1956

	Name ID	Species Name	Naturalised	Conservation Code	†Endemic To Query Area
Alga					
1.		*Sphaerococcus sp.*			
Amphibian					
2.	25401	*Crinia pseudinsignifera (Bleating Froglet)*			
3.	25408	*Heleioporus albopunctatus (Western Spotted Frog)*			
4.	25410	*Heleioporus eyrei (Moaning Frog)*			
5.		*Heleioporus sp.*			
6.	25415	*Limnodynastes dorsalis (Western Banjo Frog)*			
7.	25378	*Litoria adelaidensis (Slender Tree Frog)*			
8.	25388	*Litoria moorei (Motorbike Frog)*			
9.	25420	*Myobatrachus gouldii (Turtle Frog)*			
10.	25426	*Neobatrachus pelobatoides (Humming Frog)*			
11.	25433	*Pseudophryne guentheri (Crawling Toadlet)*			
Bird					
12.	24559	*Acanthagenys rufogularis (Spiny-cheeked Honeyeater)*			
13.	24260	*Acanthiza apicalis (Broad-tailed Thornbill, Inland Thornbill)*			
14.	24261	*Acanthiza chrysorrhoa (Yellow-rumped Thornbill)*			
15.	24262	*Acanthiza inornata (Western Thornbill)*			
16.	24560	*Acanthorhynchus superciliosus (Western Spinebill)*			
17.	25535	*Accipiter cirrocephalus (Collared Sparrowhawk)*			
18.	25536	*Accipiter fasciatus (Brown Goshawk)*			
19.	24310	*Anas castanea (Chestnut Teal)*			
20.	24312	*Anas gracilis (Grey Teal)*			
21.	24315	*Anas rhynchotis (Australasian Shoveler)*			
22.	24316	*Anas superciliosa (Pacific Black Duck)*			
23.	24561	*Anthochaera carunculata (Red Wattlebird)*			
24.	24562	*Anthochaera lunulata (Western Little Wattlebird)*			
25.	24285	*Aquila audax (Wedge-tailed Eagle)*			
26.	41324	*Ardea modesta (great egret, white egret)*			
27.	24341	*Ardea pacifica (White-necked Heron)*			
28.	24610	*Ardeotis australis (Australian Bustard)*			
29.	25566	*Artamus cinereus (Black-faced Woodswallow)*			
30.	24356	*Artamus personatus (Masked Woodswallow)*			
31.		*Barnardius zonarius*			
32.	24319	*Biziura lobata (Musk Duck)*			
33.	25714	*Cacatua pastinator (Western Long-billed Corella)*			
34.	24723	*Cacatua pastinator subsp. butleri (Butler's Corella)*			
35.	24725	*Cacatua roseicapilla subsp. assimilis (Galah)*			
36.	25716	*Cacatua sanguinea (Little Corella)*			

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Mapping Western Australia's Biodiversity

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
37.	25598	*Cacomantis flabelliformis (Fan-tailed Cuckoo)*			
38.	42307	*Cacomantis pallidus (Pallid Cuckoo)*			
39.	24269	*Calamanthus campestris (Rufous Fieldwren)*			
40.	47899	*Calamanthus cautus (Shy Groundwren, Shy Heathwren)*			
41.	24779	*Calidris acuminata (Sharp-tailed Sandpiper)*		IA	
42.	24780	*Calidris alba (Sanderling)*		IA	
43.	24734	*Calyptorhynchus latirostris (Carnaby's Cockatoo, White-tailed Short-billed Black Cockatoo)*		T	
44.		*Calyptorhynchus sp. 'white-tailed black cockatoo'*			
45.	24321	*Chenonetta jubata (Australian Wood Duck, Wood Duck)*			
46.	47909	*Cheramoeca leucosterna (White-backed Swallow)*			
47.		*Chroicocephalus novaehollandiae*			
48.	24833	*Cinclorhamphus cruralis (Brown Songlark)*			
49.	24834	*Cinclorhamphus mathewsi (Rufous Songlark)*			
50.	24288	*Circus approximans (Swamp Harrier)*			
51.	25675	*Colluricincla harmonica (Grey Shrike-thrush)*			
52.	24613	*Colluricincla harmonica subsp. rufiventris (Grey Shrike-thrush)*			
53.	25568	*Coracina novaehollandiae (Black-faced Cuckoo-shrike)*			
54.	24416	*Corvus bennetti (Little Crow)*			
55.	25592	*Corvus coronoides (Australian Raven)*			
56.	24420	*Cracticus nigrogularis (Pied Butcherbird)*			
57.	25595	*Cracticus tibicen (Australian Magpie)*			
58.	25596	*Cracticus torquatus (Grey Butcherbird)*			
59.	30901	*Dacelo novaeguineae (Laughing Kookaburra)*	Y		
60.	25607	*Dicaeum hirundinaceum (Mistletoebird)*			
61.	24470	*Dromaius novaehollandiae (Emu)*			
62.		*Egretta novaehollandiae*			
63.	47937	*Elseyornis melanops (Black-fronted Dotterel)*			
64.		*Eolophus roseicapillus*			
65.	24652	*Eopsaltria georgiana (White-breasted Robin)*			
66.	24567	*Epthianura albifrons (White-fronted Chat)*			
67.	25621	*Falco berigora (Brown Falcon)*			
68.	25622	*Falco cenchroides (Australian Kestrel, Nankeen Kestrel)*			
69.	25530	*Gerygone fusca (Western Gerygone)*			
70.	47962	*Glyciphila melanops (Tawny-crowned Honeyeater)*			
71.	24443	*Grallina cyanoleuca (Magpie-lark)*			
72.	47965	*Hieraaetus morphnoides (Little Eagle)*			
73.	24491	*Hirundo neoxena (Welcome Swallow)*			
74.	48587	*Hydroprogne caspia (Caspian Tern)*		IA	
75.	24557	*Leipoa ocellata (Malleefowl)*		T	
76.	24581	*Lichenostomus virescens (Singing Honeyeater)*			
77.	25661	*Lichmera indistincta (Brown Honeyeater)*			
78.	25651	*Malurus lamberti (Variegated Fairy-wren)*			
79.	24544	*Malurus lamberti subsp. assimilis (Variegated Fairy-wren)*			
80.	25652	*Malurus leucopterus (White-winged Fairy-wren)*			
81.	24551	*Malurus pulcherrimus (Blue-breasted Fairy-wren)*			
82.	25654	*Malurus splendens (Splendid Fairy-wren)*			
83.	24583	*Manorina flavigula (Yellow-throated Miner)*			
84.	25663	*Melithreptus brevirostris (Brown-headed Honeyeater)*			
85.	24598	*Merops ornatus (Rainbow Bee-eater)*			
86.		*Microcarbo melanoleucos*			
87.	25693	*Microeca fascinans (Jacky Winter)*			
88.	25748	*Ninox novaeseelandiae (Boobook Owl)*			
89.	24820	*Ninox novaeseelandiae subsp. boobook (Boobook Owl)*			
90.	24407	*Ocyphaps lophotes (Crested Pigeon)*			
91.	25679	*Pachycephala pectoralis (Golden Whistler)*			
92.	24623	*Pachycephala pectoralis subsp. fuliginosa (Golden Whistler)*			
93.	25680	*Pachycephala rufiventris (Rufous Whistler)*			
94.	25681	*Pardalotus punctatus (Spotted Pardalote)*			
95.	25682	*Pardalotus striatus (Striated Pardalote)*			
96.	48060	*Petrochelidon ariel (Fairy Martin)*			
97.	48061	*Petrochelidon nigricans (Tree Martin)*			
98.	48066	*Petroica boodang (Scarlet Robin)*			
99.	24659	*Petroica goodenovii (Red-capped Robin)*			
100.	25697	*Phalacrocorax carbo (Great Cormorant)*			
101.	24667	*Phalacrocorax sulcirostris (Little Black Cormorant)*			
102.	24409	*Phaps chalcoptera (Common Bronzewing)*			
103.	48071	*Phylidonyris niger (White-cheeked Honeyeater)*			
104.	24596	*Phylidonyris novaehollandiae (New Holland Honeyeater)*			
105.	24843	*Plegadis falcinellus (Glossy Ibis)*		IA	

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	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
105.	24383	*Pluvialis squatarola (Grey Plover)*		IA	
107.	24681	*Poliocephalus poliocephalus (Hoary-headed Grebe)*			
108.	25722	*Polytelis anthopeplus (Regent Parrot)*			
109.	30854	*Polytelis anthopeplus subsp. westralis (Regent Parrot)*			
110.	34013	*Pomatostomus superciliosus subsp. ashbyi (White-browed Babbler (western wheatbelt))*			
111.	25731	*Porphyrio porphyrio (Purple Swamphen)*			
112.	24771	*Porzana fabvensis (Spotless Crake)*			
113.	24716	*Puffinus pacificus (Wedge-tailed Shearwater)*		IA	
114.	48096	*Rhipidura albiscapa (Grey Fantail)*			
115.	25614	*Rhipidura leucophrys (Willie Wagtail)*			
116.	25534	*Sericornis frontalis (White-browed Scrubwren)*			
117.	30948	*Smicrornis brevirostris (Weebill)*			
118.	25655	*Stipiturus malachurus (Southern Emu-wren)*			
119.	42310	*Sugomel niger (Black Honeyeater)*			
120.	24331	*Tadorna tadornoides (Australian Shelduck, Mountain Duck)*			
121.	48597	*Thalasseus bergii (Crested Tern)*		IA	
122.	24845	*Threskiornis spinicollis (Straw-necked Ibis)*			
123.	25549	*Todiramphus sanctus (Sacred Kingfisher)*			
124.	24806	*Tringa glareola (Wood Sandpiper)*		IA	
125.	25765	*Zosterops lateralis (Grey-breasted White-eye, Silvereye)*			
Fish					
126.		*Carcharhinus brevipinna*			
127.		*Carcharhinus obscurus*			
128.		*Negaprion sp.*			Y
Invertebrate					
129.		*Acariformes sp.*			
130.		*Aedes alboannulatus*			
131.		*Aedes sp. 4 (SAP)*			Y
132.		*Aeshnidae sp.*			
133.		*Aganippe sp.*			
134.		*Agraptocorixa eurynome*			
135.		*Alboa worooa*			
136.		*Allodessus bistrigatus*			
137.		*Alona rectangula novaezealandiae*			
138.		*Anisops hyperion*			
139.		*Anisops thienemanni*			
140.		*Anopheles annulipes s.l.*			
141.		*Antichiropus sulcatus*			
142.		*Araneae sp.*			
143.		*Archilarpiolestes pusillus*			
144.		*Australocamptus near sp. 6 (SAP)*			
145.		*Austrolestes analis*			
146.		*Austrosimulium furiosum*			
147.		*Austrotrombella sp. nov. (SAP)*			
148.		*Baetidae sp.*			
149.		*Ballarra longipalpus*			
150.		*Bassianobdella sp.*			Y
151.		*Berosus sp.*			
152.		*Bezzia sp. 2 (SAP)*			
153.		*Candonocypris novaezelandiae*			
154.		*Celinidae sp.*			
155.		*Cephalodella gibba*			
156.		*Ceratopogonidae sp.*			
157.		*Cercophonius granulosus*			
158.		*Cercophonius sulcatus*			
159.		*Chironominae sp.*			
160.		*Chironomus aff. alternans (V24) (CB)*			
161.		*Coenagrionidae sp.*			
162.		*Corduliidae sp.*			
163.		*Corixidae sp.*			
164.		*Cormocephalus novaehollandiae*			
165.		*Cormocephalus strigosus*			
166.		*Corynoneura sp. (V49) (SAP)*			
167.		*Cryptochironomus griseidorsum*			
168.		*Culex globocoxitus*			
169.		*Culicoides sp.*			
170.		*Curculionidae sp.*			
171.		*Cypretta bayliyi*			

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172.		*Dytiscidae sp.*			
173.		*Empididae sp.*			
174.		*Enchytraeidae /cs2*			
175.		*Enchytraeidae sp.*			
176.		*Ethmostigmus rubripes*			
177.		*Exocelina ater*			
178.		*Eylais sp.*			
179.		*Forcipomyia sp.*			
180.		*Geogarypus taylori*			
181.		*Gymnometriocnemus spp. (not V44 or V46)*			
182.		*Hallplidae sp.*			
183.		*Hemicordulia tau*			
184.		*Henicops dentatus*			
185.		*Heterocypris tatei*			
186.		*Hyderodes sp.*			
187.		*Hyphydrus elegans*			
188.		*Hypomegalopsalis tanisphyros*			
189.		*Isopeda leishmanni*			
190.		*Lepidoptera (non-pyralid) sp. 3 (SAP)*			
191.		*Lepidoptera sp.*			
192.		*Leptoceridae sp.*			
193.		*Lestidae sp.*			
194.		*Limbodessus inomatus*			
195.		*Limnovenus sp.*			
196.		*Mesocyclops brooksi*			
197.		*Mesostigmata sp.*			
198.		*Mesovelia sp.*			
199.		*Microvelia sp.*			
200.		*Monohelea sp. 3 (SAP)*			
201.		*Naididae (ex Tubificidae)*			
202.		*Necterosoma darwini*			
203.		*Necterosoma penicillatus*			
204.		*Notonectidae sp.*			
205.		*Oligochaeta sp.*			
206.		*Oribatida sp.*			
207.		*Orthetrum caledonicum*			
208.		*Orthocladiinae SIO3 sp. A (SAP)*			
209.		*Orthocladiinae sp.*			
210.		*Paracyclops chiltoni*			
211.		*Paramerina levidensis*			
212.		*Paranacaena littoralis*			
213.		*Parastenocarididae sp.*			
214.		*Paroster niger*			
215.		*Pescecyclops sp. 434 (Stuart's original arnaudi sensu Sars)*			
216.		*Philosciidae sp.*			
217.		*Phlebfloydia harveli*			
218.		*Platynectes aenescens*			
219.		*Platynectes decempunctatus var polygrammus*			
220.		*Procladius paludicola*			
221.		*Psychodinae sp. 2 (SAP)*			
222.		*Pyralidae sp.*			
223.		*Ravenlelia cirrata*			
224.		*Rhantus suturalis*			
225.		*Sarscypridopsis aculeata*			
226.		*Scirtidae sp.*			
227.		*Simulium ornatipes*			
228.		*Syrphidae sp.*			
229.		*Tabanidae sp.*			
230.		*Tanypodinae sp.*			
231.		*Tanytarsus fuscithorax/semibarbitarsus*			
232.		*Thienemanniella sp. (V19) (SAP)*			
233.		*ant sp.*			
234.		*pseudoscorpion sp.*			
Mammal					
235.	24041	*Felis catus (Cat)*	Y		
236.	24180	*Macroderma gigas (Ghost Bat)*		T	
237.	24223	*Mus musculus (House Mouse)*	Y		
238.	48022	*Notamacropus irma (Western Brush Wallaby)*		P4	
239.	24230	*Pseudomys albocinereus (Ash-grey Mouse)*			
240.	24243	*Rattus fuscipes (Western Bush Rat)*			

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	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
241.	24108	*Sminthopsis crassicaudata (Fat-tailed Dunnart)*			
242.	24112	*Sminthopsis granulipes (White-tailed Dunnart)*			
243.	24113	*Sminthopsis griseoventer subsp. griseoventer (Grey-bellied Dunnart)*			
244.	24167	*Tarsipes rostratus (Honey Possum, Noolbenger)*			
245.	24206	*Vespadelus regulus (Southern Forest Bat)*			
246.	24040	*Vulpes vulpes (Red Fox)*	Y		
Reptile					
247.	25241	*Antaresia stimsoni subsp. stimsoni (Stimson's Python)*			
248.	24980	*Christinus marmoratus (Marbled Gecko)*			
249.	24918	*Crenadactylus ocellatus subsp. ocellatus (Clawless Gecko)*			
250.	30893	*Cryptoblepharus buchananl*			
251.	30899	*Ctenophorus adelaidensis (Southern Heath Dragon, Western Heath Dragon)*			
252.	24881	*Ctenophorus maculatus subsp. maculatus (Spotted Military Dragon)*			
253.	25027	*Ctenotus australis*			
254.	25039	*Ctenotus fallens*			
255.	25047	*Ctenotus impar*			
256.	25065	*Ctenotus pantherinus subsp. pantherinus (Leopard Ctenotus)*			
257.	25086	*Cyclodomorphus branchialis (Gilled Slender Blue-tongue Skink)*		T	
258.	25087	*Cyclodomorphus celatus (Western Slender Blue-tongue)*			
259.	30905	*Delma concinna subsp. concinna (Javelin Legless Lizard)*			
260.	25766	*Delma fraseri (Fraser's Legless Lizard)*			
261.	24999	*Delma grayii*			
262.	25296	*Demansia psammophis subsp. reticulata (Yellow-faced Whipsnake)*			
263.	24938	*Diplodactylus ornatus*			
264.	24939	*Diplodactylus polyophthalmus*			
265.		*Diplodactylus sp.*			
266.	25251	*Echiopsis curta (Bardick)*			
267.	25100	*Egernia napoleonis*			
268.	24959	*Gehyra variegata*			
269.	25131	*Lerista distinguenda*			
270.	25133	*Lerista elegans*			
271.	25148	*Lerista lineopunctulata*			
272.	25160	*Lerista planiventralis subsp. decora*			
273.	25165	*Lerista praepedita*			
274.	25005	*Liaiis burtonis*			
275.	41413	*Liopholis multiscutata (Bull Skink)*			
276.	42414	*Lucasium alboguttatum*			
277.	25184	*Menetia greyii*			
278.	25191	*Morethia lineocellata*			
279.	25192	*Morethia obscura*			
280.	25248	*Neelaps bimaculatus (Black-naped Snake)*			
281.	25253	*Parasuta gouldii*			
282.	25007	*Pletholax gracilis subsp. gracilis (Keeled Legless Lizard)*			
283.	24907	*Pogona minor subsp. minor (Dwarf Bearded Dragon)*			
284.	25261	*Pseudechis australis (Mulga Snake)*			
285.	42416	*Pseudonaja mengdeni (Western Brown Snake)*			
286.	25008	*Pygopus lepidopodus (Common Scaly Foot)*			
287.	25271	*Ramphotyphlops australis*			
288.	25267	*Simoselaps littoralis (West Coast Banded Snake)*			
289.	24942	*Strophurus spinigerus subsp. spinigerus*			
290.	25203	*Tiliqua occipitalis (Western Bluetongue)*			
291.	25207	*Tiliqua rugosa subsp. rugosa*			
292.	24983	*Underwoodisaurus milii (Barking Gecko)*			
293.	25218	*Varanus gouldii (Bungarra or Sand Monitor)*			
294.	25526	*Varanus tristis (Racehorse Monitor)*			

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 search results – flora within Gravel Pit Reserve 35593

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19-08 Gravel Pit Reserve

Created By Scott Hitchcock on 28/10/2019

Kingdom Plantae
Core Datasets Only Yes
Method 'By Polygon'
Vertices 30° 09' 40" S,115° 08' 08" E 30° 11' 01" S,115° 09' 05" E 30° 11' 00" S,115° 08' 36" E 30° 09' 38" S,115° 07' 53" E
Group By Conservation Status

Conservation Status	Species	Records
Non-conservation taxon	35	43
Priority 2	2	2
Priority 3	2	2
TOTAL	**39**	**47**

	Name ID	Species Name	Naturalised	Conservation Code	Endemic To Query Area
Priority 2					
1.	48347	*Lasiopetalum rutilans*		P2	
2.	6432	*Leucopogon plumuliflorus*		P2	
Priority 3					
3.	23469	*Gompholobium gardnerianum*		P3	
4.	1292	*Hensmania stoniella*		P3	
Non-conservation taxon					
5.	1284	*Arnocrinum preissii*			
6.	6328	*Astroloma glaucescens*			
7.	1835	*Banksia micrantha*			
8.	5441	*Calytrix aurea*			
9.	5502	*Conothamnus trinervis*			
10.	3793	*Daviesia angulata*			
11.	17682	*Desmocladus flexuosus*			
12.	13201	*Drosera eneabba*			
13.	5543	*Eremaea violacea (Violet Eremaea)*			
14.	17459	*Eremaea violacea subsp. raphiophylla*			
15.	3957	*Gompholobium tomentosum (Hairy Yellow Pea)*			
16.	14420	*Grevillea synapheae subsp. pachyphylla*			
17.	2161	*Hakea flabellifolia (Fan-leaved Hakea)*			
18.	6840	*Hemiandra rubriflora*			
19.	41020	*Hemiphora bartlingii (Woolly Dragon)*			
20.	46534	*Hibbertia hypericoides subsp. hypericoides*			
21.	48381	*Hibbertia striata*			
22.	2232	*Isopogon linearis*			
23.	2237	*Isopogon sphaerocephalus (Drumstick Isopogon)*			
24.	15528	*Lambertia multiflora var. multiflora*			
25.	7586	*Lechenaultia stenosepala (Narrow-sepaled Leschenaultia)*			
26.	5857	*Leptospermum spinescens*			
27.	6420	*Leucopogon oldfieldii*			
28.	1477	*Macropidia fuliginosa (Black Kangaroo Paw)*			
29.	2385	*Olax benthamiana*			
30.	46254	*Orianthera spermacocea*			
31.	6262	*Platysace xerophila*			
32.	29919	*Polianthion wichurae*			
33.	7603	*Scaevola canescens (Grey Scaevola)*			
34.	9070	*Stackhousia pubescens (Downy Stackhousia)*			
35.	4528	*Tetratheca confertifolia*			
36.	29451	*Tricoryne sp. Eneabba (E.A. Griffin 1200)*			
37.	12398	*Verticordia blepharophylla*			
38.	6063	*Verticordia grandis (Scarlet Featherflower)*			
39.	20858	*Xanthorrhoea sp. Lesueur (G.J. Keighery 15404)*			

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Name ID	Species Name	Naturalised	Conservation Code	Endemic To Query Area

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Table 12: Conservation significant flora database search results

Species	Conservation Code	PMST	NM	TPFL	WAHERB
Acacia forrestiana	T (EPBC - VU, BC - VU)	•	•	•	•
Andersonia gracilis	T (EPBC EN, BC - VU)	•			
Anigozanthos viridis subsp. *terraspectans*	T (EPBC - VU, BC - VU)	•			
Banksia catoglypta	T (EPBC - VU, BC - VU)	•			•
Caladenia hoffmanii	T (EPBC EN, BC EN)	•			
Drakaea elastica	T (EPBC EN, BC - CR)	•			
Eleocharis keigheryi	T (EPBC - VU, BC - VU)	•		•	•
Eucalyptus impensa	T (EPBC EN, BC - CR)	•			
Eucalyptus johnsoniana	T (EPBC - VU, BC - VU)	•		•	
Eucalyptus lateritica	T (EPBC - VU, BC EN)	•	•	•	•
Eucalyptus leprophloia	T (EPBC EN, BC EN)	•			
Eucalyptus suberea	T (EPBC - VU, BC - VU)	•	•	•	•
Eucalyptus x *balanites*	T (EPBC EN, BC - CR)	•			
Grevillea batrachioides	T (EPBC EN, BC - CR)	•	•	•	•
Grevillea humifusa	T (EPBC EN, BC - CR)	•			•
Hakea megalosperma	T (EPBC - VU, BC - VU)	•	•	•	•
Hemiandra gardneri	T (EPBC EN, BC - CR)	•		•	•
Leucopogon obtectus	T (EPBC EN, BC EN)	•			
Paracaleana dixonii	T (EPBC EN, BC - VU)	•	•	•	•
Tetratheca nephelioides	T (EPBC EN, BC - CR)	•			
Thelymitra stellata	T (EPBC EN, BC EN)	•	•	•	•
Drosera pedicellaris	P1		•		•
Stylidium carnosum subsp. Narrow leaves (J.A. Wege 490)	P1		•		•
Acacia carens	P2		•	•	•
Acacia lasiocarpa var. *lasiocarpa* Cockleshell Gully variant (E.A. Griffin 2039)	P2		•		•
Acacia retrorsa	P2		•		•
Amanita lesueurii	P2				•
Andersonia sp. Mt Lesueur (E.A. Griffin 5536)	P2		•	•	•
Banksia fraseri var. *effusa*	P2		•		•
Beyeria similis	P2		•		•
Boronia ramosa subsp. *lesueurana*	P2		•		•
Boronia scabra subsp. *condensata*	P2				•
Cristonia biloba subsp. *pubescens*	P2				•
Dampiera sp. Jurien (G. Lullfitz s.n. 10/7/1986)	P2				•
Daviesia debilior subsp. *debilior*	P2		•	•	•
Eucalyptus abdita	P2		•		•
Goodenia xanthotricha	P2		•		•
Grevillea delta	P2		•		•
Hypocalymma sp. Gairdner Range (C.A. Gardner 9091)	P2		•		•

Species	Conservation Code	PMST	NM	TPFL	WAHERB
Hypocalymma tenuatum	P2		•	•	•
Lasiopetalum rutilans	P2		•		•
Lepyrodia curvescens	P2				•
Leucopogon plumuliflorus	P2		•	•	•
Phlebocarya pilosissima subsp. *teretifolia*	P2		•		•
Ptilotus clivicola	P2		•		•
Stenanthemum limitatum	P2				•
Stylidium diplotrichum	P2				•
Synaphea lesueurensis	P2		•		•
Tetratheca remota	P2				•
Thelymitra pulcherrima	P2		•		•
Thysanotus sp. Badgingarra (E.A. Griffin 2511)	P2		•		
Walteranthus erectus	P2				•
Acacia epacantha	P3				•
Acacia plicata	P3		•		•
Allocasuarina grevilleoides	P3		•		•
Banksia fraseri var. *crebra*	P3				•
Banksia kippistiana var. *paenepeccata*	P3				•
Calytrix ecalycata subsp. *brevis*	P3				•
Daviesia pteroclada	P3		•	•	•
Drosera prophylla	P3				•
Gompholobium gairdnerianum	P3		•	•	•
Grevillea uniformis	P3		•		•
Guichenotia alba	P3		•		•
Haemodorum loratum	P3		•	•	•
Hakea longiflora	P3		•		•
Hensmania stoniella	P3		•		•
Hypocalymma gardneri	P3		•	•	•
Isopogon drummondii	P3		•		•
Lepidobolus quadratus	P3		•		•
Patersonia argyrea	P3		•		•
Persoonia filiformis	P3		•		•
Persoonia rudis	P3		•	•	•
Stackhousia sp. Red-blotched corolla (A. Markey 911)	P3		•		•
Stylidium maritimum	P3			•	•
Stylidium nonscandens	P3		•		•
Stylidium periscelianthum	P3		•		•
Stylidium torticarpum	P3		•		•
Styphelia filifolia	P3		•		•
Tetratheca angulata	P3		•		•
Thysanotus anceps	P3		•	•	•
Thysanotus vernalis	P3		•		•

Species	Conservation Code	PMST	NM	TPFL	WAHERB
Verticordia amphigia	P3		•	•	•
Verticordia insignis subsp. *eomagis*	P3		•	•	•
Verticordia rutilastra	P3		•	•	•
Asterolasia drummondii	P4		•	•	•
Banksia chamaephyton	P4				•
Banksia elegans	P4				•
Banksia tricuspis	P4		•	•	•
Drosera occidentalis	P4		•		
Eucalyptus exilis	P4			•	•
Eucalyptus macrocarpa subsp. *elachantha*	P4		•		•
Grevillea olivacea	P4				•
Hakea neurophylla	P4		•		•
Hemiandra sp. Watheroo (S. Hancocks 4)	P4		•		•
Hypolaena robusta	P4		•		•
Stylidium aeonioides	P4		•		•
Stylidium inversiflorum	P4		•		•
Thelymitra apiculata	P4		•		•
Thysanotus glaucus	P4			•	
Xanthosia tomentosa	P4		•		•

Note: PMST = EPBC Act Protected Matters Search Tool (DotEE, 2019a; search reference PMST NUXJIB); NM = NatureMap search (DBCA, 2007-); TPFL = DBCA Threatened and Priority Flora List (search reference #46-0919FL); WAHERB = DBCA Western Australian Herbarium (search reference #46-0919FL); T = Threatened, P1 – P4 = Priority 1 to Priority 4 species, EPBC = species listed under the Commonwealth's EPBC Act, BC = species listed under the Western Australian BC Act, CR = Critically Endangered, EN = Endangered, VU = Vulnerable; orange = species or species habitat known to occur within the 10 km buffered search area, green = likely and blue = may occur within area.

Table 13: Conservation significant fauna database search results

Species	Conservation Code	EPBC	NM
Threatened Fauna			
Calidrus canutus (Red Knot)[2]	T (EPBC – EN, BC – EN)	•	
Callidrus ferruginea (Curlew Sandpiper)[2]	T (EPBC – CR, BC – CR)	•	
Calyptorhynchus latirostris (Carnaby's Black-Cockatoo)	T (EPBC – EN, BC – EN)	•	•
Cyclodomorphus branchialis (Gilled Slender Blue-tongue Skink)	T (BC – VU)		•
Dasyurus geoffroii (Chuditch)	T (EPBC – VU, BC – VU)	•	
Leipoa ocellata (Malleefowl)	T (EPBC – VU, BC – VU)	•	•
Macroderma gigas (Ghost Bat)	T (EPBC – VU, BC – VU)		•
Numenius madagascariensis (Eastern Curlew)[2]	T (EPBC – CR, BC – CR)	•	
Parantechinus apicalis (Dibbler)	T (EPBC – EN, BC – EN)	•	
Rostratula australis (Australian Painted Snipe)	T (EPBC – EN, BC – EN)	•	
Sternula nereis nereis (Australian Fairy Tern)	T (EPBC – VU, BC – VU)	•	
Migratory Fauna			
Actitis hypoleucos (Common Sandpiper)		•	
Apus pacificus (Fork-tailed Swift)		•	
Calidris acuminata (Sharp-tailed Sandpiper)		•	•
Calidris alba (Sanderling)			•
Calidris melanotos (Pectoral Sandpiper)		•	
Hydroprogne caspia (Caspian Tern)			•
Motacilla cinerea (Grey Wagtail)		•	
Pandion haliaetus (Osprey)		•	
Plegadis falcinellus (Glossy Ibis)			•
Pluvialis squatarola (Grey Plover)			•
Puffinus pacificus (Wedge-tailed Shearwater)			•
Thalasseus bergii (Crested Tern)			•
Tringa glareola (Wood Sandpiper)			•
Tringa nebularia (Common Greenshank)		•	
Priority Fauna			
Notamacropus irma (Western Brush Wallaby)	P4		•

Note: PMST = EPBC Act Protected Matters Search Tool (DotEE, 2019a; search reference PMST NUXJIB); NM = NatureMap search (DBCA, 2007-); T = Threatened, P4 = Priority 4 species, EPBC = species listed under the Commonwealth's EPBC Act, BC = species listed under the Western Australian BC Act, CR = Critically Endangered, EN = Endangered, VU = Vulnerable; [2] = Threatened and Migratory Fauna species; purple = breeding known to occur within the 10 km buffered search area, green = likely and blue = may occur within area.

APPENDIX 2: QUADRATS AND PHOTO POINTS

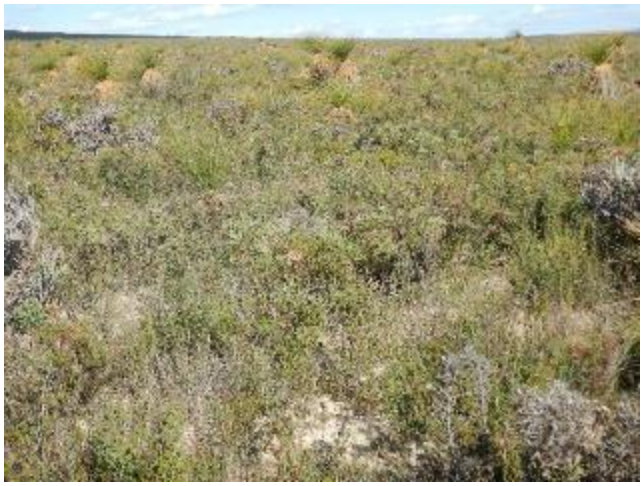
Table 14: Quadrat information and photo points

Quadrat:	GP1	Described by:	Christina Cox and Michael Pezzaniti		Date:	14/10/2019	Photo:
Location (GDA94):		MGA50	321143	mE	6660971	mN	
Habitat:		Low rolling hill gentle west facing slope (midslope)					
Soil:		White fine sand loose soil (50%)					
Rocks:		Laterite gravel (10%)					
Mapped as:		M**HL**					
Vegetation Association:		Open Low Shrubland of *Isopogon dubius* and *Banksia armata* var. *armata* with an Open Sedgeland of *Caustis dioica*, *Mesomelaena pseudostygia* with *Georgeantha hexandra* and Sparse Mid Shrubland of *Xanthorrhoea* sp. Lesueur (G.J. Keighery 16404)					
Vegetation Condition:		Excellent					
Disturbances:		Feral animals and grazing					
Fire Age:		None evident					
Species:		*Acacia acuaria, Allocasuarina microstachya, Anigozanthos humilis* subsp. *humilis*, *Astroloma glaucescens, Babingtonia grandiflora, Banksia armata* var. *armata*, *Banksia bipinnatifida* subsp. *bipinnatifida*, *Banksia dallanneyi* subsp. *dallanneyi* var. *dallanneyi*, *Banksia micrantha, Calothamnus sanguineus, Caustis dioica, Chorizema aciculare* subsp. *laxum*, *Conostylis aurea, Conostylis* sp. Indet., *Darwinia sanguinea, Daviesia incrassata* subsp. *incrassata*, *Diplolaena ferruginea, Eremaea violacea* subsp. *raphiophylla*, *Gastrolobium* ?*retusum*, *Georgeantha hexandra,* ***Haemodorum loratum*** **(P3),** *Haemodorum venosum, Hakea* ?*prostrata*, *Hakea auriculata, Hakea neospathulata, Hibbertia aurea, Isopogon dubius, Isopogon inconspicuus, Lambertia multiflora* var. *multiflora*, *Leptospermum spinescens, Melaleuca trichophylla, Mesomelaena pseudostygia, Petrophile brevifolia* subsp. *brevifolia*, *Scaevola canescens, Schoenus* aff. *pleiostemoneus* EAG 1991, *Stylidium cygnorum, Stylidium diuroides* subsp. *paucifoliatum*, *Xanthorrhoea* sp. Lesueur (G.J. Keighery 16404), ***Xanthosia tomentosa*** **(P4)**					

Quadrat:	GP2	Described by:	Christina Cox and Michael Pezzaniti		Date:	14/10/2019	Photo:
Location (GDA94):		MGA50	321103	mE	6660834	mN	
Habitat:		Low rolling hill gentle west facing slope (midslope)					
Soil:		White fine sand loose soil (50%)					
Rocks:		No rocks					
Mapped as:		M**HL**					
Vegetation Association:		Open Low Shrubland of *Isopogon dubius* and *Banksia sclerophylla* with an Open Sedgeland of *Caustis dioica*, *Mesomelaena pseudostygia* with *Georgeantha hexandra* and Sparse Mid Shrubland of *Xanthorrhoea* sp. Lesueur (G.J. Keighery 16404)					
Vegetation Condition:		Excellent					
Disturbances:		Feral animals and grazing					
Fire Age:		None evident					
Species:		*Allocasuarina humilis, Allocasuarina microstachya, Astroloma glaucescens, Babingtonia grandiflora, Banksia armata* var. *armata*, *Banksia micrantha, Banksia sclerophylla, Banksia tridentata, Calothamnus sanguineus, Calectasia narragara, Caustis dioica, Conostylis* sp. Indet., *Dampiera spicigera, Daviesia epiphyllum, Daviesia nudiflora* subsp. *nudiflora*, *Eremaea violacea* subsp. *raphiophylla*, *Eucalyptus todtiana, Gastrolobium obovatum, Georgeantha hexandra, Grevillea synapheae* subsp. *pachyphylla*, ***Haemodorum loratum*** **(P3),** *Hakea auriculata, Hakea conchifolia, Hakea flabellifolia, Hakea incrassata, Hibbertia aurea, Isopogon dubius, Isopogon inconspicuus, Mesomelaena pseudostygia, Orianthera spermacocea, Petrophile brevifolia* subsp. *brevifolia*, *Petrophile macrostachya, Pimelea sulphurea, Scaevola canescens, Schoenus* aff. *pleiostemoneus* EAG 1991, *Stylidium cygnorum, Tetraria octandra, Thysanotus patersonii, Verticordia pennigera, Xanthorrhoea* sp. Lesueur (G.J. Keighery 16404)					

Quadrat:	GP3	Described by:	Christina Cox and Michael Pezzaniti		Date:	14/10/2019	Photo:
Location (GDA94):		MGA50	321003	mE	6661078	mN	
Habitat:		Low rolling hill gentle west facing slope (midslope)					
Soil:		White fine sand loose soil (50%)					
Rocks:		Laterite gravel (5%)					
Mapped as:		M**HL**					
Vegetation Association:		Open Low Shrubland of *Allocasuarina microstachya*, *Banksia armata* var. *armata* and *Isopogon dubius* with an Open Sedgeland of *Caustis dioica* and *Mesomelaena pseudostygia* with *Georgeantha hexandra* and Isolated Shrubs of *Xanthorrhoea* sp. Lesueur (G.J. Keighery 16404)					
Vegetation Condition:		Excellent					
Disturbances:		Kangaroo scats in plot					
Fire Age:		None evident					
Species:		*Acacia auronitens*, *Allocasuarina humilis*, *Allocasuarina microstachya, Astroloma glaucescens, Banksia armata* var. *armata*, *Banksia dallanneyi* var. *dallanneyi*, *Banksia micrantha*, *Banksia shuttleworthiana*, *Calothamnus sanguineus*, *Caustis dioica*, *Chordifex sinuosus*, *Chorizema aciculare* subsp. *laxum*, *Conostylis aurea*, *Cristonia biloba* subsp. *biloba*, *Cryptandra* sp., *Daviesia epiphyllum*, *Daviesia nudiflora* subsp. *nudiflora*, *Diplolaena ferruginea*, *Georgeantha hexandra, Grevillea synapheae* subsp. *pachyphylla*, *Hakea incrassata*, *Hakea neospathulata*, *Hibbertia aurea*, *Isopogon dubius*, *Isopogon inconspicuus, Leptospermum spinescens*, *Melaleuca trichophylla*, *Mesomelaena pseudostygia*, *Orianthera spermacocea, Petrophile brevifolia* subsp. *brevifolia*, *Pimelea sulphurea*, *Platysace xerophila*, *Scaevola canescens*, *Schoenus* aff. *pleiostemoneus* EAG 1991, *Stylidium diuroides* subsp. *diuroides*, ***Synaphea lesueurensis* (P2)**, *Verticordia pennigera*, *Xanthorrhoea* sp. Lesueur (G.J. Keighery 16404)					

Photo points



Note: photograph on left = northwest photo point location shown on **Map 5 (Section 11)**, photograph on right = central/eastern photo point location shown on **Map 5 (Section 11)**.

APPENDIX 3: SPECIES LIST

Table 15: Species list

Family	Taxa	FlFr	Quadrat	OppColl
Apiaceae	*Platysace xerophila*			•
Apiaceae	***Xanthosia tomentosa* (P4)**	Fl	•	•
Asparagaceae	*Laxmannia grandiflora* subsp. *grandiflora*	Fl		•
Asparagaceae	*Lomandra sericea*	Fl		•
Asparagaceae	*Thysanotus patersonii*	FlFr	•	•
Asteraceae	*Podotheca angustifolia*	Fl		•
Casuarinaceae	*Allocasuarina humilis*	Fl	•	
Casuarinaceae	*Allocasuarina microstachya*	Fl	•	•
Colchicaceae	*Burchardia congesta*	Fr		•
Cupressaceae	*Callitris acuminata*			•
Cyperaceae	*Caustis dioica*		•	•
Cyperaceae	*Mesomelaena pseudostygia*	FlFr	•	•
Cyperaceae	*Mesomelaena tetragona*	Fl		•
Cyperaceae	*Schoenus* aff. *pleiostemoneus* EAG 1991	Fr	•	•
Cyperaceae	*Tetraria octandra*	Fr	•	•
Dasypogonaceae	*Calectasia narragara*	Fl	•	•
Dasypogonaceae	*Dasypogon obliquifolius*			•
Dilleniaceae	*Hibbertia aurea*		•	•
Dilleniaceae	*Hibbertia striata*	Fl		•
Ecdeiocoleaceae	*Georgeantha hexandra*	FlFr	•	•
Elaeocarpaceae	*Tetratheca confertifolia*	Fl		•
Ericaceae	*Andersonia heterophylla*	Fl		•
Ericaceae	*Astroloma glaucescens*		•	•
Ericaceae	*Lysinema pentapetalum*	Fl		•
Fabaceae	*Acacia acuaria*		•	
Fabaceae	*Acacia auronitens*	Fl	•	•
Fabaceae	*Acacia stenoptera*			•
Fabaceae	***Bossiaea* ?*ornata* (potential REx)**			•
Fabaceae	*Chorizema aciculare* subsp. *laxum*	Fl	•	•
Fabaceae	*Cristonia biloba* subsp. *biloba*		•	
Fabaceae	*Daviesia decurrens*			•
Fabaceae	*Daviesia epiphyllum*		•	•
Fabaceae	*Daviesia incrassata* subsp. *incrassata*	Fr	•	•
Fabaceae	*Daviesia nudiflora* subsp. *nudiflora*		•	•
Fabaceae	***Gastrolobium* ?*retusum* (potential REx)**		•	
Fabaceae	*Gastrolobium obovatum*		•	
Fabaceae	*Gompholobium knightianum*	Fl		•
Fabaceae	*Jacksonia floribunda*			•
Fabaceae	*Jacksonia restioides*	Fl		•
Goodeniaceae	*Dampiera spicigera*	Fl	•	•
Goodeniaceae	*Goodenia coerulea*	Fl		•
Goodeniaceae	*Scaevola canescens*		•	•
Haemodoraceae	*Anigozanthos humilis* subsp. *humilis*	Fl	•	•
Haemodoraceae	*Conostylis aurea*	Fl	•	•
Haemodoraceae	*Conostylis* sp. Indet		•	•
Haemodoraceae	***Haemodorum loratum* (P3)**	Fl	•	•
Haemodoraceae	*Haemodorum* sp. Indet.			•

Family	Taxa	FlFr	Quadrat	OppColl
Haemodoraceae	*Haemodorum venosum*	Fl	•	•
Hemerocallidaceae	*Tricoryne elatior*	Fl		•
Iridaceae	***Patersonia argyrea* (P3) (REn)**	Fl		•
Iridaceae	*Patersonia occidentalis* var. *occidentalis*	Fl		•
Loganiaceae	*Orianthera spermacocea*	Fl	•	•
Malvaceae	*Lasiopetalum drummondii*	Fl		•
Myrtaceae	*Babingtonia grandiflora*	Fl	•	•
Myrtaceae	*Calothamnus sanguineus*	FlFr		•
Myrtaceae	***Darwinia sanguinea* (REn)**	Fl	•	
Myrtaceae	*Eremaea ectadioclada*	Fl		•
Myrtaceae	***Eremaea violacea* subsp. *raphiophylla* (REn)**	Fl	•	•
Myrtaceae	*Eucalyptus todtiana*		•	•
Myrtaceae	*Leptospermum spinescens*	Fr	•	
Myrtaceae	*Melaleuca trichophylla*	FlFr	•	•
Myrtaceae	*Verticordia nobilis*	Fl		•
Myrtaceae	*Verticordia ovalifolia*	Fl		•
Myrtaceae	*Verticordia pennigera*	Fl	•	•
Myrtaceae	***Verticordia rutilastra* (P3)**	Fl		•
Poaceae	*Neurachne alopecuroidea*	Fl		•
Poaceae	POACEAE sp. Indet.			•
Polygalaceae	*Comesperma acerosum*	Fl		•
Proteaceae	*Banksia armata* var. *armata*	FlFr	•	•
Proteaceae	***Banksia bipinnatifida* subsp. *bipinnatifida* (REx)**		•	
Proteaceae	*Banksia bipinnatifida* subsp. *multifida*	Fl		•
Proteaceae	*Banksia dallanneyi* subsp. *media*	Fr		•
Proteaceae	*Banksia dallanneyi* subsp. *dallanneyi* var. *dallanneyi*	FlFr	•	•
Proteaceae	*Banksia micrantha*		•	
Proteaceae	*Banksia sclerophylla*	Fl	•	•
Proteaceae	*Banksia shuttleworthiana*	Fl		•
Proteaceae	***Banksia tridentata* (REn)**	FlFr	•	•
Proteaceae	*Conospermum boreale* subsp. *ascendens*	Fl		•
Proteaceae	*Grevillea synapheae* subsp. *pachyphylla*	Fr	•	•
Proteaceae	*Hakea auriculata*	Fl	•	•
Proteaceae	*Hakea conchifolia*	FlFr	•	•
Proteaceae	*Hakea flabellifolia*		•	•
Proteaceae	*Hakea incrassata*		•	
Proteaceae	*Hakea neospathulata*		•	•
Proteaceae	*Hakea prostrata*	Fr		•
Proteaceae	*Hakea ?prostrata*		•	
Proteaceae	*Hakea stenocarpa*			•
Proteaceae	*Isopogon dubius*	Fl	•	•
Proteaceae	***Isopogon inconspicuus* (REn)**	Fl	•	•
Proteaceae	*Lambertia multiflora* var. *multiflora*	Fl	•	•
Proteaceae	***Petrophile brevifolia* subsp. *brevifolia* (REx)**	FlFr	•	•
Proteaceae	*Petrophile macrostachya*	Fl	•	•
Proteaceae	***Synaphea lesueurensis* (P2, REn)**	Fr		•
Proteaceae	*Synaphea* sp. Indet.			•
Rhamnaceae	*Cryptandra* sp.		•	
Restionaceae	*Chordifex sinuosus*	Fr	•	•
Rutaceae	*Diplolaena ferruginea*		•	•

Family	Taxa	FlFr	Quadrat	OppColl
Rutaceae	*Philotheca spicata*	Fl		•
Santalaceae	*Leptomeria empetriformis*	Fr		•
Stylidiaceae	*Stylidium crossocephalum*	Fl		•
Stylidiaceae	*Stylidium cygnorum*	Fl	•	•
Stylidiaceae	*Stylidium diuroides* subsp. *paucifoliatum*	Fl	•	•
Stylidiaceae	*Stylidium maitlandianum*	Fl		•
Stylidiaceae	*Stylidium piliferum*	Fl		•
Thymelaeaceae	*Pimelea sulphurea*	Fl	•	•
Xanthorrhoeaceae	*Xanthorrhoea* sp. Lesueur (G.J. Keighery 16404)	Fl	•	

Note: P2 - P4 = Priority 2 to Priority 4 species, REn = regional endemic, REx = range extension, sp. = species, subsp. = subspecies, var. = variety, sp. Indet = species indeterminate, Fl = flowering, Fr = fruiting, OppColl = opportunistic collection.

APPENDIX 4: CONSERVATION SIGNIFICANT FLORA PHOTOGRAPHS

Table 16: Priority flora species recorded in the Survey Area

***Synaphea lesueurensis* (Priority 2)**	
	
***Haemodorum loratum* (Priority 3)**	
	
***Patersonia argyrea* (Priority 3)**	
	

Verticordia rutilastra (Priority 3)	
	
***Xanthosia tomentosa* (Priority 4)**	
	

APPENDIX 5: CONSERVATION SIGNIFICANCE FLORA, FAUNA AND ECOLOGICAL COMMUNITIES

Threatened Flora

Some flora species can be protected by Australian Government legislation (*Environment Protection and Biodiversity Conservation Act 1999*, EPBC Act) or by WA legislation (*Biodiversity Conservation Act 2016*, BC Act) (DotEE, 2019b; GoWA, 2016). Species specially protected by these acts are referred to as threatened species and can be listed as critically endangered, endangered or vulnerable.

On 1 January 2019, the BC Act and *Biodiversity Conservation Regulations 2018* replaced both the *Wildlife Conservation Act 1950* and the *Sandalwood Act 1929* and their associated regulations (DBCA, 2019c; GoWA, 2016 and 2018). The new BC Act and regulations provide greater protection for threatened species and ecological communities.

Priority Flora

Possible threatened species that do not meet survey criteria, or are otherwise data deficient, are added to the Priority Flora List under Priorities (P) 1, 2, 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. 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 list for other than taxonomic reasons, are placed in Priority 4 and require regular monitoring (DBCA, 2019b).

Threatened Fauna

Threatened Fauna are those listed as such under the EPBC Act or BC Act and can be listed as critically endangered, endangered or vulnerable.

Migratory Fauna

Migratory Fauna are those listed as such under the EPBC Act or the BC Act.

Specially Protected Fauna

Specially Protected Fauna are those listed as such under the BC Act and may be either other specially protected fauna (OS) or conservation dependent fauna (CD).

Priority Fauna

Possible threatened species that do not meet survey criteria, or are otherwise data deficient, are added to the Priority Fauna List under Priorities (P) 1, 2, 3. These three categories are ranked in order of priority for survey and evaluation of conservation status so that consideration can be given to their declaration as threatened fauna. 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 list for other than taxonomic reasons, are placed in Priority 4. These species require regular monitoring (DBCA, 2019b).

Threatened Ecological Communities

Some ecological communities are protected by Australian Government legislation (the EPBC Act) based on the perceived levels of threat to the community or species population at a national level. They are listed as threatened ecological communities – TECs – and can be listed as Critically Endangered, Endangered or Vulnerable (DotEE, 2019b). The communities are listed by state on the DotEE website (DotEE, 2019c; DotEE, 2019d).

In WA the Minister for Environment previously listed ecological communities as threatened through a non-statutory process if the community was presumed to be totally destroyed or at risk of becoming totally destroyed. 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. These TECs are listed as presumed totally destroyed, critically endangered, endangered or vulnerable (DBCA, 2019d).

Priority Ecological Communities

Ecological communities with insufficient information available to be considered a TEC, or which are rare but not currently threatened are placed on a priority list and are referred to as priority ecological communities (PECs; DBCA, 2019d). Definitions, categories and criteria for threatened and priority ecological communities can be found on the DBCA's website (DEC, 2013).

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