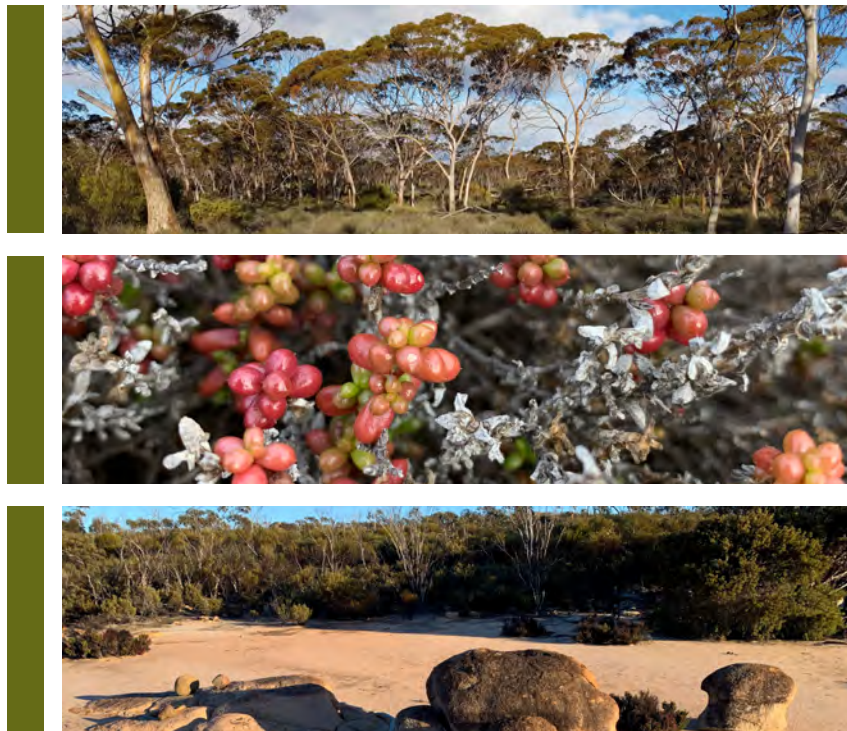




# Norseman Gold (Scotia) Reconnaissance Flora and Vegetation Survey



Prepared for Pantoro South

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ABN 49 092 687 119  
Level 1, 228 Carr Place  
Leederville Western Australia 6007  
Ph: (08) 9328 1900 Fax: (08) 9328 6138

Project No.: 1536

Prepared by: A. Braxton-Smith  
C. Flaherty

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# Scotia – Reconnaissance Flora and Vegetation Survey

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# 1.0 Summary

## 1.1 Project

Pantoro South Pty Ltd (Pantoro), the operator of the Norseman Gold Project, is planning to undertake development associated with its Scotia Gold Mine. The proposed development of the Scotia project involves dewatering to facilitate gold mining. The discharged water is proposed to be piped, using an existing pipeline, to a small ephemeral playa lake located adjoining the western edge of Lake Dundas, approximately 30 km south of Norseman, in the Goldfields region of Western Australia. Hydrological modelling has been undertaken to identify the predicted dewatering discharge volume footprint and the potential impact areas for vegetation.

Pantoro commissioned Biota Environmental Sciences Pty Ltd (Biota) to undertake a baseline 'Reconnaissance' level flora and vegetation survey of the littoral areas that may be impacted by the activities and development (primarily dewatering and discharge) associated with the Scotia Gold Mine. We understand that impact modelling has been undertaken, and the potential impact area (hereafter referred to as the study area) has subsequently been identified. The study area comprised a 248 ha area, consisting of salt flats and littoral vegetation. The overall objective of the survey was to provide baseline flora and vegetation data to support the environmental approval process, and later inform a monitoring program.

## 1.2 Vegetation and Flora

A desktop review and a four-day survey were conducted by two botanists in mid-August 2020. The baseline survey included quadrat sampling (10 standard 20 x 20 m flora quadrats), mapping of vegetation types and vegetation condition, and targeted searches for significant flora (native and introduced) while traversing the site on foot.

Seven vegetation types were identified within the study area. A mosaic of five different *Eucalyptus* open forest vegetation types (E1 to E5) was recorded on plains surrounding the lake; these encompassed differing dominant Eucalypt species in the tree canopy and slight changes in dominant mid and lower level stratum. The MS (*Melaleuca* shrubland) vegetation type occurred along the salt lake margins, with three small depressions of SS (samphire shrubland) scattered through the site. Two other units not assessed as vegetation types were also identified and mapped; these were SL (the non-vegetation bed of the salt lake) and RT (cleared gravel roads and tracks).

The majority of the study area (150.67 ha, or 60.73%) was comprised of 'Pristine' vegetation condition with no signs of human disturbance or presence of introduced flora. Less than 5% of the study area was rated as 'Excellent' (the E5 vegetation type) due to the presence of the weed species *Pentameris airoides*, while less than 1% was rated as 'Completely Degraded' and comprised the cleared roads and tracks. The non-vegetated salt lake bed, covering just over a third of the study area, was not assigned a condition rating due to it being naturally devoid of vegetation.

Based on database searches, the study area does not intersect any mapped occurrences of Threatened or Priority Ecological Communities (TECs or PECs). The August 2020 survey confirmed the absence of TECs or PECs within the study area. The nearest known PEC is located approximately 12 km north, namely the Priority 1 *Allocasuarina globosa* assemblages on greenstone rock; this sheoak species was not recorded in the study area.

A total of 136 native vascular flora taxa from 68 genera and 41 families were recorded from the study area. In addition, one introduced flora species (*\*Pentameris airoides*) was recorded.

No Commonwealth listed Threatened flora were found within the study area, however one State-listed Priority species was recorded, *Eremophila purpurascens* (Priority 3). Two plants were

recorded at two separate locations in the E5 vegetation type. These records are over 70 m from the salt lake margin on a raised hill crest and are highly unlikely to be impacted by the proposed dewatering activities. One potential State-listed Priority species, *Lepidosperma ? lyonsii* (Priority 1), was not able to be confirmed through the formal identification process as the taxonomic revision for the genus is not yet complete. A small population of this species was found within the MS vegetation type along the central western edge of the study area.

## 2.0 Introduction

### 2.1 Project Purpose, Background and Location

Pantoro, the operator of the Norseman Gold Project, is planning to undertake development associated with its Scotia Gold Mine. The Scotia deposit is situated on the western side of Lake Dundas, approximately 30 km south of Norseman in the Goldfields region of Western Australia, and is contained within the Great Western Woodlands<sup>1</sup>.

The Scotia deposit has been mined both open cut and underground periodically since the 1890s, with two main pits and several waste rock dumps still present on the site. The proposed development of the Scotia project involves dewatering to facilitate gold mining. The discharged water is proposed to be piped, using an existing pipeline, to a small ephemeral playa lake adjoining the western edge of Lake Dundas. Hydrological modelling has been undertaken to identify the predicted dewatering discharge volume footprint and the potential areas of impact on vegetation.

The proposed dewatering discharge for the Scotia project will require approval by the Department of Water and Environmental Regulation (DWER), via a licence issued under the *Environmental Protection Act 1986* (EP Act). The dewatering impact area is located within the Shire of Dundas in the Eastern Goldfields Interim Biogeographic Regionalisation of Australia (IBRA) subregion of Western Australia (Figure 2.1).

### 2.2 Scope and Objectives

Pantoro commissioned Biota to undertake a baseline flora and vegetation assessment of the littoral areas that may be impacted by the activities and development (primarily dewatering and discharge) associated with the Scotia Gold Mine. Impact modelling has been undertaken, and the potential impact area (henceforth referred to as the study area) has subsequently been identified. The study area comprised a 248 ha area, consisting of salt flats and littoral vegetation (Figure 2.1). The primary objective of the survey was to provide baseline flora and vegetation data to support the environmental approval process, and later to inform the design of a monitoring program.

The approach and methodology of the 'Reconnaissance' level flora and vegetation survey was undertaken in accordance with all relevant legislation and Commonwealth and State documentation, including the following:

- *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016a); and
- *Environmental Factor Guideline: Flora and Vegetation* (EPA 2016b).

This report documents the methods, results and key findings of the flora and vegetation survey conducted in 2020 in the study area. The specific objectives of this study were as follows:

1. Undertake a desktop assessment, including database and literature searches, to consolidate all available existing data relevant to the study area.
2. Undertake a field survey to:
  - describe, photograph and map the dominant vegetation units in the study area;
  - assess and map vegetation condition through the study area;
  - identify any vegetation units of significance in the study area, including assessment of potential TECs against the relevant Commonwealth conservation advice documents, and

<sup>1</sup> The Great Western Woodlands is the largest intact temperate woodland on the planet; see <http://greatwesternwoodlands.com>

assessment of potential PECs against information available from the Department of Biodiversity, Conservation and Attractions (DBCA);

- compile a list of vascular flora species for the study area;
  - record and photograph flora of particular significance, including Threatened and Priority species and any other species of interest; and
  - record any significant introduced flora species (weeds) occurring in the study area.
3. Prepare a flora and vegetation report to collate, present and discuss all data from the 2020 survey and desktop review, with a particular focus on identifying communities or species of particular significance.
  4. Supply all relevant data to Pantoro in the relevant data standards, submit flora specimens as required to the WA Herbarium, and submit Report forms for all Threatened and Priority flora and any TECs or PECs to the DBCA.

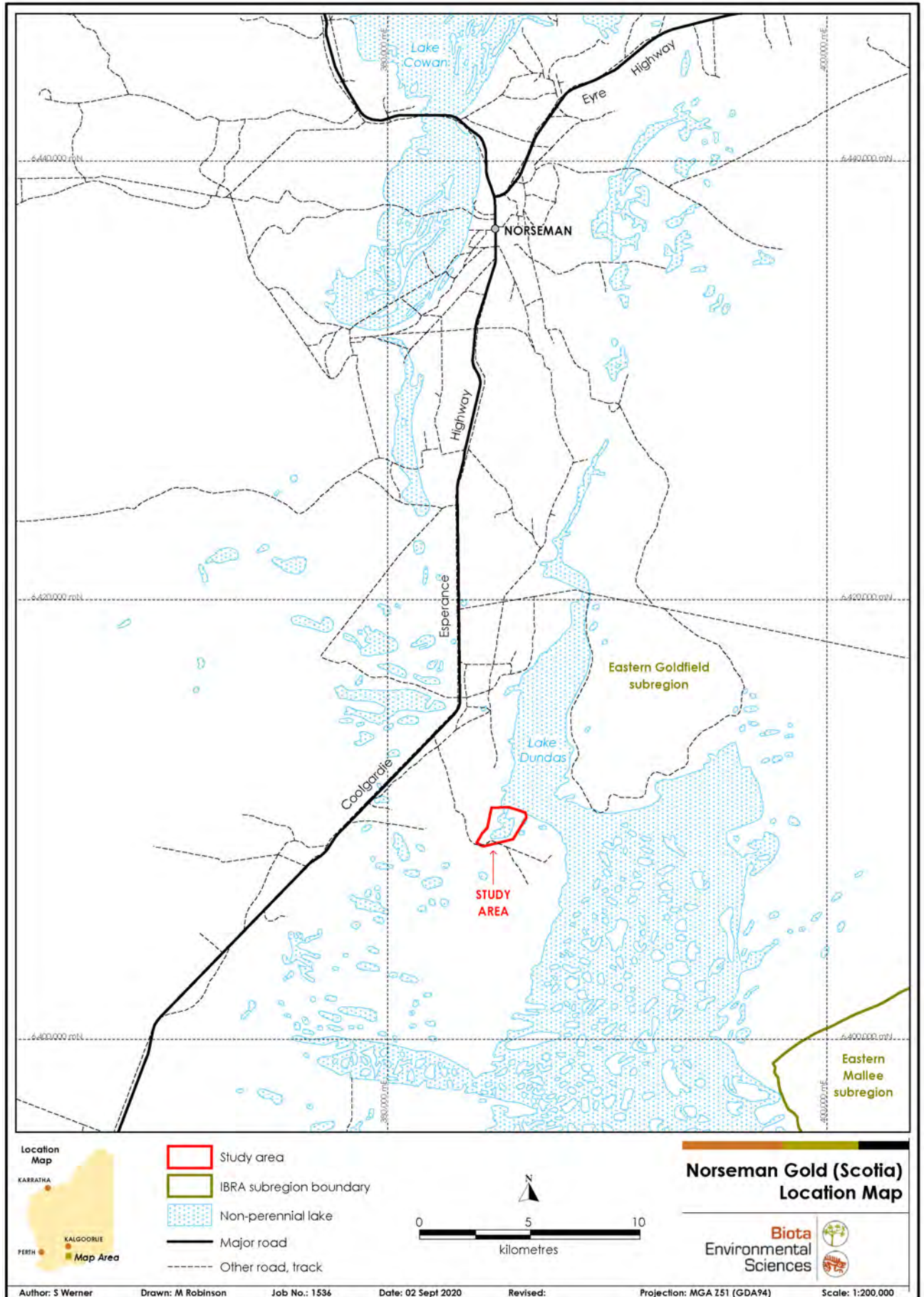


Figure 2.1: Location of the Scotia study area.

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## 3.0 Methodology

### 3.1 Definitions of Significant Communities and Species

#### 3.1.1 Communities

In Western Australia, an ecological community that is presumed to be totally destroyed or at risk of becoming totally destroyed may be listed as a TEC by the Minister for the Environment under the *Biodiversity Conservation Act 2016* (BC Act). Communities may also be listed as TECs at the Federal level under the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Communities with insufficient information available to be considered a TEC, or which are rare but not currently threatened, are placed on the Priority list and referred to as PECs. Further information regarding the framework for conservation significance ranking of communities in WA is presented in Appendix 1.

#### 3.1.2 Species

Native flora species that are rare, threatened with extinction, or have high conservation value, are specially protected by law under either or both of the WA BC Act and the Commonwealth EPBC Act. The WA DBCA also maintains a list of Priority species that are considered to be of conservation significance, but which have not been assigned statutory protection under the BC Act.

Appendix 1 details the categories of conservation significance recognised under the above frameworks and Table 3.1 outlines the codes used throughout this report for each category.

**Table 3.1: Explanation of codes used to identify categories of conservation significance for flora species.**

Category	Listing		
	EPBC Act	BC Act	DBCA
Critically Endangered	CR	CR	-
Endangered	EN	EN	-
Vulnerable	VU	VU	-
Extinct	-	EX	-
Extinct in the Wild	-	EW	-
Conservation Dependent	CD	-	-
Near Threatened	NT	-	-
Priority 1	-	-	P1
Priority 2	-	-	P2
Priority 3	-	-	P3
Priority 4	-	-	P4

#### 3.1.3 Environmentally Sensitive Areas

Environmentally sensitive areas (ESAs) are declared by the WA Minister for the Environment under section 51B of the *Environmental Protection Act 1986* (EP Act). ESAs that could potentially be of relevance to the current study would comprise:

- a defined wetland and the area within 50 metres of the wetland;
- the area covered by vegetation within 50 metres of Threatened flora; or
- the area covered by a TEC.

## 3.2 Desktop Assessment

A desktop review was undertaken to compile and review information relevant to the study area, in particular to identify known features of conservation significance (see Appendix 1), and as a preliminary assessment of potential key issues relating to the vegetation present. This review considered regional information and previous biological surveys in the locality (Section 3.2.1), as well as the results of database searches (Section 3.2.2).

### 3.2.1 Literature Review

Published and unpublished reports relevant to the study area were reviewed, including regional scale reports:

- Flora and Vegetation Assessment: Norseman Gold Project (Mattiske 2020);
- Coolgardie 3 (COO3-Eastern Goldfields subregion) (Cowan 2001);
- The Great Western Woodlands – A Global Treasure (The Wilderness Society 2020); and
- A Biodiversity and Cultural Strategy for the Great Western Woodlands (DEC 2010).

Results of several biological surveys either overlapping the study area or completed in the locality were reviewed and incorporated into the desktop assessment (see Section 4.6).

Regional and bioregional mapping and datasets relevant to the study area were also reviewed, including soils and geology, and vegetation mapping (Beard 1979).

### 3.2.2 Database Searches

The following databases were searched to assist in the determination of flora and vegetation of conservation significance occurring in the study area:

1. NatureMap<sup>2</sup> is a joint project of the DBCA and the WA Museum, and represents the most comprehensive source of information on the distribution of WA's flora. It includes records from the DBCA Threatened and Priority Flora Database and the WA Herbarium Specimen Database.
2. A specific search of the DBCA Threatened and Priority Flora Database was also commissioned to confirm the Threatened and Priority flora species known from the area.
3. The DBCA database of TECs, PECs and ESAs was searched to identify significant communities known to occur in the locality.
4. The EPBC Act Protected Matters Search Tool (PMST) was used to identify flora species and other matters of national environmental significance (MNES) that may occur in the locality.

The searches of NatureMap and the DBCA Threatened and Priority Flora Database were conducted for a 30 km radius around the study area, as was the DBCA TEC, PEC and ESA Communities database search. The EPBC Act PMST was conducted for a 30 km radius around a central point of the study area. The conservation significant flora species returned from NatureMap, the DBCA database and the EPBC Act Protected Matters Search Tool are compiled and provided in Appendix 2.

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<sup>2</sup> <http://naturemap.dbca.wa.gov.au>



### 3.3 Assessment of Likelihood of Occurrence for Conservation Significant Flora

In order to determine which flora of conservation significance species have the potential to occur in the study area, consideration was given to:

- the results of the database and literature searches;
- the known habitat preferences for each species compared to those available within the study area; and
- distributions and last known records for the species.

For each conservation significant flora species, defined rankings and criteria were subsequently applied as per Table 3.2 (see Appendix 3).

**Table 3.2: Ranking system used to assign the likelihood of occurrence of flora of conservation significance.**

Rank	Criteria
Recorded	1. The species has been previously recorded in the study area.
Likely to occur	1. There are existing records of the species within 20 km of the study area; and <ul style="list-style-type: none"> <li>• the species is strongly linked to a specific habitat, which is present in the study area; or</li> <li>• the species has more general habitat preferences, and suitable habitat is present.</li> </ul>
May potentially occur	1. There are existing records of the species within 20 km of the study area, however <ul style="list-style-type: none"> <li>• the species is strongly linked to a specific habitat, of which only a small amount is present in the study area; or</li> <li>• the species has more general habitat preferences, but only some suitable habitat is present.</li> </ul> 2. There is suitable habitat in the study area, but the species is recorded infrequently in the region.
Unlikely to occur	1. The species is linked to a specific habitat, which is absent in the study area; or 2. Suitable habitat is present, however there are no existing records of the species from within 20 km of the study area despite reasonable previous search effort in suitable habitat; or 3. There is some suitable habitat in the study area, however the species is very infrequently recorded in the region.
Would not occur	1. The species is strongly linked to a specific habitat, which is absent from the study area; and/or 2. The species' range is very restricted and would not include the study area.

### 3.4 Field Survey

#### 3.4.1 Study Team and Survey Timing

The field survey was conducted between the 11<sup>th</sup> and 14<sup>th</sup> of August 2020 by Scott Werner (Senior Biologist) and Aster Braxton-Smith (Graduate Botanist). A total of five person-days were spent on the field component of this study (excludes travel time - 2.5 days of survey effort for two botanists). A summary of the field personnel and their respective roles in the survey is provided in Table 3.3.

**Table 3.3: Summary of personnel involved in the survey.**

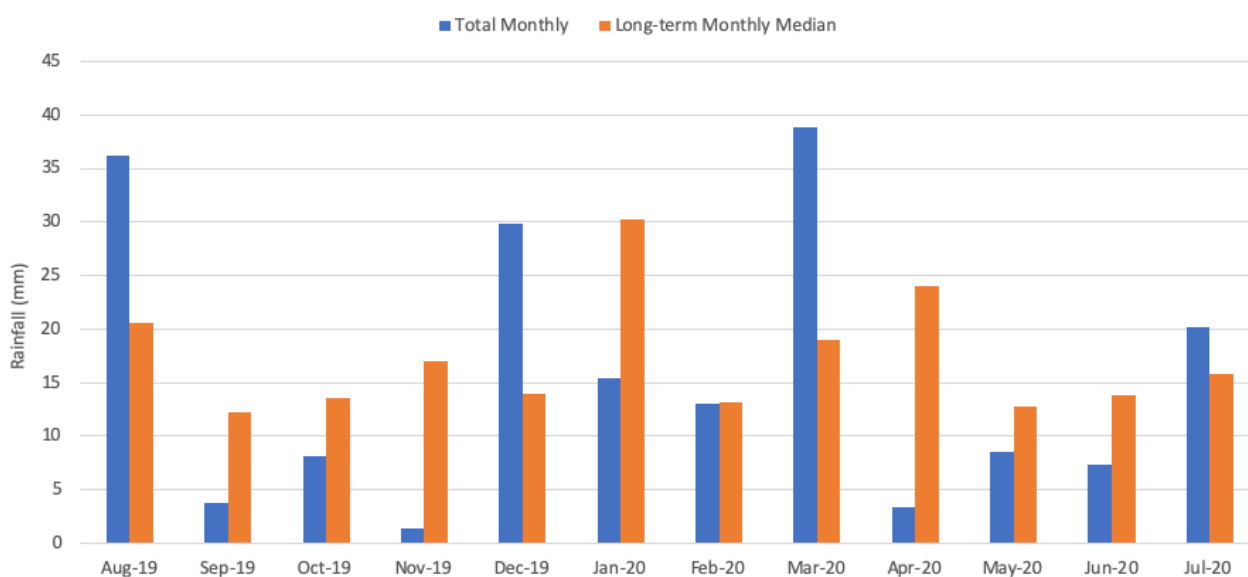
Name	Position	Qualification	Years of Experience	Survey Role	DBCA Flora Licence No.
Scott Werner	Senior Biologist	BSc (Conservation Biology & Management) (Hons)	10	Project Manager Vegetation mapping Quadrat sampling Rare flora searches	FB62000038
Aster Braxton-Smith	Graduate Botanist	BSc (Conservation & Wildlife Biology)	2	Vegetation mapping Quadrat sampling Rare flora searches	FB62000269

### 3.4.2 Survey Conditions

The weather conditions (particularly rainfall) leading up to a biological survey are important factors that influence both the number and type of species recorded from an area, especially for flora. One of the more notable effects is the increased presence of annual species following high rainfall, in addition to a higher likelihood of plants bearing reproductive material (flowers and/or fruit). This typically results in a more complete list of species from the area, along with greater confidence in identifications.

The survey was undertaken in the last month of winter, which is outside of the recommended season for botanical surveys in the Eremaean Botanical Province (EPA 2016a). Total monthly rainfall data relevant to the study area were sourced from the Norseman Aero weather station (Bureau of Meteorology station #12009), located approximately 26 km north of the study area. Data for the 12 months preceding the field survey were compared to the monthly median rainfall for the years 2000-2019 from the same station (Figure 3.1).

Rainfall recorded during the month prior to the survey (20.2 mm) was slightly higher than the long-term median (15.8 mm). A total of 36.2 mm of rainfall was received in the three months prior to the field survey (May – July 2020), which is slightly lower than the long-term median for the same period (42.4 mm; 2000-2019). Long-term climate data indicate that the rainfall recorded preceding the survey was slightly lower than the average for the time of year. However, the vegetation was in healthy condition overall and several annual species (e.g. *Erodium cygnorum* and *Hyalochlamys globifera*) were present at the time of the survey. Based on the rainfall data and the on-ground conditions, conditions were considered adequate for the collection of most ephemeral and cryptic perennial flora, however some material was in poor condition and not able to be fully identified (see Section 6.0).



**Figure 3.1: Total monthly rainfall for the 12 months preceding the survey, compared to the long-term monthly median (2000-2019) for Norseman Aero recording station.**

### 3.4.3 Site Selection

Initial site selection was based on the vegetation types apparent from viewing aerial photography, and avoided areas that appeared to be in 'Degraded' or 'Completely Degraded' condition. Ground-truthing revealed several indicative site locations to be less representative of the surrounding vegetation, therefore new locations were selected in the field.

The intention was to establish three replicate quadrats within each of the vegetation types required to be sampled, as per the current recognised standard for sampling replication (EPA 2016a). This was achieved for the MS vegetation type (*Melaleuca* tall open shrubland over samphire low shrubland), but was not possible for the five *Eucalyptus* open forest vegetation types due to their mosaic nature, continual changes in dominant canopy *Eucalypt* species, and variability in dominant mid and lower level stratum.

A total of 10 quadrats were established for the current study, and data were also available from four quadrats sampled previously by Matiske (2020).

### 3.4.4 Floristic Data Collection: Assessment of Quadrats

Ten quadrats (20 x 20 m) were assessed during the field survey within native vegetation in the study area. Each site was marked with pegs and delineated with tapes.

The following information was recorded for each quadrat:

1. location using MGA coordinates (GDA94, zone 50K); recorded with a Tablet unit for the four corners;
2. digital photographs of each site;
3. habitat description;
4. broad description of soil type;
5. fire history (approximate time since last fire, where applicable);
6. all species present and their estimated height and percent foliar cover;
7. vegetation description, based on the height and estimated cover of dominant species using the vegetation structural classes scheme developed by Keighery (1994) and summarised in Bush Forever (WA Planning Commission 2000) (see Appendix 4); and
8. vegetation condition ranking according to Keighery (1994) as presented in Bush Forever (WA Planning Commission 2000) (Appendix 4).

Raw quadrat data are provided in Appendix 5, along with coordinates of each corner point, and colour photographs of the overstorey and understorey.

### 3.4.5 Vegetation Description and Mapping

Vegetation in the study area was described at the sub-association level (Level VI as per the National Vegetation Information System<sup>3</sup>). The sub-association level includes information about the dominant growth form, height and cover for up to five species in all layers/sub-strata observed.

The vegetation maps were created and consolidated using Geographical Information System (GIS) software (QGIS and MapInfo Professional). All maps in this report were produced by Melissa Robinson (Senior GIS Cartographer) and Brandon King (Data Administrator), both of Biota, using MapInfo Professional GIS v12.

Full descriptions of all vegetation types are presented in Section 5.2.

<sup>3</sup> See the NVIS Information Hierarchy: <http://www.environment.gov.au/land/publications/australian-vegetation-attribute-manual-v6/section-2#hierarchy>.

### 3.4.6 Vegetation Condition Mapping

In addition to spatially mapping the extent of vegetation throughout the study area, an assessment of the condition of the vegetation was also carried out. Vegetation condition is determined in relation to the (perceived) ability of the vegetation to maintain itself (Keighery 1994). This is commonly interpreted from the visible amount of introduced species compared to native species. However, numerous other factors are also considered in the assessment of condition, including disturbance (e.g. grazing, erosion), degree of alteration to community and habitat structure, and overall site ecology. The categories of vegetation condition used (see Appendix 4) were consistent with the descriptive and qualitative method developed by Keighery (1994).

### 3.4.7 Searches for Conservation Significant Flora and Weeds

The desktop review identified a subset of significant flora (i.e. Threatened and Priority listed species) that had been previously recorded from the locality and were considered to have some potential to occur in the study area (see Appendix 3). Targeted systematic searches for these species were then conducted on foot throughout the entire study area. Tracklogs of foot traverses were captured using handheld GPS units and are shown in Appendix 6.

Locations of species of conservation significance or unknown taxa were recorded using a handheld GPS unit with accuracy equivalent to a differential GPS (<1.5 m). The number of individuals and extent of the population were also recorded for each location.

Locations of any declared pests (weeds listed under the *WA Biosecurity and Agriculture Management Act 2007*; the BAM Act) or Weeds of National Significance (WoNS) were also recorded during the foot traverses, along with an estimate of their population size. Opportunistic records were also made of other introduced flora species, however no attempt was made to document all such species throughout the entire study area.

## 3.5 Specimen Identification, Nomenclature, and Data Management

Flora species were identified either in the field, or in the office following the field survey. If a species was common and well known to the survey botanists, the identification was confirmed and noted in the field. If the species was of conservation significance, difficult to determine without microscopic examination, belonged to a recognised species complex, or was poorly collected or otherwise unusual, a voucher specimen was collected. Specimens were pressed in the field, and then dried for further study and confirmation.

Voucher specimens were identified using flora keys, reference to appropriate publications, use of voucher reference collections and comparisons to the collections held at the WA Herbarium. Biota botanists Aster Braxton-Smith and Scott Werner identified the majority of the specimens. A subset of specimens were submitted to the WA Herbarium for paid identifications as per Section 6.2.

All data were entered into a Microsoft Access Vegetation Database structure held internally at Biota. The database model employed by Biota was developed by Ted Griffin (private consultant) at the request of Malcolm Trudgen (M.E. Trudgen and Associates).

A full list of vascular flora species recorded from the study area is presented in Appendix 7; this includes all species recorded by Biota, as well as those recorded by Mattiske (2020) in quadrats within the current study area. Nomenclature and conservation significance rankings used in this report are in accordance with the current listing of WA flora recognised by the WA Herbarium, as listed on FloraBase<sup>4</sup> at the time of reporting.

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<sup>4</sup> <http://florabase.dbca.wa.gov.au>

## 3.6 Limitations of the Study

The results of the field survey provide a good representation of the vegetation and flora of the study area. However, there are limitations to this study that must be considered when reviewing and applying the results detailed in this report. As per the relevant EPA Technical Guidance Statement (EPA 2016a), potential constraints and consequent limitations of this study are summarised in Table 3.4.

**Table 3.4: Potential constraints and limitations of the current study.**

Potential Constraint	Statement of Limitations
1. Availability of contextual information at a regional and local scale	<ul style="list-style-type: none"> <li>A small number of previous biological surveys have been completed in the locality of the study area, and regional studies were considered as part of the desktop review. Publicly available databases of information relating to rare species and communities were also searched. The current biological survey added considerable new data specific to the study area, and was supplemented with data from a previous survey that overlapped the area (Mattiske 2020).</li> </ul> <p>Contextual information is therefore not considered to be a limiting factor for this study.</p>
2. Competency / experience of the team carrying out the survey, including experience in the bioregion surveyed	<ul style="list-style-type: none"> <li>The field personnel were suitably qualified to identify flora and the team leader has over nine years of experience in conducting biological surveys.</li> </ul> <p>There were therefore no limitations due to experience of personnel.</p>
3. Proportion of flora recorded and/or collected, any identification issues	<ul style="list-style-type: none"> <li>All vascular flora encountered during the field survey were recorded, comprising 136 native taxa and one introduced flora species. The majority of the flora specimens collected (92%) were of sufficient quality to be fully determined to the lowest relevant taxonomic level. Fungi and non-vascular flora (algae, mosses and liverworts) were not systematically surveyed, which is consistent with the accepted level of effort for a survey of this type and scale.</li> </ul> <p>The proportion of flora recorded was considered to be a limitation for this study. Additional taxa would be recorded with further survey work under more optimal conditions, and this may include some species of conservation significance (e.g. the Priority 3 annual species <i>Phlegmatospermum eremaeum</i> and <i>Notisia intonsa</i>).</p>
4. Appropriate area fully surveyed (effort and extent)	<ul style="list-style-type: none"> <li>The scope of works required a Reconnaissance level survey for vegetation and flora, together with a Targeted survey for significant flora (terms as described in EPA 2016a). A total of five person days were spent surveying the flora and vegetation of the study area. The entire study area was searched on foot for significant flora, and mapping of vegetation types and vegetation condition was prepared.</li> <li>A total of 10 quadrats were completed in the study area. Due to the small size of the study area and the mosaic nature of the vegetation, the number of quadrats per vegetation type was fewer than recommended by EPA (2016a), however the units are considered to have been adequately surveyed.</li> </ul>
5. Access restrictions within the study area	<ul style="list-style-type: none"> <li>The entire study area was accessible and there were no access restrictions.</li> </ul>
6. Survey timing, rainfall, season of survey	<ul style="list-style-type: none"> <li>The flora and vegetation survey was completed in mid-August 2020 and was considered adequate for the recording of most annual and cryptic perennial species, however not all specimens were able to be identified on the basis of the material collected (see Section 3.4.2). Timing of the flora and vegetation survey was considered a limitation for the assessment of the study area values.</li> </ul>

<p>7. Disturbance that may have affected the results of survey such as fire, flood or clearing</p>	<ul style="list-style-type: none"><li>• Disturbance within the study area was minimal. Two minor vehicle access tracks were present in the southern part of the study area. These are not considered to have substantially affected the vegetation, and are not considered to be a limitation for the study.</li></ul>
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## 4.0 Desktop Assessment

### 4.1 IBRA Bioregion and Subregion

The study area lies within the Eastern Goldfields subregion (COO3) of the Coolgardie (COO) bioregion, as defined by the IBRA (DSEWPaC 2012). The Eastern Goldfields subregion is 5,102,425 ha in size, and described by Cowan (2001) as:

*“Gently undulating plains interrupted in the west with low hills and ridges of Archaean greenstones and in the east by a horst of Proterozoic basic granulite. The underlying geology is of gneisses and granites eroded into a flat plane covered with tertiary soils and with scattered exposure of bedrock. Calcareous earths are the dominant soil group and cover much of the plains and greenstone areas. A series of large playa lakes in the western half are the remnants of an ancient major drainage line.*

*The vegetation is of mallees, Acacia thickets and shrub heaths on sandplains. Diverse Eucalyptus woodlands occur around salt lakes, on ranges, and in valleys. Salt lakes support dwarf shrublands of samphire. Woodlands and Dodongaea shrubland occur on basic granitites of the Fraser Range. The area is rich in endemic Acacias. The climate is Arid to Semi-arid with 200-300 mm of rainfall, sometimes in summer but usually in winter.”*

### 4.2 Conservation Reserves in the Locality

No conservation reserves overlap the study area or are located in close proximity.

There are a number of conservation reserves in the surrounding area, the closest of which is the Dundas Nature Reserve, located approximately 10 km east of the study area (Figure 4.1). The other DBCA-managed lands in the vicinity of the study area include:

- four un-named nature reserves (R 6043, R 42943, R 33501 and R 33113);
- the Dowak Nature Reserve; and
- an un-named Timber Reserve (see Figure 4.1).

### 4.3 Great Western Woodlands

The study area occurs within the southern extent of the ‘Great Western Woodlands’, which represents the largest remaining area of intact Mediterranean-climate woodland in the world (DEC 2010, The Wilderness Society 2020). The Great Western Woodlands span an area from the edge of the Wheatbelt to Kalgoorlie-Boulder in the north, to the inland deserts of the northeast and the Nullabor Plain to the east, and cover 16 million hectares (DEC 2010). They consist mostly of Eucalypt woodlands and are recognised for being botanically rich, supporting over 30% of all Australia’s Eucalypt species and over 20% of all of Australia’s native plants (The Wilderness Society 2020). Although largely intact, the Great Western Woodlands are under increasing pressure from competing land uses, with more than 60% of the woodlands covered by operating mines, granted mineral tenements and tenement applications (DEC 2010).

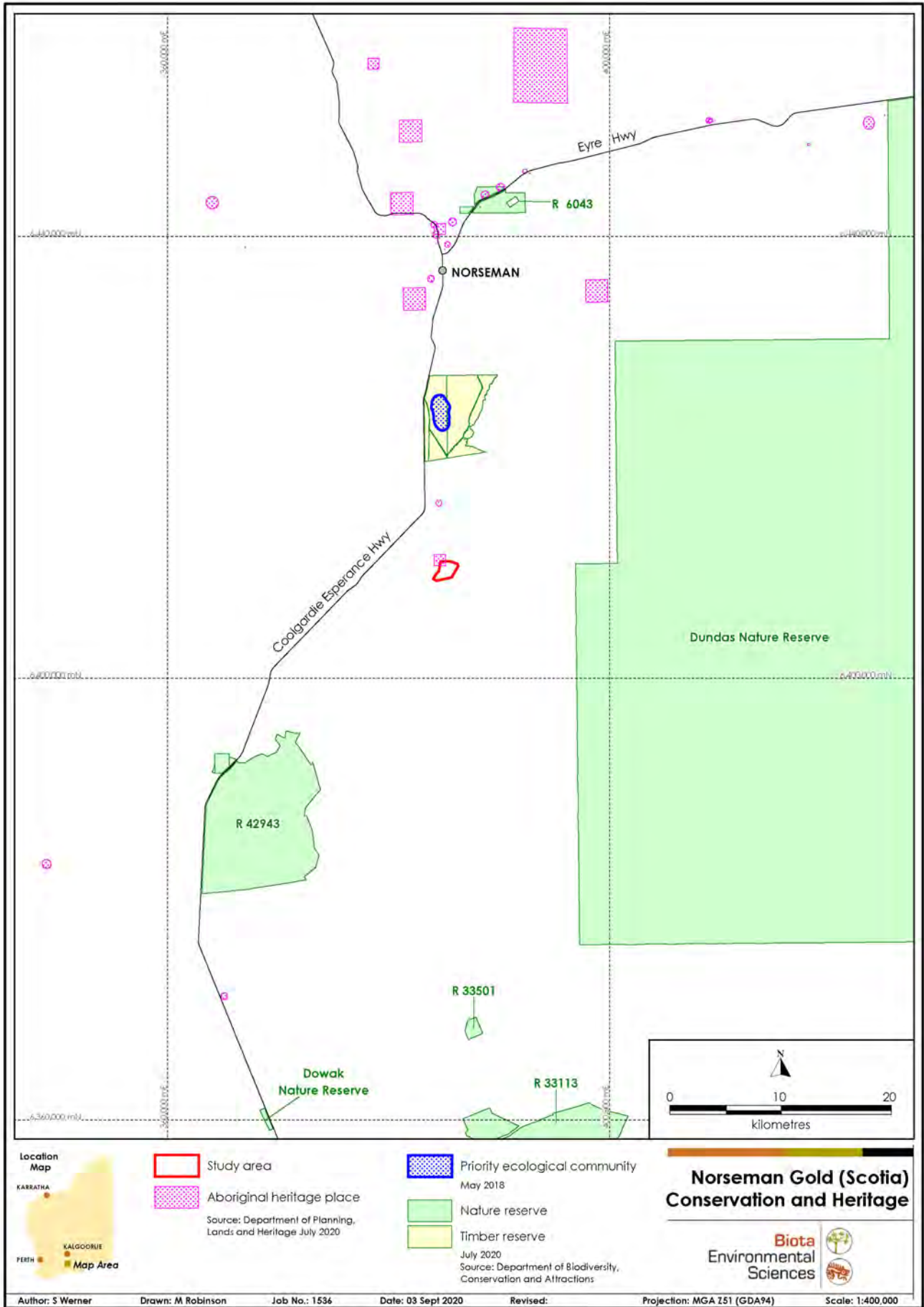


Figure 4.1: Conservation and Heritage areas in the locality.



## 4.4 Surface Geology and Soils

The study area contains six geological units (Figure 4.2 and Table 4.1), mapped at a scale of 1:100,000 by the Geological Survey of WA and collated in Geoscience Australia (2008). The geologic ages of the units within the study area are Archaean and Phanerozoic, with Cztd identified as the dominant geological unit, covering almost half of the study area.

**Table 4.1: Extent of surface geology units as described in Geoscience Australia (2008).**

Unit	Description	Geological Age	Proportion in Study Area (ha; %)	
Aci	Banded iron-formation: layered quartz-hematite-magnetite rock; massive and layered gossanous ironstone.	Archaean	6.4 ha	2.6%
Agmd	Lake Dundas monzogranite: sub-equigranular, medium- to coarse-grained biotite monzogranite.	Archaean	20.8 ha	8.3%
Asn	Clastic and sedimentary rocks: includes polymictic conglomerate (locally important felsic volcanoclastic component and associated massive iron sulphide body), pelite.	Archaean	2.5 ha	1.0%
Czc	Colluvium: gravel, sand, and soil; may include laterite debris.	Phanerozoic	15.3 ha	6.2%
Cztd	Quartz sand and gypsum dune deposits adjacent to playas.	Phanerozoic	112.9 ha	45.6%
Czts	Saline and gypsiferous evaporite deposits interbedded with sand and clays in playas.	Phanerozoic	90.1 ha	36.3%

According to the Atlas of Australian Soils (Northcote et al. 1960) two soil types occur within the study area, namely DD14 and SV2 (Figure 4.2). The dominant soil type is DD14, which covers an area of 196.2 ha (79.1%) and is characterised as “flat to undulating land with small valleys occasionally broken by low narrow rocky hills and ridges, or tors and bosses” (Northcote et al. 1960). The SV2 soil type is located along the eastern edge and covers an area of 51.8 ha (20.9%). It is described as “saline valleys with some dunes including barchan forms, salt lake channels, mostly devoid of true soils, and their fringing areas” (Northcote et al. 1960).

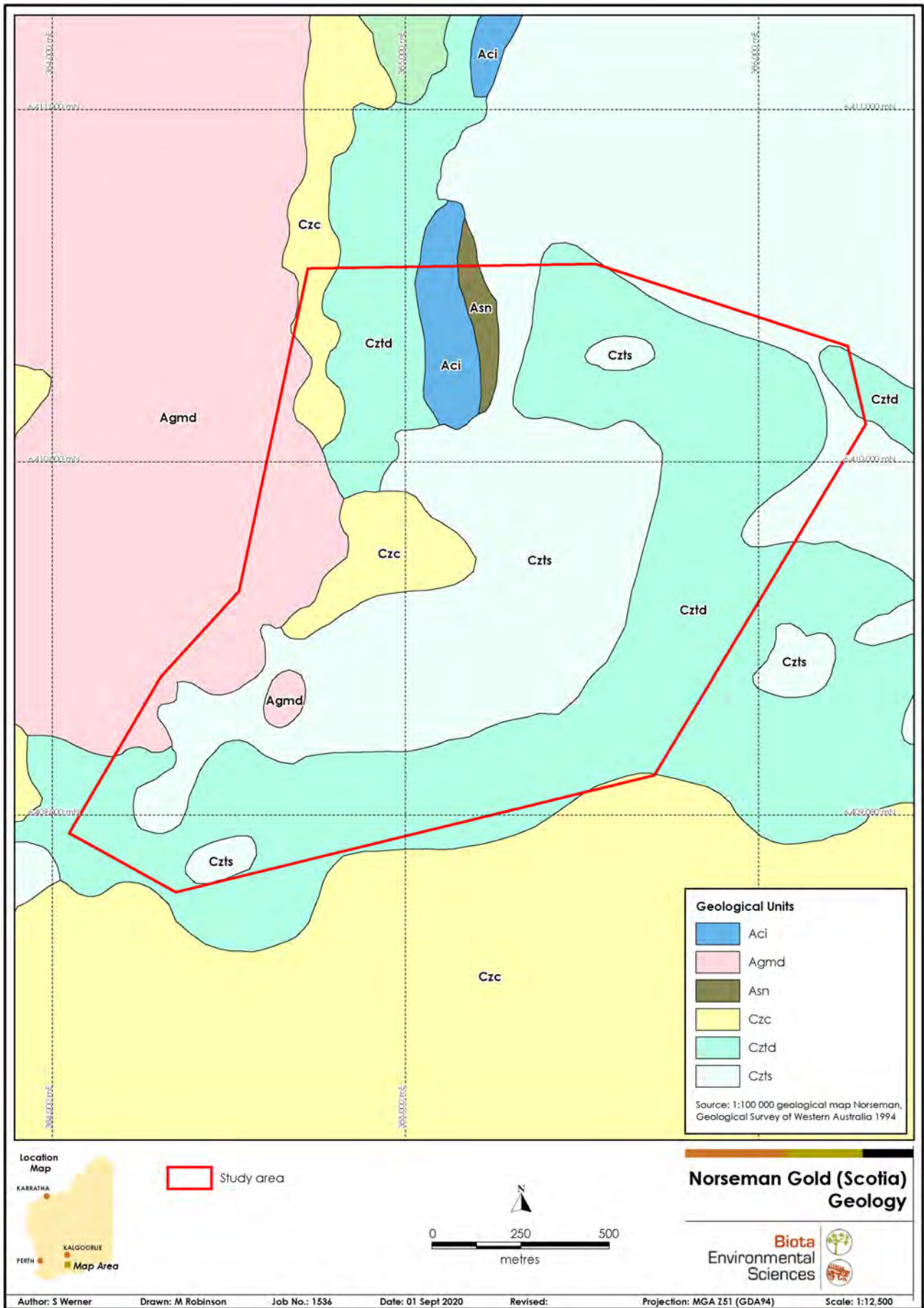


Figure 4.2: Geological units intersected by the study area.

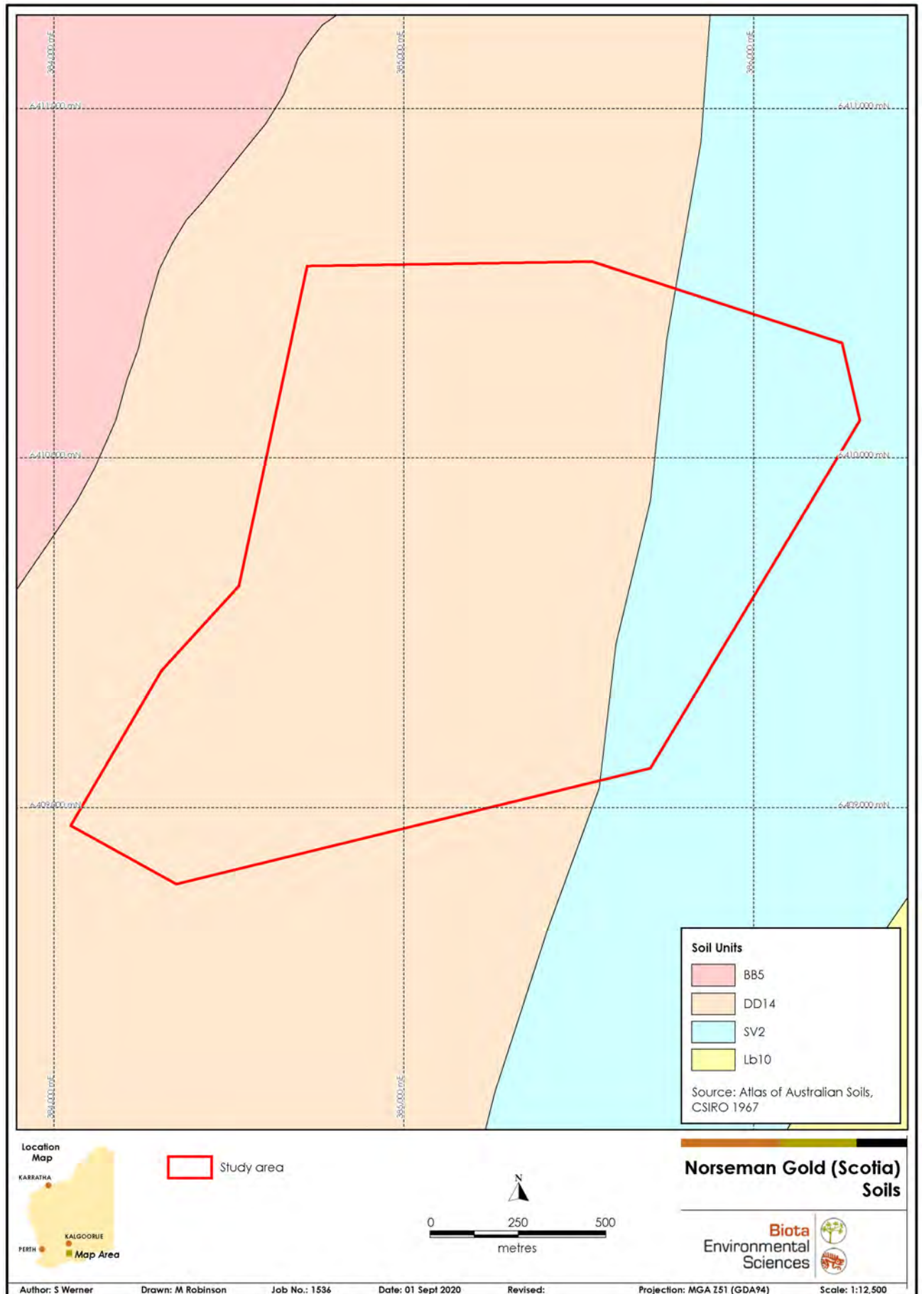


Figure 4.3: Soil units intersected by the study area.

## 4.5 Regional Vegetation Mapping

### 4.5.1 Pre-European Vegetation Mapping by Beard (1979)

John Beard mapped broad “vegetation associations” for the locality at 1:250,000 scale (Beard 1979), with each vegetation association divided into finer scale “system associations” (see Table 4.2, Figure 4.4). The majority (62.0%) of the study area was mapped as Dundas 125, encompassing the non-vegetated salt lake bed. The remainder of the study area was mapped as Dundas 3106 (31.1%), which is comprised of *Eucalyptus* woodlands; and Dundas 221 (3.9%), which is comprised of saltbush (*Atriplex* spp.) shrubland with other Chenopodiaceae species.

**Table 4.2: Extent of vegetation associations in the study area as described and mapped by Beard (1979).**

Beard's Vegetation System Association	Description	Proportion in Study Area	
		ha	%
<b>Dundas 221</b>	<i>Atriplex</i> spp., <i>Maireana</i> spp. communities on alkaline soils.	9.6	3.9
<b>Dundas 125</b>	Salt lake, lagoon, clay pan.	153.8	62.0
<b>Dundas 3106</b>	For the Goldfields region; Eucalypt woodlands of Gimlet, Redwood etc. <i>Eucalyptus salubris</i> , <i>Eucalyptus oleosa</i>	84.6	34.1

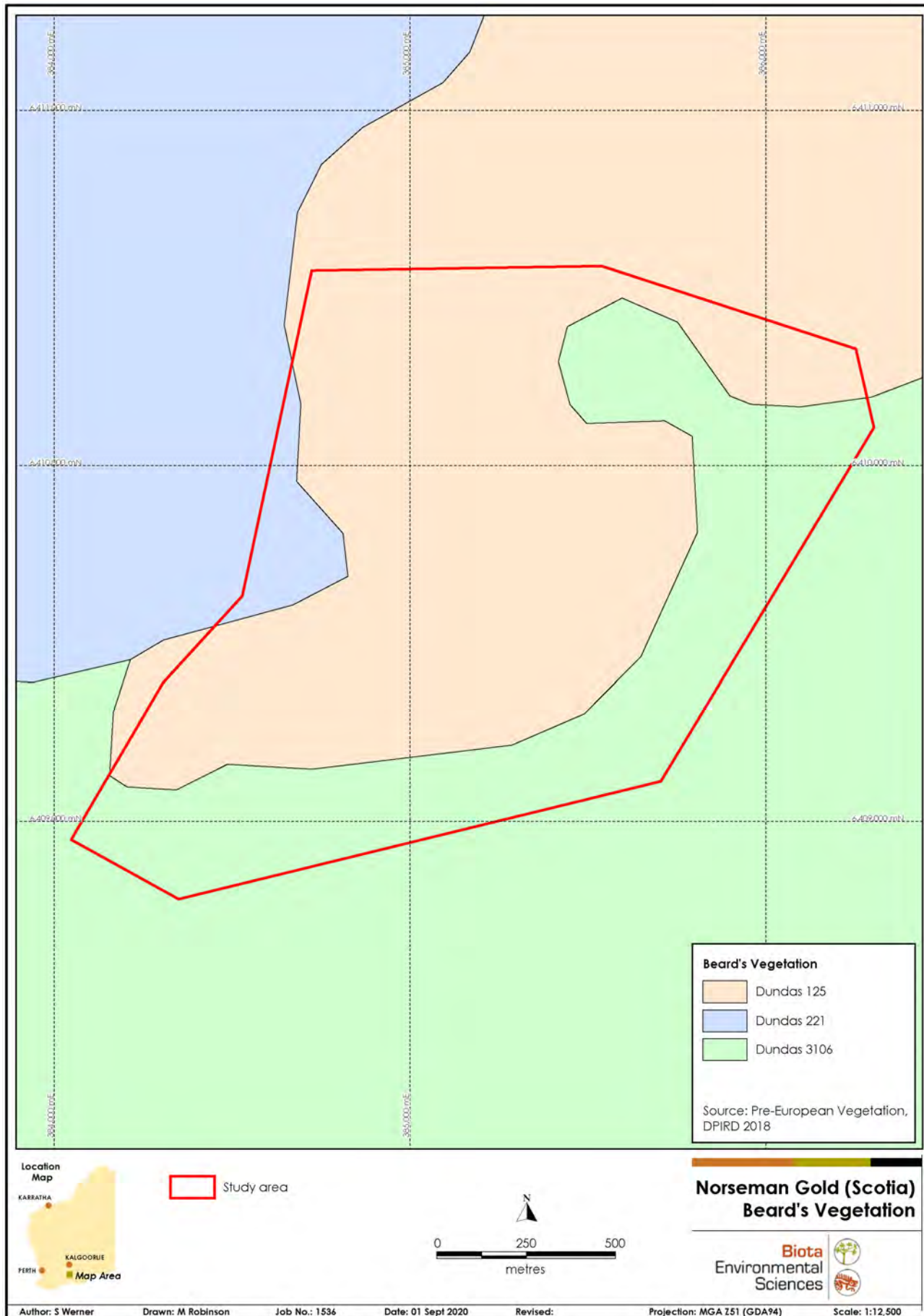


Figure 4.4: Beard's vegetation associations intersected by the study area.

## 4.6 Previous Botanical Surveys in the Locality

A number of biological surveys have been conducted in close proximity to the study area, with the most relevant being the following:

- Flora and Vegetation Assessment: Norseman Gold Project, Norseman, WA (Mattiske 2020).

The majority of the Mattiske (2020) survey was conducted approximately 500 m south of the study area, however a small section overlaps the current study area, where two minor tracks are currently situated. The main results and methodologies of Mattiske (2020) were reviewed prior to the field survey and the conservation significant flora recorded were included in the likelihood assessment (see Appendix 3).

In addition, the conservation significant species recorded from the following four recent biological surveys conducted on the Scotia tenement (results of which are summarised in Mattiske (2020)) were also included in the likelihood assessment<sup>5</sup>:

- Rare flora and vegetation survey of North Scotia prospect, conducted August 2004 (Paul Armstrong & Associates 2004)
- Report for proposed small scale mining operation – targeted flora survey (GHD 2009);
- Addendum to 'Report prepared for proposed small scale mining operation – targeted flora survey' (GHD 2010); and
- Flora and vegetation survey of the Mt Henry study area (Mattiske 2013).

## 4.7 Vegetation of Conservation Significance from the Locality

### 4.7.1 Threatened and Priority Ecological Communities

Based on database search results and a review of regional vegetation mapping and associated literature, the study area does not intersect any mapped occurrences of TECs or PECs.

Two conservation significant communities were identified from the desktop review as occurring in the vicinity of the study area (Table 4.3).

The EPBC Act PMST search results returned the 'Proteaceae Dominated Kwongkan Shrublands of the Southeast Coastal Floristic Province of Western Australia' TEC. This community is federally protected as an endangered TEC as well as being protected at a state-level as a Priority 3 PEC (DBCA 2020). It is described as consisting of "predominantly obligate seeding proteaceous shrubland and heath (kwongkan) and mallee heath on sandplain, duplex sand/clay and gravels overlying Eocene sediments, quartzite, schist, Yilgarn and Albany Fraser granite and greenstone ranges." It is confined to coastal areas on the south coast of WA and would not occur in the study area.

The DBCA communities database search returned the '*Allocasuarina globosa* assemblages on Greenstone rock (Esperance District)' PEC, which has been recorded approximately 12 km north of the study area (Figure 4.1). This PEC is listed as Priority 1 at a State level by the DBCA (DBCA 2020) (Table 4.3). It is described as "*Allocasuarina* thickets on greenstone ridges of lateritic breakaways; *Acacia duriuscula*, *Allocasuarina globosa*, *Eucalyptus georgei* subsp. *georgei* and *Eucalyptus oleosa* thickets on greenstone ridges with skeletal soils" (DBCA 2020). Based on an assessment of the aerial photography, greenstone ridges (key habitat for this PEC) appear to be absent from the study area, therefore this PEC is considered unlikely to occur.

<sup>5</sup> These reports were available for review; only the summarised results presented in Mattiske (2020) were incorporated into the likelihood assessment.

**Table 4.3: Conservation significant communities identified for the locality during the desktop review.**

Community Name	Status		Likelihood of Occurrence in the Study Area
	Commonwealth	State	
<b>Threatened Ecological Community (TEC)</b>			
Proteaceae Dominated Kwongan Shrublands of the Southeast Coastal Floristic Province of Western Australia	Endangered	Priority 3	<b>Would not occur:</b> community occurs in the south coast region of WA.
<b>Priority Ecological Community (PEC)</b>			
<i>Allocasuarina globosa</i> assemblages on Greenstone rock (Esperance District)	–	Priority 1	<b>Unlikely to occur:</b> community strongly linked to greenstone ridges, which are absent from the study area.

## 4.8 Significant Flora Species Known from the Locality

A large number of Threatened and Priority flora species were identified through the desktop review as having been recorded from the locality, including some that were considerably distant from the study area. An assessment of the likelihood of occurrence of each of these species within the study area was completed during the desktop review, based on the habitats and vegetation types known to be present, as well as the number and currency of records in close proximity (within 20 km; see Appendix 3).

This likelihood assessment found that 27 of these species had some potential to occur in the study area:

- six species were considered "likely to occur":
  - *Bossiaea arcuata* (P1);
  - *Bossiaea aurantiaca* (P1);
  - *Aotus* sp. Dundas (M.A. Burgman 2835) (P2);
  - *Drosera salina* (P2);
  - *Acacia ancistrophylla* var. *perarcuata* (P3);
  - *Acacia triculenta* (P3).
- 21 species "may potentially occur":
  - *Allocasuarina globosa* (T);
  - *Acacia dorsenna* (P1);
  - *Calandrinia lefroyensis* (P1);
  - *Cryptandra exserta* (P1);
  - *Eucalyptus jimberlanica* (P1);
  - *Lepidosperma lyonsii* (P1);
  - *Micromyrtus papillosa* (P1);
  - *Philothea apiculate* (P1);
  - *Scaevola tortuosa* (P1);
  - *Acacia kerryana* (P2);
  - *Beyeria sulcata* var. *truncata* (P3);
  - *Chrysocephalum apiculatum* subsp. *norsemanense* (P3);
  - *Eremophila purpurascens* (P3);
  - *Goodenia laevis* subsp. *laevis* (P3);
  - *Melaleuca macronychia* subsp. *trygonoides* (P3);

- *Notisia intonsa* (P3);
- *Phlegmatospermum eremaeum* (P3);
- *Pityrodia chrysocalyx* (P3);
- *Stylidium pulviniforme* (P3);
- *Eremophila parvifolia* subsp. *parvifolia* (P4); and
- *Frankenia glomerata* (P4).

These species collectively comprised the target species for the current field survey.



## 5.0 Vegetation

### 5.1 Previous Vegetation Mapping of the Study Area

Overall, the vegetation types mapped during the current survey were similar to those mapped by Mattiske (2020), in terms of the dominant species and general composition (Table 5.1).

Previous vegetation mapping by Mattiske (2020) intersecting the current study area is shown in Figure 5.1.

**Table 5.1: Vegetation types previously mapped in the study area by Mattiske (2020).**

<b>Vegetation Type Code:</b> Description
<b>W2:</b> Woodland to open woodland of <i>Eucalyptus flocktoniae</i> complex, <i>Eucalyptus lesouefii</i> and <i>Eucalyptus dundasii</i> over sparse shrubland of <i>Melaleuca sheathiana</i> , <i>Scaevola spinescens</i> , <i>Beyeria sulcata</i> and <i>Exocarpos aphyllus</i> over isolated shrubs of <i>Olearia muelleri</i> on orange-red to brown clayey loam on flats and slopes.
<b>W5:</b> Open woodland of <i>Eucalyptus gracilis</i> and <i>Eucalyptus flocktoniae</i> over sparse shrubland of <i>Olearia</i> sp. <i>Eremicola</i> (Diels & Pritzel s.n. PERTH 00449628) and <i>Olearia muelleri</i> on red-orange clayey loam flats.
<b>S3:</b> Open woodland of <i>Eucalyptus ?salicola</i> over open shrubland of <i>Bossiaea barbarae</i> , <i>Acacia assimilis</i> subsp. <i>assimilis</i> and <i>Melaleuca lanceolata</i> over <i>Lepidosperma</i> sp. on pale orange sand flats on salt lake margins.
<b>SL:</b> Salt lake or non-vegetated lake bed.

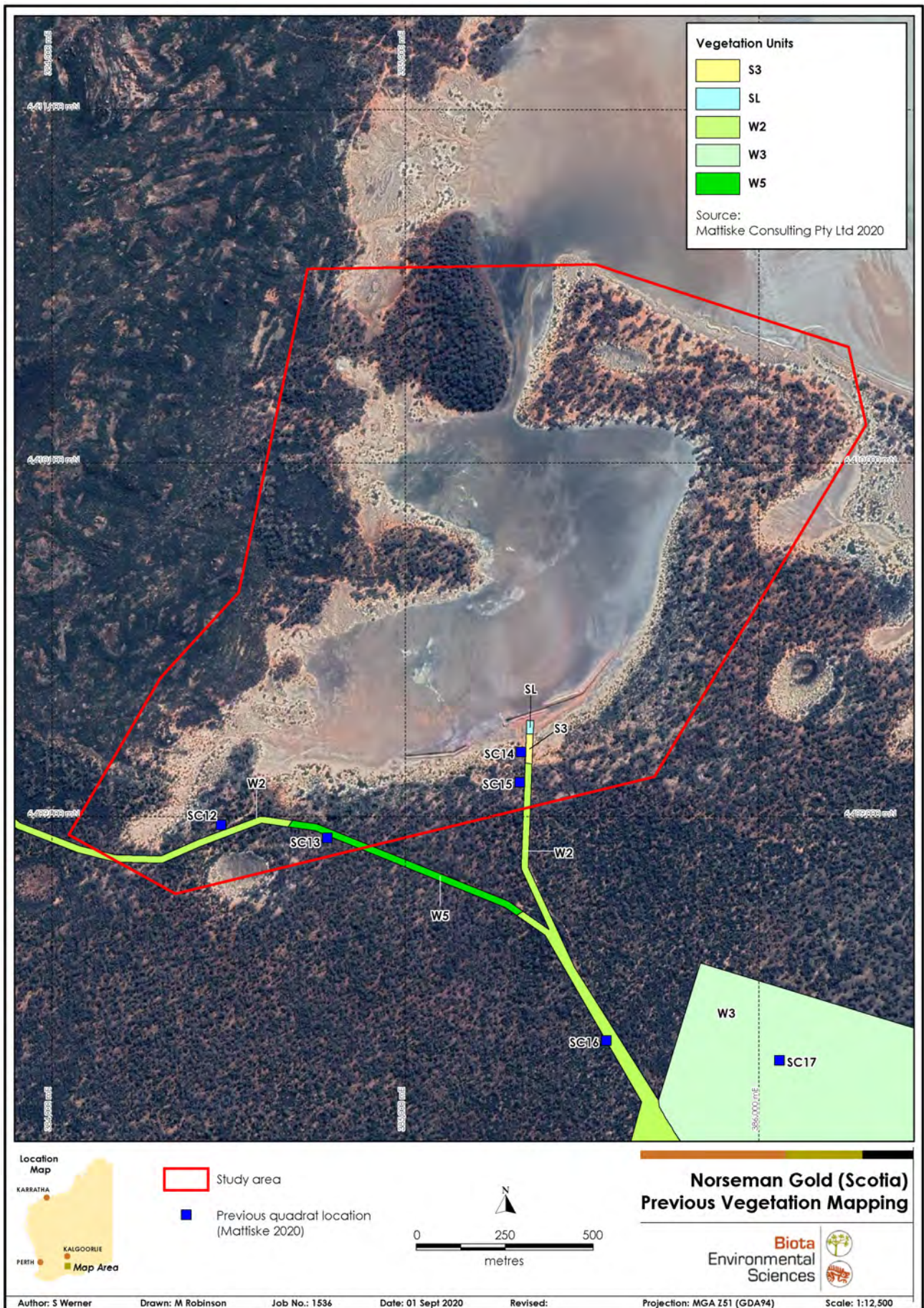


Figure 5.1: Previously mapped vegetation within the study area (Mattiske 2020).

## 5.2 Vegetation Types of the Study Area

Vegetation types were mapped for the study area utilising data from the sampling sites and foot traverses. Seven vegetation types were identified within the study area and are described and discussed in Sections 5.2.1 to 5.2.7 below. Two other units not assessed as vegetation types in the field were also identified and mapped; these were SL (the non-vegetation salt lake bed) and RT (cleared gravel roads and tracks) (see Section 5.2.8).

Five 'mosaic' *Eucalyptus* open forest vegetation types (E1 to E5) were identified and described, comprising differing dominant canopy Eucalypt species and slight changes in dominant mid and lower level stratum. The MS (*Melaleuca* shrubland) vegetation type occurred along the salt lake margins, with three small stands of SS (samphire shrubland) scattered in depressions through the site. The most widespread vegetation types in the study area were MS, which covered a third of the study area; followed by E2 and E1, which together covered over a quarter of the area.

Maps showing the distribution of the seven vegetation types and the two other mapping units in the study area are presented in Figure 5.2, with the extent of each described in Table 5.2.

**Table 5.2: Extent of the mapping units within the study area.**

Mapping unit code: Description	Area (ha)	Proportion of Study Area (%)
<b>Vegetation Types</b>		
E1: <i>Eucalyptus</i> open forest over <i>Alyxia</i> , <i>Olearia</i> open shrubland over <i>Lepidosperma</i> open sedgeland	33.0	13.3
E2: <i>Eucalyptus</i> open forest over <i>Exocarpos</i> , <i>Cratystylis</i> low open shrubland over scattered herbs, grasses and sedges	35.1	14.2
E3: <i>Eucalyptus</i> (mallee) low open woodland over <i>Melaleuca</i> , <i>Acacia</i> , <i>Eremophila</i> and <i>Grevillea acuarria</i> low shrubland	16.1	6.5
E4: <i>Eucalyptus</i> open forest over <i>Melaleuca</i> tall open shrubland over <i>Senna</i> , <i>Acacia</i> open shrubland	16.1	6.5
E5: <i>Eucalyptus</i> open forest over <i>Cratystylis</i> , <i>Eremophila</i> open shrubland and scattered low <i>Chenopodiaceae</i> shrubs	11.9	4.8
MS: <i>Melaleuca</i> tall open shrubland over samphire low shrubland	45.3	18.2
SS: Samphire low shrubland	5.0	2.0
<b>Other Units</b>		
SL: Non-vegetated salt lake bed	84.1	33.9
RT: Roads and tracks	1.4	0.6
<b>Total</b>	<b>284.0</b>	<b>100.0</b>

### 5.2.1 E1: *Eucalyptus* open forest over *Alyxia*, *Olearia* open shrubland over *Lepidosperma* open sedgeland

Vegetation Code	E1
Vegetation Type Description	<i>Eucalyptus gracilis</i> , <i>Eucalyptus salicola</i> , <i>Eucalyptus transcontinentalis</i> open forest over <i>Alyxia buxifolia</i> , <i>Olearia muelleri</i> , <i>Westringia cephalantha</i> var. <i>cephalantha</i> , <i>Acacia</i> spp. open shrubland over <i>Lepidosperma</i> sp., <i>Chamaexeros fimbriata</i> open sedgeland with scattered herbs and grasses.
Distribution	This vegetation type (Plate 5.1) occurred in the southeastern portion of the study area.
Sampling Sites	LSC01, LSC04.
Vegetation Condition	Pristine.



**Plate 5.1: Representative photographs of the E1 vegetation type.**

**5.2.2 E2: *Eucalyptus* open forest over *Exocarpos*, *Cratystylis* low open shrubland over scattered herbs, grasses and sedges**

Vegetation Code	E2
Vegetation Type Description	<i>Eucalyptus gracilis</i> , <i>Eucalyptus salicola</i> ( <i>Eucalyptus dundasii</i> ) open forest over <i>Exocarpos aphyllus</i> , <i>Cratystylis conocephala</i> , <i>Bossiaea walkeri</i> , <i>Alyxia buxifolia</i> , <i>Olearia</i> spp., <i>Acacia</i> spp. low open shrubland over scattered herbs, grasses and sedges.
Distribution	This vegetation type (Plate 5.2) occurred within lower-lying areas in the northern half of the study area.
Sampling Sites	LSC03, LSC07.
Vegetation Condition	Pristine.



**Plate 5.2: Representative photographs of the E2 vegetation type.**

### 5.2.3 **E3: *Eucalyptus* low open mallee woodland over *Melaleuca*, *Acacia*, *Eremophila* and *Grevillea acuaría* low shrubland**

Vegetation Code	E3
Vegetation Type Description	<i>Eucalyptus spreata</i> , <i>Eucalyptus</i> spp. low open mallee woodland over <i>Melaleuca hamata</i> , <i>Acacia</i> spp. scattered tall shrubs over <i>Acacia</i> spp., <i>Eremophila</i> spp., <i>Grevillea acuaría</i> low shrubland over scattered grasses, sedges and herbs (including Orchidaceae spp. and <i>Drosera</i> sp.).
Distribution	This vegetation type (Plate 5.3) occurred within higher elevated areas along the western portion of the study area. Depressions in between the outcropping granite had a high density of <i>Lepidosperma</i> sedges and small herbs (including <i>Drosera andrewsiana</i> and Orchidaceae spp.).
Sampling Sites	LSC09.
Vegetation Condition	Pristine.

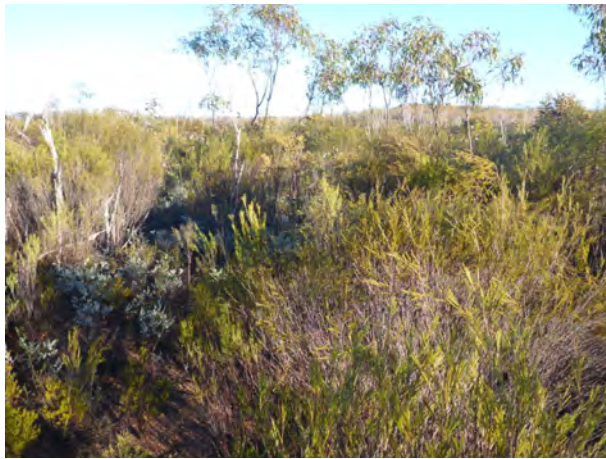


Plate 5.3: Representative photographs of the E3 vegetation type.

### 5.2.4 **E4: *Eucalyptus* open forest over *Melaleuca* tall open shrubland over *Senna*, *Acacia* open shrubland**

Vegetation Code	E4
Vegetation Type Description	<i>Eucalyptus dundasii</i> , <i>Eucalyptus salicola</i> ( <i>Eucalyptus urna</i> ) open forest over <i>Melaleuca subalaris</i> tall open shrubland over <i>Senna artemisioides</i> , <i>Acacia</i> spp., <i>Eremophila</i> spp., <i>Dodonaea</i> spp. open shrubland.
Distribution	This vegetation type (Plate 5.4) occurred within the western portion of the study area adjacent to the E3 vegetation type; it included large patches of juvenile <i>Eucalyptus</i> species under 2 m tall.
Sampling Sites	LSC06
Vegetation Condition	Pristine



Plate 5.4: Representative photographs of the E4 vegetation type.

**5.2.5 E5: *Eucalyptus* open forest over *Cratystylis*, *Eremophila* open shrubland and scattered low *Chenopodiaceae* shrubs**

Vegetation Code	E5
Vegetation Type Description	<i>Eucalyptus dundasii</i> , <i>Eucalyptus lesouefii</i> ( <i>Eucalyptus torquata</i> and <i>Allocasuarina acutivalvis</i> scattered in the higher elevated areas) open forest over <i>Cratystylis conocephala</i> , <i>Eremophila</i> spp. open shrubland over <i>Atriplex nummularia</i> and <i>Rhagodia ulicina</i> scattered low shrubs.
Distribution	This vegetation type (Plate 5.5) occurred in the northwestern corner of the study area.
Sampling Sites	LSC05.
Vegetation Condition	Excellent.



Plate 5.5: Representative photographs of the E5 vegetation type.

**5.2.6 MS: *Melaleuca* tall open shrubland over samphire low shrubland**

Vegetation Code	MS
Vegetation Type Description	<i>Melaleuca subalaris</i> , ( <i>Melaleuca thyooides</i> and <i>Melaleuca lateriflora</i> ) tall open shrubland over <i>Tecticornia</i> spp., <i>Maireana</i> spp. and <i>Frankenia</i> spp. low shrubland.
Distribution	This vegetation type (Plate 5.6) occurred around almost the entirety of the salt lake margins.
Sampling Sites	LSC02, LSC08, LSC10.
Vegetation Condition	Pristine.



**Plate 5.6:** Representative photographs of the MS vegetation type.

**5.2.7 SS: Samphire low shrubland**

Vegetation Code	SS
Vegetation Type Description	<i>Melaleuca thyoides</i> , <i>Melaleuca subularis</i> scattered tall shrubs (on margins) over <i>Tecticornia halocnemoides</i> subsp. <i>caudata</i> , <i>Maireana amoena</i> low shrubland.
Distribution	This vegetation type (Plate 5.7) occurred in low depressions within the <i>Eucalyptus</i> open forests. It was devoid of larger shrubs, other than scattered <i>Melaleuca</i> species along the margins.
Sampling Sites	Detailed mapping notes.
Vegetation Condition	Pristine.



**Plate 5.7:** Representative photographs of the SS vegetation type.

**5.2.8 Other Mapping Units**

**SL:** The salt lake bed was naturally devoid of any vegetation (Plate 5.8) and made up 33.9% (84.1 ha) of the area mapped.

**RT:** Cleared gravel roads and tracks were similarly devoid of native vegetation and made up 0.6% (1.4 ha) of the area mapped.



**Plate 5.8:** Representative photograph of the SL vegetation type.



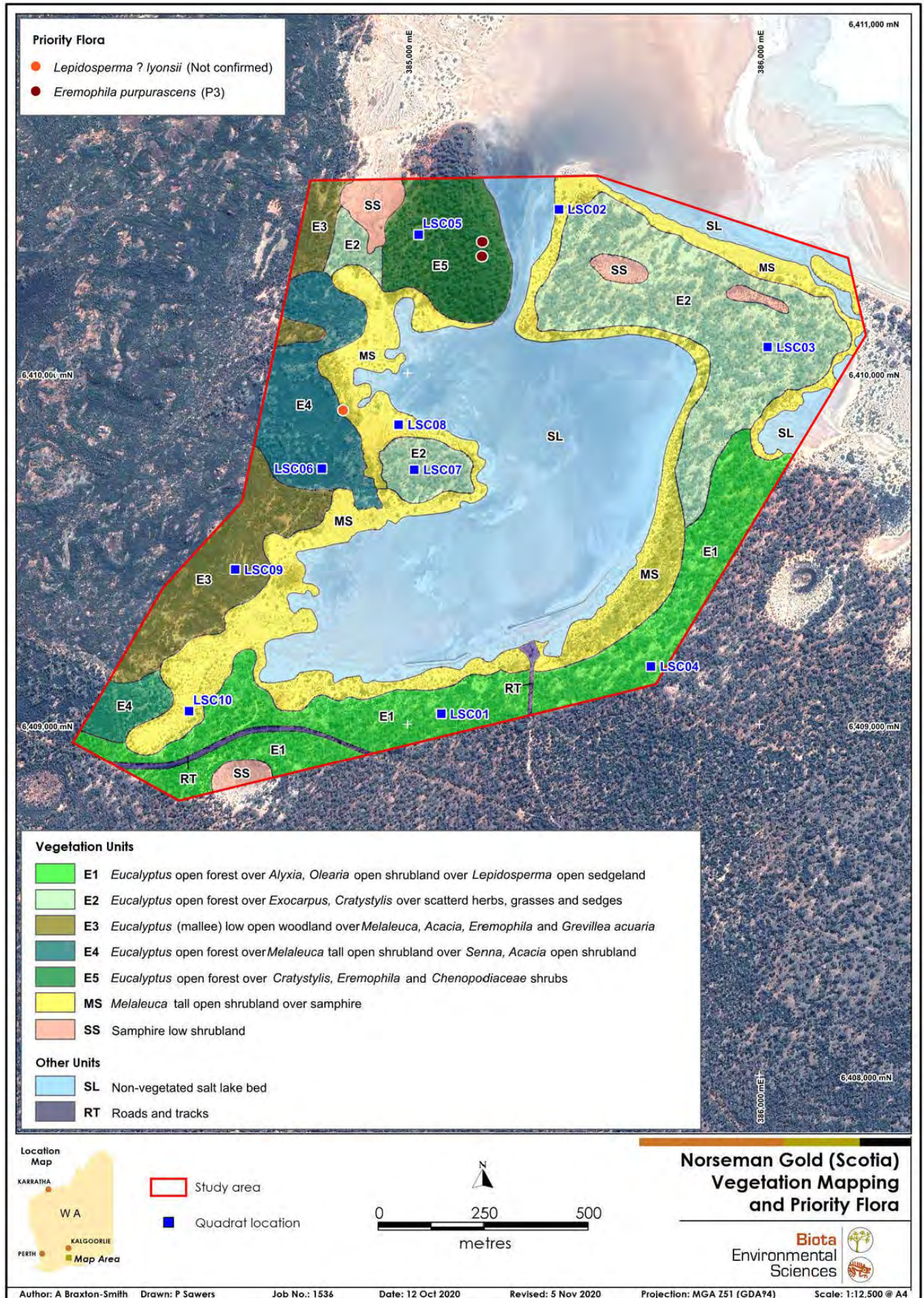


Figure 5.2: Vegetation units of the study area, with locations of Priority flora.

## 5.3 Condition of the Vegetation Types

The condition of the vegetation in the study area is mapped in Figure 5.3. The vegetation condition assessments were based on the ranking scale of Keighery (1994). The rankings considered the degree of invasion by introduced flora (weeds), impact from historical and ongoing human activity, and the structural integrity of the vegetation (see Appendix 4). The cleared areas (vegetation type RT), which was devoid of native vegetation, was assigned 'Completely Degraded'. Vegetation type SL (non-vegetated salt lake bed) was naturally devoid of native vegetation and was not assigned a condition rating.

A large portion of the vegetated study area had a condition rating of 'Pristine', with no signs of human disturbance or presence of introduced flora (weeds) (Figure 5.3). Vegetation type E5 was assigned a condition rating of 'Excellent' due to the presence of the weed species *\*Pentameris airoides* (location shown in Figure 5.3; see also Section 6.4). The extent of the vegetation condition categories are provided in Table 5.3.

**Table 5.3: Extent of vegetation condition categories within the study area.**

Condition Ranking	Area (ha)	Proportion of Study Area (%)
Pristine	150.7	60.7
Excellent	11.8	4.8
Very Good	–	–
Good	–	–
Degraded	–	–
Completely Degraded	1.4	0.6
N/A (Non-vegetated)	84.1	33.9
<b>Total</b>	<b>248.0</b>	<b>100.0</b>

## 5.4 Vegetation of Conservation Significance

### 5.4.1 Threatened and Priority Ecological Communities

Database search results showed that the study area does not intersect any mapped occurrences of Threatened or Priority Ecological Communities. The current study confirmed the absence of TECs or PECs within the study area, with the nearest known PEC located approximately 12 km north, namely the Priority 1 '*Allocasuarina globosa* assemblages on greenstone rock (Esperance District)'. Confirmation of the absence of this PEC is further reinforced by the absence of the species *Allocasuarina globosa* from the study area.

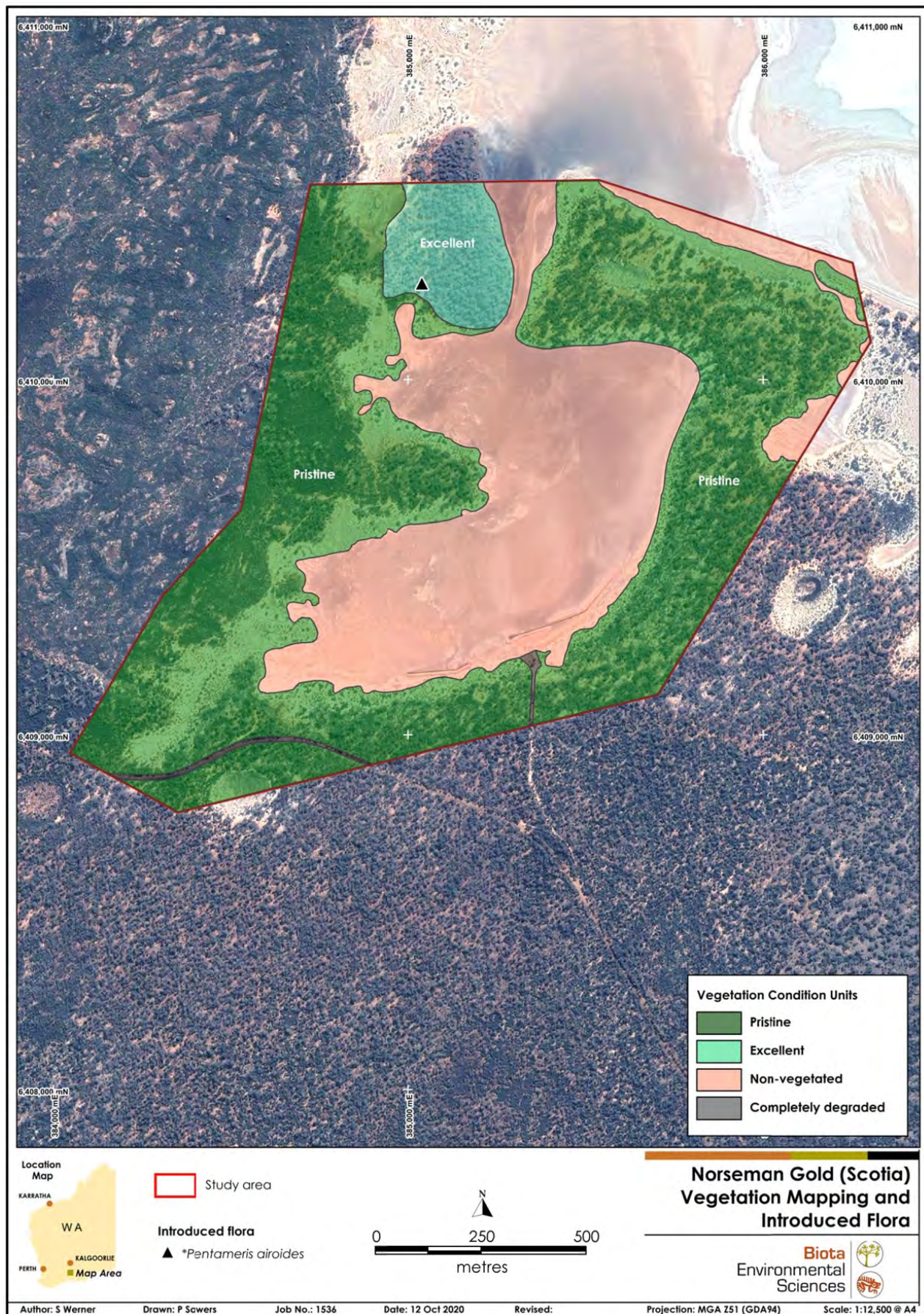


Figure 5.3: Vegetation condition of the study area, with locations of introduced flora.

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## 6.0 Flora

### 6.1 Overview

A total of 136 native vascular flora taxa from 68 genera and 41 families were recorded from the study area in 2020, and some additional taxa were previously recorded in the area by Mattiske (2020) (see Appendix 7). One introduced flora species (*\*Pentameris airoides*) was recorded in 2020, and is discussed further in Section 6.4.

Native plant families and genera with the highest species richness are shown in Table 6.1. The dominant families and genera recorded from the study area are typically well represented in species lists from the Eastern Goldfields region (see Table 6.1).

**Table 6.1: Native families and genera with the highest species richness in the study area (based on 2020 data only).**

Family	No. of Native Taxa	Genus	No. of Native Taxa
Myrtaceae	26	<i>Eucalyptus</i>	14
Chenopodiaceae	13	<i>Acacia</i>	10
Fabaceae	13	<i>Melaleuca</i>	10
Scrophulariaceae	9	<i>Eremophila</i>	9
Asteraceae	7	<i>Pterostylis</i>	4
Orchidaceae	6		

A full list of flora species identified during this study is presented in Appendix 7. It is not possible to accurately determine the total number of species recorded, as approximately 11 of the taxa listed were insufficiently resolved to determine if they may include more than one taxon (e.g. "Poaceae sp." and "*Lepidosperma* sp."), or may represent taxa that are already listed.

### 6.2 Unresolved Taxa

The majority (92%) of taxa were able to be determined with confidence to the lowest level possible within the current available taxonomic framework. The remaining species generally lacked sufficient material and were lodged with the WA Herbarium for formal identification. The following taxa warrant particular comment:

- Four *Lepidosperma* specimens were submitted to the WA Herbarium for identification, as this genus is currently undergoing revision by Dr Russell Barrett. Unfortunately, due this revision process, the WAH were unable to provide authoritative identifications. It's possible that one or more of the specimens submitted represent conservation significant species.
- Single specimens of the orchids *Diuris* sp. and *Pterostylis* sp. were not collected in the field; these had sufficient material to confirm to genus, but inadequate for further determination to species.

### 6.3 Flora of Conservation Significance

#### 6.3.1 Threatened Flora

No species listed as Threatened under the EPBC Act or BC Act were recorded in the study area, and none of the species that have been recorded from the locality are considered likely to occur (see Appendix 3).

### 6.3.2 Priority Flora

One confirmed Priority species, *Eremophila purpurascens* (Priority 3), was identified within the study area; one of the unidentified *Lepidosperma* specimens may represent a Priority species, however this is unable to be determined until the taxonomic revision is complete (see Section 6.2). Detailed location information for these taxa is presented in Table 6.2 and shown in Figure 5.2, with a brief summary of each taxon provided below.

**Table 6.2** Priority flora locations within the study area.

Species	Cons. Status	Easting (mE)	Northing (mN)
<b>Confirmed</b>			
<i>Eremophila purpurascens</i>	Priority 3	385212	6410377
<i>Eremophila purpurascens</i>	Priority 3	385211	6410336
<b>Pending Confirmation</b>			
<i>Lepidosperma</i> ? <i>lyonsii</i>	Priority 1	384817	6409896

#### *Eremophila purpurascens* (confirmed)

**(Priority 3)**

This species is an erect bushy shrub to 1.5 m tall, with pink, purple and/or red flowers (Plate 6.1). It has been recorded on sandy clay, stony loam over greenstone on granite hills and rocks (WA Herbarium 2020). The distribution of this species is limited to the Dundas Local Government Area (LGA) with the closest recorded location only 3.6 km north of the study area (WA Herbarium 2020). Two plants were recorded within the study area (Figure 5.2).



**Plate 6.1:** *Eremophila purpurascens* – specimen collected in the study area placed against WA Herbarium specimen (WA Herbarium 2020b).

#### *Lepidosperma* ? *lyonsii* (pending confirmation)

**(Priority 1)**

This species is a tufted rhizomatous perennial sedge, reaching 0.5 m in height, with distichous culms and leaves (Plate 6.3). It has been recorded in skeletal sandy loam with banded ironstone gravel along gentle hill slopes and upper slopes of large hills (WA Herbarium 2020a). The distribution of this species extends from the LGAs of Yilgarn across Kalgoorlie-Boulder. The closest confirmed voucher specimen is from about 200 km northwest of the study area, however specimens of "*Lepidosperma* aff. *lyonsii*" have been vouchered from 7 km north of the study area. A small population of this species was recorded (Figure 5.2, Table 6.2). This genus is currently undergoing revision by Dr Russell Barrett as discussed in Section 6.2.



**Plate 6.2** *Lepidosperma ? lyonsii* – specimen collected in the study area placed against the specimen at the WA Herbarium (WA Herbarium 2020b) and close up comparison of the rhizomatous base.

## 6.4 Introduced Flora

Introduced flora (weeds) were uncommon within the study area, with only one species found, namely *\*Pentameris airoides* (False Hairgrass). This species was found opportunistically (385039 mE, 6410270 mN; location shown in Figure 5.3). Under the then Department of Parks and Wildlife's Weed Prioritisation Process for the Goldfields region (Department of Parks and Wildlife 2014), this species was given an Ecological Impact rating of Unknown and an Invasiveness rating of Rapid. In the previous survey conducted in Autumn 2020 (Mattiske 2020), no introduced taxa were recorded in the quadrats that were located within the current study area.

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## 7.0 Key Biological Constraints

### 7.1 Matters of National Environmental Significance

#### 7.1.1 Vegetation

Based on database search results, the field survey data, and a review of regional vegetation mapping and associated literature, the study area does not intersect any mapped occurrences of TECs.

The EPBC Act PMST search results from the desktop review returned the Endangered Priority 3 'Proteaceae Dominated Kwongan Shrublands of the Southeast Coastal Floristic Province of Western Australia' TEC as potentially occurring within the area, however as this community is located within the south coast region of Western Australia, it would not occur within the study area.

#### 7.1.2 Flora

No flora species listed as Threatened under the EPBC Act were recorded during the field survey. One Threatened species (*Allocasuarina globosa*) was considered to have some potential to occur within the study area based on the desktop review (see Section 4.8), but was not encountered during the field survey and is now considered unlikely to occur (see Section 6.3.1).

### 7.2 Other Features of Significance

#### 7.2.1 Vegetation

Based on database search results, the field survey data, and review of regional vegetation mapping and associated literature, the study area does not intersect any mapped occurrences of PECs.

The DBCA Threatened and Priority Ecological Communities database search returned the Priority 1 '*Allocasuarina globosa* assemblages on Greenstone rock (Esperance District)' PEC as potentially occurring within the area. This was considered "unlikely to occur" as the community is strongly linked to greenstone ridges, which are absent from the study area. The nearest known location of this PEC is located 12 km north of the study area.

#### 7.2.2 Flora

One confirmed State-listed Priority species was recorded within the study area, *Eremophila purpurascens* (Priority 3); single individuals of the shrub were recorded from two locations within the study area.

One potential State-listed Priority species, *Lepidosperma* ? *lyonsii* (Priority 1), was not able to be confirmed through the formal identification process as the taxonomic revision for the genus is not yet complete. A small population of this species was found within the MS vegetation type along the central western edge of the study area.

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# Appendix 1

## Framework for Conservation Significance Ranking of Communities and Species in WA





## **A. Definitions, Categories and Criteria for Threatened and Priority Ecological Communities**

Species and Communities Branch, Department of Environment and Conservation, December 2010.

### **1. General Definitions**

#### **Ecological Community**

A naturally occurring biological assemblage that occurs in a particular type of habitat.

Note: The scale at which biological communities are defined will often depend on the level of detail in the information source, therefore no particular scale is specified.

A **threatened ecological community** (TEC) is one which is found to fit into one of the following categories; "presumed totally destroyed", "critically endangered", "endangered" or "vulnerable".

Possible threatened ecological communities that do not meet survey criteria are added to the Department of Parks and Wildlife's Priority Ecological Community Lists under Priorities 1, 2 and 3. Ecological Communities that are adequately known, are rare but not threatened, or meet criteria for Near Threatened, or that have been recently removed from the threatened list, are placed in Priority 4. These ecological communities require regular monitoring. Conservation Dependent ecological communities are placed in Priority 5.

An **assemblage** is a defined group of biological entities.

**Habitat** is defined as the areas in which an organism and/or assemblage of organisms lives. It includes the abiotic factors (e.g. substrate and topography), and the biotic factors.

**Occurrence:** a discrete example of an ecological community, separated from other examples of the same community by more than 20 metres of a different ecological community, an artificial surface or a totally destroyed community.

By ensuring that every discrete occurrence is recognised and recorded future changes in status can be readily monitored.

**Adequately Surveyed** is defined as follows:

"An ecological community that has been searched for thoroughly in most likely habitats, by relevant experts."

**Community structure** is defined as follows:

"The spatial organisation, construction and arrangement of the biological elements comprising a biological assemblage" (e.g. *Eucalyptus salmonophloia* woodland over scattered small shrubs over dense herbs; structure in a faunal assemblage could refer to trophic structure, e.g. dominance by feeders on detritus as distinct from feeders on live plants).

Definitions of **Modification** and **Destruction** of an ecological community:

**Modification:** "changes to some or all of ecological processes (including abiotic processes such as hydrology), species composition and community structure as a direct or indirect result of human activities. The level of damage involved could be ameliorated naturally or by human intervention."

**Destruction:** "modification such that reestablishment of ecological processes, species composition and community structure within the range of variability exhibited by the original community is unlikely within the foreseeable future even with positive human intervention."

**Note:** Modification and destruction are difficult concepts to quantify, and their application will be determined by scientific judgement. Examples of modification and total destruction are cited below:

Modification of ecological processes: The hydrology of Toolibin Lake has been altered by clearing of the catchment such that death of some of the original flora has occurred due to dependence on fresh water. The system may be brought back to a semblance of the original state by redirecting saline runoff and pumping waters of the rising underground watertable away to restore the hydrological balance. Total destruction of downstream lakes has occurred due to hydrology being altered to the point that few of the original flora or fauna species are able to tolerate the level of salinity and/or water logging.

Modification of structure: The understorey of a plant community may be altered by weed invasion due to nutrient enrichment by addition of fertiliser. Should the additional nutrients be removed from the system the balance may be restored, and the original plant species better able to compete. Total destruction may

occur if additional nutrients continue to be added to the system causing the understorey to be completely replaced by weed species, and death of overstorey species due to inability to tolerate high nutrient levels. Modification of species composition: Pollution may cause alteration of the invertebrate species present in a freshwater lake. Removal of pollutants may allow the return of the original inhabitant species. Addition of residual highly toxic substances may cause permanent changes to water quality, and total destruction of the community.

**Threatening processes** are defined as follows:

“Any process or activity that threatens to destroy or significantly modify the ecological community and/or affect the continuing evolutionary processes within any ecological community.”

Examples of some of the continuing threatening processes in Western Australia include: general pollution; competition, predation and change induced in ecological communities as a result of introduced animals; competition and displacement of native plants by introduced species; hydrological changes; inappropriate fire regimes; diseases resulting from introduced micro-organisms; direct human exploitation and disturbance of ecological communities.

**Restoration** is defined as returning an ecological community to its pre-disturbance or natural state in terms of abiotic conditions, community structure and species composition.

**Rehabilitation** is defined as the re-establishment of ecological attributes in a damaged ecological community although the community will remain modified.

## 2. Definitions and Criteria for Presumed Totally Destroyed, Critically Endangered, Endangered and Vulnerable Ecological Communities

### ECOLOGICAL COMMUNITIES

#### Presumed Totally Destroyed (PD)

An ecological community that has been adequately searched for but for which no representative occurrences have been located. The community has been found to be totally destroyed or so extensively modified throughout its range that no occurrence of it is likely to recover its species composition and/or structure in the foreseeable future.

An ecological community will be listed as presumed totally destroyed if there are no recent records of the community being extant and either of the following applies (A or B):

- A) Records within the last 50 years have not been confirmed despite thorough searches of known or likely habitats or
- B) All occurrences recorded within the last 50 years have since been destroyed

#### Critically Endangered (CR)

An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or that was originally of limited distribution and is facing severe modification or destruction throughout its range in the immediate future, or is already severely degraded throughout its range but capable of being substantially restored or rehabilitated.

An ecological community will be listed as Critically Endangered when it has been adequately surveyed and is found to be facing an extremely high risk of total destruction in the immediate future. This will be determined on the basis of the best available information, by it meeting any one or more of the following criteria (A, B or C):

- A) The estimated geographic range, and/or total area occupied, and/or number of discrete occurrences since European settlement have been reduced by at least 90% and either or both of the following apply (i or ii):
  - i) geographic range, and/or total area occupied and/or number of discrete occurrences are continuing to decline such that total destruction of the community is imminent (within approximately 10 years);
  - ii) modification throughout its range is continuing such that in the immediate future (within approximately 10 years) the community is unlikely to be capable of being substantially rehabilitated.
- B) Current distribution is limited, and one or more of the following apply (i, ii or iii):
  - i) geographic range and/or number of discrete occurrences, and/or area occupied is highly restricted and the community is currently subject to known threatening processes which are likely to result in total destruction throughout its range in the immediate future (within approximately 10 years);



- ii) there are very few occurrences, each of which is small and/or isolated and extremely vulnerable to known threatening processes;
  - iii) there may be many occurrences but total area is very small and each occurrence is small and/or isolated and extremely vulnerable to known threatening processes.
- C) The ecological community exists only as highly modified occurrences that may be capable of being rehabilitated if such work begins in the immediate future (within approximately 10 years).

### **Endangered (EN)**

An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or was originally of limited distribution and is in danger of significant modification throughout its range or severe modification or destruction over most of its range in the near future.

An ecological community will be listed as Endangered when it has been adequately surveyed and is not Critically Endangered but is facing a very high risk of total destruction in the near future. This will be determined on the basis of the best available information by it meeting any one or more of the following criteria (A, B, or C):

- A) The geographic range, and/or total area occupied, and/or number of discrete occurrences have been reduced by at least 70% since European settlement and either or both of the following apply (i or ii):
  - i) the estimated geographic range, and/or total area occupied and/or number of discrete occurrences are continuing to decline such that total destruction of the community is likely in the short term future (within approximately 20 years);
  - ii) modification throughout its range is continuing such that in the short term future (within approximately 20 years) the community is unlikely to be capable of being substantially restored or rehabilitated.
- B) Current distribution is limited, and one or more of the following apply (i, ii or iii):
  - i) geographic range and/or number of discrete occurrences, and/or area occupied is highly restricted and the community is currently subject to known threatening processes which are likely to result in total destruction throughout its range in the short term future (within approximately 20 years);
  - ii) there are few occurrences, each of which is small and/or isolated and all or most occurrences are very vulnerable to known threatening processes;
  - iii) there may be many occurrences but total area is small and all or most occurrences are small and/or isolated and very vulnerable to known threatening processes.
- C) The ecological community exists only as very modified occurrences that may be capable of being substantially restored or rehabilitated if such work begins in the short-term future (within approximately 20 years).

### **Vulnerable (VU)**

An ecological community that has been adequately surveyed and is found to be declining and/or has declined in distribution and/or condition and whose ultimate security has not yet been assured and/or a community that is still widespread but is believed likely to move into a category of higher threat in the near future if threatening processes continue or begin operating throughout its range.

An ecological community will be listed as Vulnerable when it has been adequately surveyed and is not Critically Endangered or Endangered but is facing a high risk of total destruction or significant modification in the medium to long-term future. This will be determined on the basis of the best available information by it meeting any one or more of the following criteria (A, B or C):

- A) The ecological community exists largely as modified occurrences that are likely to be capable of being substantially restored or rehabilitated.
- B) The ecological community may already be modified and would be vulnerable to threatening processes, is restricted in area and/or range and/or is only found at a few locations.
- C) The ecological community may be still widespread but is believed likely to move into a category of higher threat in the medium to long term future because of existing or impending threatening processes.

### 3. Definitions and Criteria for Priority Ecological Communities

#### **PRIORITY ECOLOGICAL COMMUNITY LIST**

Possible threatened ecological communities that do not meet survey criteria or that are not adequately defined are added to the Priority Ecological Community Lists under Priorities 1, 2 and 3. These three categories are ranked in order of priority for survey and/or definition of the community, and evaluation of conservation status, so that consideration can be given to their declaration as threatened ecological communities. Ecological Communities that are adequately known, and are rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list, are placed in Priority 4. These ecological communities require regular monitoring. Conservation Dependent ecological communities are placed in Priority 5.

#### **Priority One:** Poorly-known ecological communities

Ecological communities with apparently few, small occurrences, all or most not actively managed for conservation (e.g. within agricultural or pastoral lands, urban areas, active mineral leases) and for which current threats exist. Communities may be included if they are comparatively well-known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under immediate threat from known threatening processes across their range.

#### **Priority Two:** Poorly-known ecological communities

Communities that are known from few small occurrences, all or most of which are actively managed for conservation (e.g. within national parks, conservation parks, nature reserves, State forest, unallocated Crown land, water reserves, etc.) and not under imminent threat of destruction or degradation. Communities may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under threat from known threatening processes.

#### **Priority Three:** Poorly known ecological communities

- (i) Communities that are known from several to many occurrences, a significant number or area of which are not under threat of habitat destruction or degradation or;
- (ii) communities known from a few widespread occurrences, which are either large or within significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat, or;
- (iii) communities made up of large, and/or widespread occurrences, that may or not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing by domestic and/or feral stock, and inappropriate fire regimes.

Communities may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and/or are not well defined, and known threatening processes exist that could affect them.

**Priority Four:** Ecological communities that are adequately known, rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list. These communities require regular monitoring.

- (a) Rare. Ecological communities known from few occurrences that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These communities are usually represented on conservation lands.
- (b) Near Threatened. Ecological communities that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable.
- (c) Ecological communities that have been removed from the list of threatened communities during the past five years.

#### **Priority Five:** Conservation Dependent ecological communities

Ecological communities that are not threatened but are subject to a specific conservation program, the cessation of which would result in the community becoming threatened within five years.

## **B. Categories for Flora and Fauna Species**

### **1. Western Australian Biodiversity Conservation Act 2016, and Priority Species Classification**

In Western Australia, 'Threatened', 'Extinct' and 'Specially Protected' fauna and flora species are protected under the *Biodiversity Conservation Act 2016* (the BC Act), making it an offence to take or disturb these species without Ministerial approval. The definition of 'take' is broad, and includes killing, injuring, harvesting or capturing fauna, and gathering, cutting, destroying, harvesting or damaging flora.

Such species are classified within a framework of several categories.

Species of the highest conservation significance are designated as Threatened species and are protected under sections 19(1)(a), 19(1)(b) and 19(1)(c) of the BC Act. Species are listed within one of three categories:

- Critically endangered (CR), Endangered (EN), or Vulnerable (V), representing those species listed in Schedules 1 to 3 respectively of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* or the *Wildlife Conservation (Rare Flora) Notice 2018*.

Presumed extinct species are protected under sections 24 and 25 of the BC Act and are listed in one of two categories:

- Extinct (EX), representing those species listed in Schedule 4 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* or the *Wildlife Conservation (Rare Flora) Notice 2018*; or
- Extinct in the wild (EW); there are currently no listed species under this category.

Specially protected species are protected under section 13(1) of the BC Act, and include species of special conservation interest, migratory species, cetaceans, species subject to international agreement, or species otherwise in need of special protection. Of these:

- Migratory species (MI) are those listed under schedule 5 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018*;
- Species of special conservation interest (conservation dependent fauna) (CD) are those listed under schedule 6 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018*; and
- Other specially protected fauna (OS) are those listed under schedule 7 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018*;

In addition to the species formally designated as protected under the BC Act, the WA Department of Biodiversity, Conservation and Attractions (DBCA) also maintains a list of 'Priority species'.

Species that appear to be rare or threatened, but for which there is insufficient information to properly evaluate their conservation significance, are assigned to one of three Priority categories (Priority 1 to Priority 3), while species that are adequately known but require regular monitoring are assigned to Priority 4.

Note that of the above classifications, only 'Threatened', 'Extinct' and 'Specially Protected' species have statutory standing. The Priority flora and fauna classifications are employed by the WA DBCA to manage and classify their database of species considered potentially rare or at risk, but these categories have no legislative status.

Further explanations of the categories is provided in more detail in the following pages.



# CONSERVATION CODES

## For Western Australian Flora and Fauna

Threatened, Extinct and Specially Protected fauna or flora<sup>1</sup> are species<sup>2</sup> which have been adequately searched for and are deemed to be, in the wild, threatened, extinct or in need of special protection, and have been gazetted as such.

**The *Wildlife Conservation (Specially Protected Fauna) Notice 2018* and the *Wildlife Conservation (Rare Flora) Notice 2018* have been transitioned under regulations 170, 171 and 172 of the *Biodiversity Conservation Regulations 2018* to be the lists of Threatened, Extinct and Specially Protected species under Part 2 of the *Biodiversity Conservation Act 2016*.**

Categories of Threatened, Extinct and Specially Protected fauna and flora are:

### **T**     **Threatened species**

Listed by order of the Minister as Threatened in the category of critically endangered, endangered or vulnerable under section 19(1), or is a rediscovered species to be regarded as threatened species under section 26(2) of the *Biodiversity Conservation Act 2016* (BC Act).

**Threatened fauna** is that subset of 'Specially Protected Fauna' listed under schedules 1 to 3 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for Threatened Fauna.

**Threatened flora** is that subset of 'Rare Flora' listed under schedules 1 to 3 of the *Wildlife Conservation (Rare Flora) Notice 2018* for Threatened Flora.

The assessment of the conservation status of these species is based on their national extent and ranked according to their level of threat using IUCN Red List categories and criteria as detailed below.

### **CR**     **Critically endangered species**

Threatened species considered to be "*facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with criteria set out in the ministerial guidelines*".

Listed as critically endangered under section 19(1)(a) of the BC Act in accordance with the criteria set out in section 20 and the ministerial guidelines. Published under schedule 1 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for critically endangered fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for critically endangered flora.

### **EN**     **Endangered species**

Threatened species considered to be "*facing a very high risk of extinction in the wild in the near future, as determined in accordance with criteria set out in the ministerial guidelines*".

Listed as endangered under section 19(1)(b) of the BC Act in accordance with the criteria set out in section 21 and the ministerial guidelines. Published under schedule 2 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for endangered fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for endangered flora.

### **VU**     **Vulnerable species**

Threatened species considered to be "*facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with criteria set out in the ministerial guidelines*".

Listed as vulnerable under section 19(1)(c) of the BC Act in accordance with the criteria set out in section 22 and the ministerial guidelines. Published under schedule 3 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for vulnerable fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for vulnerable flora.

## **Extinct species**

Listed by order of the Minister as extinct under section 23(1) of the BC Act as extinct or extinct in the wild.

### **EX Extinct species**

Species where “*there is no reasonable doubt that the last member of the species has died*”, and listing is otherwise in accordance with the ministerial guidelines (section 24 of the BC Act).

Published as presumed extinct under schedule 4 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for extinct fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for extinct flora.

### **EW Extinct in the wild species**

Species that “*is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; and it has not been recorded in its known habitat or expected habitat, at appropriate seasons, anywhere in its past range, despite surveys over a time frame appropriate to its life cycle and form*”, and listing is otherwise in accordance with the ministerial guidelines (section 25 of the BC Act).

Currently there are no threatened fauna or threatened flora species listed as extinct in the wild. If listing of a species as extinct in the wild occurs, then a schedule will be added to the applicable notice.

## **Specially protected species**

Listed by order of the Minister as specially protected under section 13(1) of the BC Act. Meeting one or more of the following categories: species of special conservation interest; migratory species; cetaceans; species subject to international agreement; or species otherwise in need of special protection.

Species that are listed as threatened species (critically endangered, endangered or vulnerable) or extinct species under the BC Act cannot also be listed as Specially Protected species.

### **MI Migratory species**

Fauna that periodically or occasionally visit Australia or an external Territory or the exclusive economic zone; or the species is subject of an international agreement that relates to the protection of migratory species and that binds the Commonwealth; and listing is otherwise in accordance with the ministerial guidelines (section 15 of the BC Act).

Includes birds that are subject to an agreement between the government of Australia and the governments of Japan (JAMBA), China (CAMBA) and The Republic of Korea (ROKAMBA), and fauna subject to the *Convention on the Conservation of Migratory Species of Wild Animals* (Bonn Convention), an environmental treaty under the United Nations Environment Program. Migratory species listed under the BC Act are a subset of the migratory animals, that are known to visit Western Australia, protected under the international agreements or treaties, excluding species that are listed as Threatened species.

Published as migratory birds protected under an international agreement under schedule 5 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018*.

### **CD Species of special conservation interest (conservation dependent fauna)**

Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened, and listing is otherwise in accordance with the ministerial guidelines (section 14 of the BC Act).

Published as conservation dependent fauna under schedule 6 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018*.

### **OS Other specially protected species**

Fauna otherwise in need of special protection to ensure their conservation, and listing is otherwise in accordance with the ministerial guidelines (section 18 of the BC Act).

Published as other specially protected fauna under schedule 7 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018*.

**P** **Priority species**

Possibly threatened species that do not meet survey criteria, or are otherwise data deficient, are added to the Priority Fauna or Priority Flora Lists under Priorities 1, 2 or 3. These three categories are ranked in order of priority for survey and evaluation of conservation status so that consideration can be given to their declaration as threatened fauna or flora.

Species that are adequately known, are rare but not threatened, or meet criteria for near threatened, or that have been recently removed from the threatened species or other specially protected fauna lists for other than taxonomic reasons, are placed in Priority 4. These species require regular monitoring.

Assessment of Priority codes is based on the Western Australian distribution of the species, unless the distribution in WA is part of a contiguous population extending into adjacent States, as defined by the known spread of locations.

**1** **Priority 1: Poorly-known species**

Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.

**2** **Priority 2: Poorly-known species**

Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.

**3** **Priority 3: Poorly-known species**

Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species are in need of further survey.

**4** **Priority 4: Rare, Near Threatened and other species in need of monitoring**

(a) Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection but could be if present circumstances change. These species are usually represented on conservation lands.

(b) Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for vulnerable but are not listed as Conservation Dependent.

(c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

<sup>1</sup> The definition of flora includes algae, fungi and lichens

<sup>2</sup> Species includes all taxa (plural of taxon - a classificatory group of any taxonomic rank, e.g. a family, genus, species or any infraspecific category i.e. subspecies or variety, or a distinct population).

## 2. Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*

Many of the species that are specially protected at State level are also listed as Threatened species at the Federal level, as one of the Matters of National Environmental Significance (MNES) identified under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (the EPBC Act). These may be classified as 'critically endangered', 'endangered', 'vulnerable' or 'lower risk', consistent with IUCN categories:

1. **Critically Endangered (CR):** a taxon is Critically Endangered when it is facing an extremely high risk of extinction in the wild in the immediate future.
2. **Endangered (EN):** a taxon is Endangered when it is not Critically Endangered but is facing a very high risk of extinction in the wild in the near future.
3. **Vulnerable (VU):** a taxon is Vulnerable when it is not Critically Endangered or Endangered but is facing a high risk of extinction in the wild in the medium-term future.
4. **Lower Risk (LR):** a taxon is Lower Risk when it has been evaluated, does not satisfy the criteria for any of the categories Critically Endangered, Endangered or Vulnerable. Taxa included in the Lower Risk category can be separated into three subcategories:
  - **Conservation Dependent (CD).** Taxa which are the focus of a continuing taxon-specific or habitat-specific conservation program targeted towards the taxon in question, the cessation of which would result in the taxon qualifying for one of the threatened categories above within a period of five years.
  - **Near Threatened (NT).** Taxa which do not qualify for Conservation Dependent, but which are close to qualifying for Vulnerable.
  - **Least Concern (LC).** Taxa which do not qualify for Conservation Dependent or Near Threatened.

In addition, numerous Migratory fauna species are listed as MNES under the EPBC Act (some of which are also listed as Threatened). Migratory species are those animals that migrate to Australia and its external territories, or pass through or over Australian waters during their annual migrations. The list of migratory species consists of those species listed under the following international conventions:

1. Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention);
2. China-Australia Migratory Bird Agreement (CAMBA);
3. Japan-Australia Migratory Bird Agreement (JAMBA); and,
4. Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA).

Marine species are also protected under the EPBC Act, and are listed to ensure the long-term conservation of the species. Marine species include all Australian sea snakes, seals, crocodiles, dugongs, marine turtles, seahorses and seabirds that naturally occur in the Commonwealth marine area.

Under the terms of the EPBC Act, an action (e.g. a project or development) is required to be referred to the Australian Government Environment Minister for approval if it has, will have, or is likely to have, a significant impact on an MNES. The term 'action' includes projects and developments subsequent to commencement of the Act, however there are a number of exemptions (e.g. projects in Commonwealth areas). According to Department of the Environment (2013), a 'significant impact' is an impact which is important, notable, or of consequence, having regard to its context or intensity. Whether or not an action is likely to have a significant impact depends upon the sensitivity, value, and quality of the environment which is impacted, and upon the intensity, duration, magnitude and geographic extent of the impacts.

### References:

Department of the Environment (2013). Matters of National Environmental Significance - Significant Impact Guidelines 1.1 *Environment Protection and Biodiversity Conservation Act 1999*. Department of the Environment, Canberra, Australia.





## Appendix 2

### Database Searches





# Scotia 30km radius

Created By Guest user on 15/10/2020

**Kingdom** Plantae  
**Conservation Status** Conservation Taxon (T, X, IA, S, P1-P5)  
**Current Names Only** Yes  
**Core Datasets Only** Yes  
**Species Group** All Plants  
**Method** 'By Circle'  
**Centre** 121° 46' 55" E, 32° 26' 31" S  
**Buffer** 30km  
**Group By** Conservation Status

Conservation Status	Species	Records
Priority 1	11	68
Priority 2	4	7
Priority 3	15	87
Priority 4	2	6
Rare or likely to become extinct	3	15
<b>TOTAL</b>	<b>35</b>	<b>183</b>

Name ID	Species Name	Naturalised	Conservation Code	<sup>1</sup> Endemic To Query Area
<b>Rare or likely to become extinct</b>				
1.	12656 <i>Allocasuarina globosa</i>		T	
2.	12327 <i>Daviesia microcarpa</i>		T	
3.	13645 <i>Eucalyptus platydisca</i>		T	
<b>Priority 1</b>				
4.	12256 <i>Acacia dorsenna</i>		P1	
5.	14617 <i>Acacia hystrix subsp. continua</i>		P1	
6.	30235 <i>Bossiaea arcuata</i>		P1	Y
7.	30237 <i>Bossiaea aurantiaca</i>		P1	
8.	31615 <i>Cryptandra exserta</i>		P1	
9.	12378 <i>Eucalyptus jimberlanica</i>		P1	
10.	2064 <i>Grevillea phillipsiana</i>		P1	
11.	16448 <i>Micromyrtus papillosa</i>		P1	
12.	18520 <i>Philothea apiculata</i>		P1	
13.	7649 <i>Scaevola tortuosa (Tortuous-stem Scaevola)</i>		P1	
14.	46035 <i>Verticordia sp. Dundas (C.A. Gardner 2848)</i>		P1	Y
<b>Priority 2</b>				
15.	14401 <i>Aotus sp. Dundas (M.A. Burgman 2835)</i>		P2	
16.	13206 <i>Drosera salina</i>		P2	
17.	23462 <i>Goodenia granitica</i>		P2	
18.	25876 <i>Triglochin sp. Condingup (R. Davis 10877)</i>		P2	
<b>Priority 3</b>				
19.	14048 <i>Acacia ancistrophylla var. perarcuata</i>		P3	
20.	14614 <i>Acacia truculenta</i>		P3	
21.	13897 <i>Allocasuarina eriochlamys subsp. grossa</i>		P3	
22.	17520 <i>Atriplex lindleyi subsp. conduplicata</i>		P3	
23.	34298 <i>Beyeria sulcata var. truncata</i>		P3	
24.	7258 <i>Eremophila purpurascens</i>		P3	
25.	15049 <i>Eremophila succinea</i>		P3	
26.	5569 <i>Eucalyptus brockwayi (Dundas Mahogany)</i>		P3	
27.	12888 <i>Eucalyptus histophylla</i>		P3	
28.	5754 <i>Eucalyptus pterocarpa</i>		P3	
29.	17655 <i>Goodenia laevis subsp. laevis</i>		P3	
30.	5891 <i>Melaleuca coccinea (Goldfields Bottlebrush)</i>		P3	
31.	14701 <i>Melaleuca macronychia subsp. trygonoides</i>		P3	
32.	6804 <i>Pityrodia chrysocalyx</i>		P3	
33.	13789 <i>Stylidium pulviniforme</i>		P3	

	Name ID	Species Name	Naturalised	Conservation Code	<sup>1</sup> Endemic To Query Area
<b>Priority 4</b>					
	34.	31763	<i>Lepidosperma lyonsii</i>		P4
	35.	6197	<i>Myriophyllum petraeum</i> ( <i>Granite Myriophyllum</i> )		P4

**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

<sup>1</sup> 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.



# 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: 08/10/20 13:18:25

[Summary](#)

[Details](#)

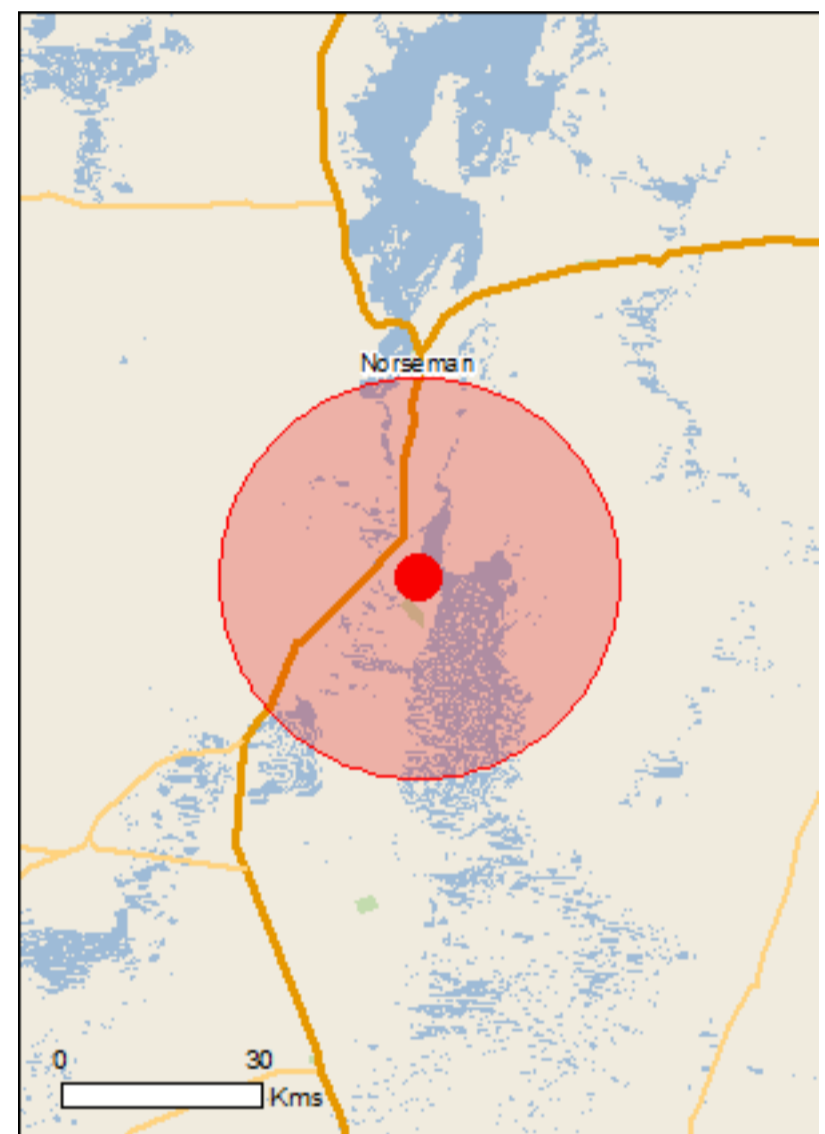
[Matters of NES](#)

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

[Extra Information](#)

[Caveat](#)

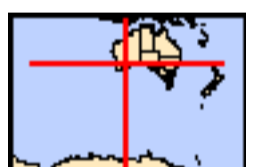
[Acknowledgements](#)



This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2015

[Coordinates](#)

Buffer: 30.0Km



# 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](#).

<a href="#">World Heritage Properties:</a>	None
<a href="#">National Heritage Places:</a>	None
<a href="#">Wetlands of International Importance:</a>	None
<a href="#">Great Barrier Reef Marine Park:</a>	None
<a href="#">Commonwealth Marine Area:</a>	None
<a href="#">Listed Threatened Ecological Communities:</a>	1
<a href="#">Listed Threatened Species:</a>	7
<a href="#">Listed Migratory Species:</a>	7

## 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.

<a href="#">Commonwealth Land:</a>	1
<a href="#">Commonwealth Heritage Places:</a>	None
<a href="#">Listed Marine Species:</a>	12
<a href="#">Whales and Other Cetaceans:</a>	None
<a href="#">Critical Habitats:</a>	None
<a href="#">Commonwealth Reserves Terrestrial:</a>	None
<a href="#">Australian Marine Parks:</a>	None

## Extra Information

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

<a href="#">State and Territory Reserves:</a>	2
<a href="#">Regional Forest Agreements:</a>	None
<a href="#">Invasive Species:</a>	13
<a href="#">Nationally Important Wetlands:</a>	None
<a href="#">Key Ecological Features (Marine)</a>	None

# Details

## Matters of National Environmental Significance

### Listed Threatened Ecological Communities

[\[ Resource Information \]](#)

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

Name	Status	Type of Presence
<a href="#">Proteaceae Dominated Kwongan Shrublands of the Southeast Coastal Floristic Province of Western Australia</a>	Endangered	Community may occur within area

### Listed Threatened Species

[\[ Resource Information \]](#)

Name	Status	Type of Presence
------	--------	------------------

#### Birds

<a href="#">Calidris ferruginea</a> Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
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<a href="#">Falco hypoleucos</a> Grey Falcon [929]	Vulnerable	Species or species habitat may occur within area
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<a href="#">Leipoa ocellata</a> Malleefowl [934]	Vulnerable	Species or species habitat known to occur within area
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<a href="#">Pezoporus occidentalis</a> Night Parrot [59350]	Endangered	Species or species habitat may occur within area
--	------------	--

#### Mammals

<a href="#">Dasyurus geoffroii</a> Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat may occur within area
---	------------	--

#### Plants

<a href="#">Daviesia microcarpa</a> Norseman Pea [56766]	Endangered	Species or species habitat likely to occur within area
---	------------	--

<a href="#">Eremophila lactea</a> Milky Emu Bush [2416]	Endangered	Species or species habitat may 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

<a href="#">Apus pacificus</a> Fork-tailed Swift [678]		Species or species habitat likely to occur within area
---	--	--

#### Migratory Terrestrial Species

Name	Threatened	Type of Presence
<a href="#">Motacilla cinerea</a> Grey Wagtail [642]		Species or species habitat may occur within area
<b>Migratory Wetlands Species</b>		
<a href="#">Actitis hypoleucos</a> Common Sandpiper [59309]		Species or species habitat may occur within area
<a href="#">Calidris acuminata</a> Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
<a href="#">Calidris ferruginea</a> Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
<a href="#">Calidris melanotos</a> Pectoral Sandpiper [858]		Species or species habitat may occur within area
<a href="#">Pandion haliaetus</a> Osprey [952]		Species or species habitat may occur within area

## Other Matters Protected by the EPBC Act

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

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

Name
Commonwealth Land -

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

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

Name	Threatened	Type of Presence
<b>Birds</b>		
<a href="#">Actitis hypoleucos</a> Common Sandpiper [59309]		Species or species habitat may occur within area
<a href="#">Apus pacificus</a> Fork-tailed Swift [678]		Species or species habitat likely to occur within area
<a href="#">Ardea alba</a> Great Egret, White Egret [59541]		Species or species habitat likely to occur within area
<a href="#">Ardea ibis</a> Cattle Egret [59542]		Species or species habitat may occur within area
<a href="#">Calidris acuminata</a> Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
<a href="#">Calidris ferruginea</a> Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
<a href="#">Calidris melanotos</a> Pectoral Sandpiper [858]		Species or species habitat may occur within area



Name	Threatened	Type of Presence
<a href="#">Chrysococcyx osculans</a> Black-eared Cuckoo [705]		Species or species habitat known to occur within area
<a href="#">Merops ornatus</a> Rainbow Bee-eater [670]		Species or species habitat may occur within area
<a href="#">Motacilla cinerea</a> Grey Wagtail [642]		Species or species habitat may occur within area
<a href="#">Pandion haliaetus</a> Osprey [952]		Species or species habitat may occur within area
<a href="#">Thinornis rubricollis</a> Hooded Plover [59510]		Species or species habitat may occur within area

## Extra Information

State and Territory Reserves	[ Resource Information ]
Name	State
Dundas	WA
Unnamed WA42943	WA

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

Name	Status	Type of Presence
<b>Birds</b>		
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
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
<b>Mammals</b>		
Camelus dromedarius Dromedary, Camel [7]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
<b>Plants</b>		
Carrichtera annua Ward's Weed [9511]		Species or species habitat likely to occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Tamarix aphylla Athel Pine, Athel Tree, Tamarisk, Athel Tamarisk, Athel Tamarix, Desert Tamarisk, Flowering Cypress, Salt Cedar [16018]		Species or species habitat likely to occur within area

# 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

-32.44315 121.7791

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

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Department of Agriculture Water and the Environment

GPO Box 858

Canberra City ACT 2601 Australia

+61 2 6274 1111

## Appendix 3

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# Potential Flora of Conservation Significance Compiled from Database and Literature Searches





Species	Habit	Habitat	Database Search				Previous Botanical Surveys	Likelihood of Occurrence Within the Study Area	
			Nature Map	TPFL Database	EPBC Act (PMST)	WA Herbarium		Initial Ranking Based on the Desktop Review (NR = nearest record)	Final Ranking including Results of 2020 Field Survey
<b>Threatened</b>									
<i>Allocasuarina globosa</i>	Shrub to 1.5 m tall.	Laterite, clay, loam; greenstone ridges.	☑	☑		☑		May potentially occur, if any suitable habitat present. (NR 13.3 km N).	Unlikely to occur; no particularly suitable habitat and not recorded during the field survey.
<i>Daviesia microcarpa</i> (Norseman Pea)	Shrub to 40 cm tall.	Weathered gravel on hills.	☑	☑	☑	☑		Unlikely to occur; no particularly suitable habitat and no records in close proximity (NR 26.2 km N).	Unlikely to occur.
<i>Eremophila lactea</i> (Milky Emu Bush)	Shrub to 3.5 m tall.	White sandy clay loam in <i>Eucalyptus</i> woodland and mixed shrubland.			☑			Unlikely to occur; known distribution is considerably further S (NR >80 km S).	Unlikely to occur.
<i>Eucalyptus platydisca</i>	Mallee to 4 m tall.	Granite soils on stony hills.	☑	☑		☑		Unlikely to occur; no suitable habitat and no records in close proximity (NR 26.3 km N).	Unlikely to occur.
<b>Priority 1</b>									
<i>Acacia dorsenna</i>	Shrub to 1.6 m tall.	Rocky sandy loam or clay loam. Low rocky hills.	☑	☑		☑		May potentially occur; some suitable habitat but no records in close proximity (NR 26.8 km N).	Unlikely to occur; not recorded during the field survey.
<i>Acacia hystrix</i> subsp. <i>continua</i>	Shrub to 1 m tall.	Flat plain, laterite.	☑	☑		☑		Unlikely to occur; no suitable habitat present; few known records, and none in close proximity (NR 25.1 km SW).	Unlikely to occur.
<i>Beyeria constellata</i>	Shrub to 1.5 m tall.	Gravelly sand.						N/A (NR 460 km NW)	Unlikely to occur.
<i>Bossiaea arcuata</i>	Shrub to 1.5 m tall.	Deep white sand. Perimeter of salt lakes.	☑	☑		☑		Likely to occur: suitable habitat present and records in close proximity (NR 14.6 km NW).	May potentially occur; not recorded during the field survey.
<i>Bossiaea aurantiaca</i>	Shrub to 1.5 m tall.	Red sand, red clay loam. Low-lying, winter-damp sites.	☑	☑		☑		Likely to occur: suitable habitat present and records in close proximity (NR 16.9 km NW).	May potentially occur; not recorded during the field survey.
<i>Calandrinia lefroyensis</i>	Slender perennial herb to 20 cm tall.	Sand dunes, saline flats, salt lake edges.					Mattiske (2020)	May potentially occur; suitable habitat present but no records in close proximity (nearest vouchered record 73 km N, but recorded by Mattiske (2020) from 31.6 km N).	May potentially occur; not recorded during the field survey but may not have been visible at the time.
<i>Cryptandra exserta</i>	Shrub to 50 cm tall.	Sandy soil with laterite gravel; mid-slopes and plains.	☑	☑		☑		May potentially occur; suitable habitat may be present (NR 16.3 km SW).	May potentially occur.
<i>Eucalyptus jimberlanica</i>	Tree (mallee) to 10 m tall.	Loam. Valley edges.	☑	☑		☑	Mattiske (2013)	May potentially occur; suitable habitat may be present and a	Unlikely to occur; not recorded during the field survey.

Species	Habit	Habitat	Database Search				Previous Botanical Surveys	Likelihood of Occurrence Within the Study Area	
			Nature Map	TPFL Database	EPBC Act (PMST)	WA Herbarium		Initial Ranking Based on the Desktop Review (NR = nearest record)	Final Ranking including Results of 2020 Field Survey
								record in close proximity (NR 8.2 km N).	
<i>Eucalyptus websteriana</i> subsp. <i>norsemanica</i>	Mallee to 3 m tall, minni ritchi bark.	Rocky rises.		☑		☑		Unlikely to occur; suitable habitat appears to be absent and no records in close proximity (NR 31.5 km NW)	Unlikely to occur.
<i>Grevillea phillipsiana</i>	Shrub to 1.5 m tall.	Red sand, stony loam. Granite hills.	☑	☑		☑		Unlikely to occur: only a small amount of suitable habitat appears to be present and no records in close proximity (NR 26.6 km N).	Unlikely to occur.
<i>Lepidosperma lyonsii</i>	Perennial sedge to 50 cm tall.	Skeletal sandy loam with banded ironstone gravel & rock, well-drained shallow stony loamy with quartz. Gentle hill slopes, upper slopes of large hill.	☑					May potentially occur: specimens identified as " <i>Lepidosperma</i> aff. <i>lyonsii</i> " vouchered from 7 km N.	Recorded (pending confirmation).
<i>Micromyrtus papillosa</i>	Shrub to 1.2 m tall.	Sandy or clay soils, ironstone, granite. Rocky sites, outcrops, on hills from base to summit.	☑	☑		☑		May potentially occur; a record in close proximity with minimal suitable habitat (NR 14.6 km N).	May potentially occur.
<i>Philothea apiculata</i>	Shrub to 1.5 m tall.	Stony clay loam. Rocky outcrops, hillsides.	☑	☑		☑	Mattiske (2013); GHD (2009, 2010).	May potentially occur; records in close proximity with minimal suitable habitat present (NR 8.3 km N).	May potentially occur.
<i>Philothea nutans</i>	Shrub to 90 cm tall.	Sandy soils. Low plains, undulating rises, edges of salt lakes.		☑				Unlikely to occur: suitable habitat present but only a single record from the locality, which was not vouchered; all other known records are over 400 km NW (32.5 km N).	Unlikely to occur.
<i>Scaevola tortuosa</i>	Perennial herb to 20 cm tall.	Margins of salt lakes.	☑	☑		☑		May potentially occur: suitable habitat present but no records in close proximity (NR 22.1 km SW).	Unlikely to occur; not recorded during field survey.
<i>Verticordia</i> sp. Dundas (C.A. Gardner 2848)	Shrub.	Red granitic soil.	☑			☑		Unlikely to occur; only records are from 1931, and location records are likely imprecise (NR apparently 1.5.9 km S).	Unlikely to occur.

**Priority 2**



Species	Habit	Habitat	Database Search				Previous Botanical Surveys	Likelihood of Occurrence Within the Study Area	
			Nature Map	TPFL Database	EPBC Act (PMST)	WA Herbarium		Initial Ranking Based on the Desktop Review (NR = nearest record)	Final Ranking including Results of 2020 Field Survey
<i>Acacia kerryana</i>	Spreading shrub to 1 m tall.	Granitic loamy sand, stony clayey loam or clayey sand. Low stony ridges, undulating plains.		☑		☑	Mattiske (2020)	May potentially occur: suitable habitat may be present but no records in close proximity (NR 26.6 km N).	Unlikely to occur; not recorded during field survey.
<i>Aotus</i> sp. Dundas (M.A. Burgman 2835)	Shrub to 1 m tall.	Edges of salt lakes, sandy soils.	☑			☑		Likely to occur; suitable habitat present and records to N and S (NR 8.3 km N).	May potentially occur; not recorded during field survey but would not have been flowering at the time and may have been overlooked.
<i>Drosera salina</i>	Perennial herb to 10 cm tall.	Salt-free white sand. Margins of salt lakes	☑	☑		☑	Paul Armstrong & Associates (2004)	Likely to occur; suitable habitat present and a record in very close proximity (NR 150 m N).	May potentially occur; not recorded during field survey but this small herb may be overlooked without intensive searches..
<i>Frankenia brachyphylla</i>	Halophytic shrub to 15 cm tall.	Salt lake margins.		☑		☑		Unlikely to occur; suitable habitat present but no records in close proximity (NR 44.6 km SW).	Unlikely to occur.
<i>Thysanotus brachyantherus</i>	Perennial herb to 40 cm tall.	Clay over limestone, loam, with samphire.	☑			☑		Unlikely to occur: suitable habitat may be present but no records in close proximity (NR 36 km N).	Unlikely to occur.
<i>Triglochin</i> sp. Condingup (R. Davis 10877)	Perennial herb.	Pools of water in granite outcrops, brown mud.	☑	☑		☑		Unlikely to occur; a record in close proximity but no suitable habitat (NR 8.7 km W).	Unlikely to occur.
<b>Priority 3</b>									
<i>Acacia ancistrophylla</i> var. <i>perarcuata</i>	Shrub to 1.6 m tall.	Red sand, clay loam, loam. Undulating plains.	☑			☑		Likely to occur; suitable habitat present and a record in close proximity (NR 5.6 km S).	Unlikely to occur: not recorded during field survey.
<i>Acacia truculenta</i>	Prickly shrub to 2.2 m tall.	Sand or loam.	☑			☑		Likely to occur: suitable habitat present and records to N and S (NR 16.6 km N).	May potentially occur; not recorded during field survey.
<i>Allocasuarina eriochlamys</i> subsp. <i>grossa</i>	Shrub to 3 m tall.	Stony loam, laterite clay. Granite outcrops and laterite hills.	☑			☑	Mattiske (2013)	Unlikely to occur: a record in close proximity but no particularly suitable habitat present (NR 16.5 km N).	Unlikely to occur.
<i>Atriplex lindleyi</i> subsp. <i>conduplicata</i>	Annual or perennial herb to 20 cm tall.	Clay plains	☑			☑		Would not occur; no suitable habitat and very rarely collected (NR 24 km N).	Would not occur.

Species	Habit	Habitat	Database Search				Previous Botanical Surveys	Likelihood of Occurrence Within the Study Area	
			Nature Map	TPFL Database	EPBC Act (PMST)	WA Herbarium		Initial Ranking Based on the Desktop Review (NR = nearest record)	Final Ranking including Results of 2020 Field Survey
<i>Beyeria sulcata</i> var. <i>truncata</i>	Shrub to 1.3 m tall.	Plains, orange-yellow sands.	☑			☑		May potentially occur; suitable habitat present but no records in close proximity (NR 26.2 km N).	Unlikely to occur; not recorded during field survey.
<i>Chrysocephalum apiculatum</i> subsp. <i>norsemanense</i>	Biannual (?) daisy to 40 cm tall.	Well-drained granitic loamy sandplains.				☑		May potentially occur; suitable habitat present but no records in close proximity (NR 29.9 km N).	Unlikely to occur; not recorded during field survey
<i>Cyathostemon</i> sp. Salmon Gums (B. Archer 769)	Shrub to 3 m tall.	Orange or white sand, sandy clay over granite, light brown clay with gypsum, saline soils. Flats, near river beds, claypans.				☑	Mattiske (2013)	Unlikely to occur; potentially some suitable habitat present (near salt lake) but no records in close proximity (NR 33.5 km SW).	Unlikely to occur.
<i>Eremophila purpurascens</i>	Shrub to 1.5 m tall.	Sandy clay, stony loam over greenstone. Granite hills and rocks.	☑			☑	Mattiske (2013); GHD (2009); Paul Armstrong & Associates (2004)	May potentially occur; some suitable habitat and a record in close proximity (NR 3.6 km N).	Recorded.
<i>Eremophila succinea</i>	Shrub to 3 m tall.	Sand over clay.	☑					Unlikely to occur; no particularly suitable habitat and nearest record location is uncertain (NR 23.1 km W).	Unlikely to occur.
<i>Eucalyptus brockwayi</i> (Dundas Mahogany)	Tree to 20 m tall.	Gravelly sandy loam. Low rocky hills and slopes.	☑			☑	Mattiske (2013); GHD (2009)	Unlikely to occur: a record in close proximity but no suitable habitat appears to be present (NR 6.2 km N).	Unlikely to occur.
<i>Eucalyptus histophylla</i> (Dundas Mallee)	Mallee to 6 m tall.	Sandy loam on granite or laterite; granite outcrops.	☑			☑		Unlikely to occur: a record in close proximity but minimal suitable habitat (NR 18.1 km SW).	Unlikely to occur.
<i>Eucalyptus pterocarpa</i>	Tree to 15 m tall.	Red-brown sandy loam, yellow-brown silty loam. Creek edges, rocky slopes.	☑			☑		Unlikely to occur: no particularly suitable habitat present and no records further SE from NR (30.9 km NW).	Unlikely to occur.
<i>Goodenia laevis</i> subsp. <i>laevis</i>	Subshrub to 25 cm tall.	Sandy loam or laterite.	☑			☑	Mattiske (2013)	May potentially occur : suitable habitat present; a record in close proximity but infrequently collected (16.5 km N).	May potentially occur.
<i>Melaleuca coccinea</i> (Goldfields Bottlebrush)	Shrub to 2.6 m tall.	Sandy loam over granite. Granite outcrops, sandplain, river valleys.	☑			☑	Mattiske (2013)	Unlikely to occur; a record in close proximity but no particularly suitable habitat present (NR 7.6 km N).	Unlikely to occur.
<i>Melaleuca macronychia</i> subsp. <i>trygonoides</i>	Shrub to 4 m tall.	Sandy soils. Granite outcrops.	☑			☑	Paul Armstrong & Associates (2004)	May potentially occur; small amount of granite appears to be present in W section of study area (NR 580 m NW).	Unlikely to occur; not recorded during field survey.

Species	Habit	Habitat	Database Search				Previous Botanical Surveys	Likelihood of Occurrence Within the Study Area	
			Nature Map	TPFL Database	EPBC Act (PMST)	WA Herbarium		Initial Ranking Based on the Desktop Review (NR = nearest record)	Final Ranking including Results of 2020 Field Survey
<i>Notisia intonsa</i>	Annual daisy to 10 cm tall.	Hillslopes and plains; red clay loams, granitic soils, edges of salt lakes.				☑		May potentially occur: suitable habitat present; records to N and S, but none in close proximity (NR 30.2 km N).	May potentially occur: not recorded during field survey but may not have been visible at the time of survey.
<i>Phlegmatospermum eremaicum</i>	Annual herb to 10 cm tall.	Stony loam.				☑		May potentially occur: suitable habitat present; records to N and S, but none in close proximity (NR 32.5 km N).	May potentially occur: not recorded during field survey but this very small herb may be overlooked without intensive searches..
<i>Pityrodia chrysocalyx</i>	Shrub to 75 cm tall.	Sandy soils.	☑			☑		May potentially occur: suitable habitat present; records to N and S, but none in close proximity (NR 26.2 km N).	Unlikely to occur; not recorded during field survey.
<i>Stylidium pulviniforme</i>	Perennial herb to 5 cm tall.	Saline flats.	☑	☑		☑		May potentially occur: suitable habitat present but no records E of the closest record (NR 26.5 km SW).	Unlikely to occur; not recorded during field survey.
<b>Priority 4</b>									
<i>Eremophila parvifolia</i> subsp. <i>parvifolia</i>	Shrub to 70 cm tall.	Loam, yellow sand, clay, limestone. Plains and claypans.					Mattiske (2020)	May potentially occur: suitable habitat present but no records in close proximity (closest vouchered record is 170 km E but unconfirmed records from 36.4 km N; see Mattiske (2020)).	Unlikely to occur: not recorded during field survey.
<i>Frankenia glomerata</i> (Cluster Head Frankenia)	Subshrub to 30 cm tall.	White sand.		☑		☑		May potentially occur. suitable habitat present; records to N and S, but none in close proximity (28.9 km N).	Unlikely to occur: not recorded during field survey.
<i>Myriophyllum petraeum</i> (Granite Myriophyllum)	Aquatic annual herb.	Strictly confined to ephemeral rock pools on granite outcrops.	☑	☑		☑		Unlikely to occur; a record in close proximity but no suitable habitat (NR 8.8 km W).	Unlikely to occur.

NB. Record of "*Goodenia granitica*" returned by NatureMap search is not included here as it refers to a WA Herbarium specimen identified as *G. aff. granitica*; all other specimens of this species are over 300 km NW.



## Appendix 4

# Vegetation Structural Classification and Condition Scale





**Vegetation Structural Classes\***

Stratum	Canopy Cover (%)				
	70-100%	30-70%	10-30%	2-10%	<2%
Trees over 30 m	Tall closed forest	Tall open forest	Tall woodland	Tall open woodland	Scattered tall trees
Trees 10-30 m	Closed forest	Open forest	Woodland	Open woodland	Scattered trees
Trees under 10 m	Low closed forest	Low open forest	Low woodland	Low open woodland	Scattered low trees
Tree Mallee	Closed tree mallee	Tree mallee	Open tree mallee	Very open tree mallee	Scattered tree mallee
Shrub Mallee	Closed shrub mallee	Shrub mallee	Open shrub mallee	Very open shrub mallee	Scattered shrub mallee
Shrubs over 2 m	Tall closed scrub	Tall open scrub	Tall shrubland	Tall open shrubland	Scattered tall shrubs
Shrubs 1-2 m	Closed heath	Open heath	Shrubland	Open shrubland	Scattered shrubs
Shrubs under 1 m	Low closed heath	Low open heath	Low shrubland	Low open shrubland	Scattered low shrubs
Hummock grasses	Closed hummock grassland	Hummock grassland	Open hummock grassland	Very open hummock grassland	Scattered hummock grasses
Grasses, Sedges, Herbs	Closed tussock grassland / bunch grassland / sedgeland / herbland	Tussock grassland / bunch grassland / sedgeland / herbland	Open tussock grassland / bunch grassland / sedgeland / herbland	Very open tussock grassland / bunch grassland / sedgeland / herbland	Scattered tussock grasses / bunch grasses / sedges / herbs

- Based on Keighery (1994), adapted from Muir (1977), and Aplin's (1979) modification of the vegetation classification system of Specht (1970):
  - Keighery B.J. (1994). *Bushland Plant Survey: A Guide for Community Surveys*. Wildflower Society of Western Australia, Perth WA;
  - Aplin T.E.H. (1979). The Flora. Chapter 3 In O'Brien, B.J. (ed.) (1979). *Environment and Science*. University of Western Australia Press;
  - Muir B.G. (1977). Biological Survey of the Western Australian Wheatbelt. Part II: Vegetation and habitat of Bending Reserve. *Records of the Western Australian Museum, Suppl. No. 3*;
  - Specht R.L. (1970). Vegetation. In *The Australian Environment*. 4th edn (Ed. G.W. Leeper). Melbourne.

Vegetation Condition	South West and Interzone Botanical Provinces	Eremæan and Northern Botanical Provinces
<b>Pristine</b>	Pristine or nearly so, no obvious signs of disturbance or damage caused by human activities since European settlement.	
<b>Excellent</b>	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.	Pristine or nearly so, no obvious signs of damage caused by human activities since European settlement.
<b>Very Good</b>	Vegetation structure altered, obvious signs of disturbance. Disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.	Some relatively slight signs of damage caused by human activities since European settlement. For example, some signs of damage to tree trunks caused by repeated fire, the presence of some relatively non-aggressive weeds, or occasional vehicle tracks.
<b>Good</b>	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.	More obvious signs of damage caused by human activity since European settlement, including some obvious impact on the vegetation structure such as that caused by low levels of grazing or slightly aggressive weeds.
<b>Poor</b>		Still retains basic vegetation structure or ability to regenerate it after very obvious impacts of human activities since European settlement, such as grazing, partial clearing, frequent fires or aggressive weeds.
<b>Degraded</b>	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.	Severely impacted by grazing, very frequent fires, clearing or a combination of these activities. Scope for some regeneration but not to a state approaching good condition without intensive management. Usually with a number of weed species present including very aggressive species.
<b>Completely Degraded</b>	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.	Areas that are completely or almost completely without native species in the structure of their vegetation; i.e. areas that are cleared or 'parkland cleared' with their flora comprising weed or crop species with isolated native trees or shrubs.



# Appendix 5

## Raw Quadrat Data





<b>Site</b>	LSC01		
<b>Described by</b>	SW, ABS	<b>Date</b> 11-Aug-20	<b>Type</b> Quadrat 20 x 20 m
<b>MGA Zone</b>	384946mE 6408872mN		
<b>Habitat</b>	Undulating plain, 0-3% gradient slope to the northwest, 200 m from salt lake margin.		
<b>Soil</b>	5YR 4/6 yellowish red loamy sand.		
<b>Vegetation</b>	<i>Eucalyptus gracilis</i> , <i>Eucalyptus eremophila</i> open forest over <i>Eucalyptus transcontinentalis</i> low open woodland over <i>Alyxia buxifolia</i> ( <i>Acacia hemiteles</i> , <i>Exocarpos aphyllus</i> ) shrubland over <i>Olearia muelleri</i> , <i>Westringia cephalantha</i> var. <i>cephalantha</i> , <i>Acacia merrallii</i> , <i>Acacia pachypoda</i> low open shrubland over scattered sedges and herbs.		
<b>Veg Condition</b>	Pristine.		
<b>Fire Age</b>	Very long unburnt.		

Species	Cover (%)	Height (cm)	Specimen
<i>Acacia hemiteles</i>	1.5	130	LSC01-11
<i>Acacia merrallii</i>	1	50	LSC01-13
<i>Acacia pachypoda</i>	1	100	LSC01-15
<i>Alyxia buxifolia</i>	15	150	LSC01-10
Asteraceae sp.	0.1	15	LSC01-09
<i>Austrostipa</i> sp.	0.1	20	LSC01-16
<i>Eremophila psilocalyx</i>	0.5	100	LSC01-05
<i>Eucalyptus eremophila</i>	40	1000	LSC01-01
<i>Eucalyptus gracilis</i>	20	1500	LSC01-02
<i>Eucalyptus transcontinentalis</i>	10	300	LSC01-03
<i>Exocarpos aphyllus</i>	0.5	150	LSC01-06
<i>Olearia muelleri</i>	5	50	LSC01-04
<i>Olearia</i> sp. <i>Eremicola</i> (Diels & Pritzel s.n. PERTH 00449628)	0.5	50	LSC01-14
<i>Scaevola spinescens</i>	0.5	50	LSC01-08
<i>Thysanotus manglesianus</i>	0.1	150	LSC01-07
<i>Westringia cephalantha</i> var. <i>cephalantha</i>	1.5	40	LSC01-12



LSC01 – Overstorey



LSC01 – Understorey

**Site** LSC02  
**Described by** SW, ABS **Date** 12-Aug-20 **Type** Quadrat 20 x 20 m  
**MGA Zone** 385305mE 6410324mN  
**Habitat** Salt lake margin, flat 0% gradient.  
**Soil** 7.5YR 4/4 brown loamy sand.  
**Vegetation** *Melaleuca thyooides* tall shrubland over *Melaleuca subalaris*, *Tecticornia halocnemoides* subsp. *caudata*, *Scaevola spinescens*, *Maireana amoena*, *Frankenia irregularis* low open shrubland over scattered sedges and herbs.  
**Veg Condition** Pristine.  
**Fire Age** Very long unburnt.

Species	Cover (%)	Height (cm)	Specimen
<i>Acacia prainii</i>	0.25	100	LSC02-04
<i>Atriplex nana</i>	0.5	50	LSC02-10
<i>Austrostipa</i> sp.	0.1	50	LSC02-16
<i>Billardiera lehmanniana</i>	0.1	50	LSC02-08
<i>Chenopodium desertorum</i> subsp. <i>microphyllum</i>	0.1	100	LSC02-13
<i>Chenopodium desertorum</i> subsp. <i>microphyllum</i>	0.1	10	LSC02-12
<i>Disphyma crassifolium</i>	0.1	10	
<i>Eragrostis dielsii</i>	0.1	5	LSC02-17
<i>Frankenia irregularis</i>	1	10	LSC02-02
<i>Gunnipopsis quadrifida</i>	0.1	20	LSC02-09
<i>Leucopogon</i> sp. Kau Rock (M.A. Burgman 1126)	0.5	100	LSC02-01
<i>Maireana amoena</i>	1	20	LSC02-11
<i>Maireana oppositifolia</i>	0.1	10	LSC02-15
<i>Melaleuca subalaris</i>	8	60	LSC02-05
<i>Melaleuca thyooides</i>	12	300	LSC02-14
<i>Rhagodia ulicina</i>	0.1	25	LSC02-06
<i>Scaevola spinescens</i>	1	50	LSC02-03
<i>Tecticornia halocnemoides</i> subsp. <i>caudata</i>	4	30	LSC02-07



LSC02 – Overstorey



LSC02 – Understorey

<b>Site</b>	LSC03		
<b>Described by</b>	SW, ABS	<b>Date</b> 12-Aug-20	<b>Type</b> Quadrat 20 x 20 m
<b>MGA Zone</b>	385896 mE 6409929 mN		
<b>Habitat</b>	Undulating plain, crest of a slope between Scotia Salt Lake and Lake Dundas tributary.		
<b>Soil</b>	5YR 4/6 yellowish red sandy loam.		
<b>Vegetation</b>	<i>Eucalyptus gracilis</i> , <i>Eucalyptus spreta</i> , <i>Eucalyptus salicola</i> open forest over <i>Santalum acuminatum</i> scattered low trees over <i>Olearia muelleri</i> , <i>Acacia prainii</i> low open shrubland over <i>Chamaexeros fimbriata</i> very open sedgeland over scattered perennial herbs and grasses.		
<b>Veg Condition</b>	Pristine		
<b>Fire Age</b>	No sign of recent fire.		

Species	Cover (%)	Height (cm)	Specimen
<i>Acacia erinacea</i>	2	50	LSC03-12
<i>Acacia prainii</i>	0.1	60	LSC02-04=
<i>Alyxia buxifolia</i>	0.5	100	
<i>Aristida contorta</i>	0.1	10	LSC03-06
Asteraceae sp.	0.1	0.1	LSC01-09=
<i>Austrostipa</i> sp.	0.1	25	LSC03-14
<i>Austrostipa</i> sp.	0.1	20	LSC01-16=
<i>Austrostipa trichophylla</i>	0.25	25	LSC03-10
<i>Chamaexeros fimbriata</i>	2	40	LSC03-05
<i>Dianella revoluta</i> var. <i>divaricata</i>	0.5	80	
<i>Enchylaena tomentosa</i>	0.1	50	
<i>Erodium cygnorum</i>	0.1	0.1	LSC03-09
<i>Eucalyptus gracilis</i>	16	2000	LSC03-01
<i>Eucalyptus gracilis</i>	1	500	LSC03-03
<i>Eucalyptus salicola</i>	9	2000	LSC03-04
<i>Eucalyptus spreta</i>	14	1300	LSC03-02
<i>Exocarpos aphyllus</i>	0.5	80	
<i>Olearia muelleri</i>	3	50	LSC01-04=
<i>Santalum acuminatum</i>	1.5	300	
<i>Sclerolaena diacantha</i>	0.1	5	LSC03-08
<i>Senna artemisioides</i>	0.25	60	LSC03-07
<i>Solanum nummularium</i>	0.1	30	LSC03-11
<i>Thysanotus manglesianus</i>	0.1	30	LSC01-07=
<i>Westringia rigida</i>	0.1	20	LSC03-13



LSC03 – Overstorey



LSC03 – Understorey

**Site** LSC04  
**Described by** SW, ABS **Date** 12-Aug-20 **Type** Quadrat 20 x 20 m  
**MGA Zone** 385560 mE 6409023 mN  
**Habitat** Undulating plain, flat with 0% gradient.  
**Soil** 5YR 5/4 orange loamy sand.  
**Rock Type** Gravel 1-25%.  
**Vegetation** *Eucalyptus salicola* open forest over *Alyxia buxifolia*, *Leucopogon* sp. outer wheatbelt (M. Hislop 30) tall open shrubland over *Beyeria sulcata* var. *sulcata*, *Acacia camptoclada*, *Olearia* sp. *Eremicola* (Diels & Pritzel s.n. PERTH 00449628) low open shrubland over *Lepidosperma* sp., sedgeland.  
**Veg Condition** Pristine.  
**Fire Age** No sign of recent fire.

Species	Cover (%)	Height (cm)	Specimen	Notes
<i>Acacia camptoclada</i>	1	120	LSC04-05	
<i>Alyxia buxifolia</i>	2	220	LSC01-10=	
<i>Austrostipa</i> sp.	0.1	10	LSC03-14=	
<i>Austrostipa</i> sp.	1	30	LSC01-16=	
<i>Beyeria sulcata</i> var. <i>sulcata</i>	4	110	LSC04-03	
<i>Eucalyptus salicola</i>	55	1200	LSC04-02	
<i>Exocarpos sparteus</i>	0.5	200	LSC04-07	
<i>Lepidosperma</i> sp.	31	45	LSC04-01	? <i>diurnum</i>
<i>Leucopogon</i> sp. outer wheatbelt (M. Hislop 30)	1	200	OPPABS-13=	
<i>Melaleuca hamata</i>	0.5	210	OPPABS-11=	
<i>Olearia muelleri</i>	0.1	30	LSC01-04=	
<i>Olearia</i> sp. <i>Eremicola</i> (Diels & Pritzel s.n. PERTH 00449628)	1	100	LSC04-04	
<i>Scaevola spinescens</i>	0.1	45	LSC02-03=	
<i>Westringia cephalantha</i> var. <i>cephalantha</i>	0.1	15	LSC04-06	



LSC04 – Overstorey



LSC04 – Understorey

<b>Site</b>	LSC05		
<b>Described by</b>	SW, ABS	<b>Date</b> 13-Aug-20	<b>Type</b> Quadrat 20 x 20 m
<b>MGA Zone</b>	384889 mE 6410253 mN		
<b>Habitat</b>	Undulating plain sloping to WNW, 0-3% gradient, lower slope.		
<b>Soil</b>	5YR 3/4 dark reddish brown sandy clay loam.		
<b>Rock Type</b>	Dolerite, quartz, limestone, dark red conglomerates.		
<b>Vegetation</b>	<i>Eucalyptus dundasii</i> , <i>Eucalyptus lesouefii</i> open forest over <i>Eremophila scoparia</i> , <i>Cratystylis conocephala</i> , <i>Exocarpos aphyllus</i> open shrubland over <i>Atriplex nummularia</i> , <i>Rhagodia ulicina</i> low open shrubland.		
<b>Veg Condition</b>	Pristine.		
<b>Fire Age</b>	Very long unburnt.		
<b>Notes</b>	Bare ground 5%. Leaf litter 95%		

Species	Cover (%)	Height (cm)	Specimen
<i>Alyxia buxifolia</i>	0.1	50	LSC01-10=
<i>Atriplex nummularia</i>	3.5	80	LSC05-04
<i>Chenopodium nitrariaceum</i>	0.1	30	LSC05-09
<i>Cratystylis conocephala</i>	1.5	100	LSC05-03
<i>Eremophila deserti</i>	0.25	50	LSC05-10
<i>Eremophila scoparia</i>	1.75	180	LSC05-06
<i>Eucalyptus dundasii</i>	28	1500	LSC05-02
<i>Eucalyptus lesouefii</i>	17	1500	LSC05-01
<i>Exocarpos aphyllus</i>	1	100	LSC05-08
<i>Rhagodia ulicina</i>	1	50	LSC05-07
<i>Scaevola spinescens</i>	0.1	30	LSC02-03=
<i>Tecticornia halocnemoides</i> subsp. <i>caudata</i>	0.1	80	LSC05-05



LSC05 – Overstorey



LSC05 – Understorey

<b>Site</b>	LSC06		
<b>Described by</b>	SW, ABS	<b>Date</b> 13-Aug-20	<b>Type</b> Quadrat 20 x 20 m
<b>MGA Zone</b>	384609 mE	6409584 mN	
<b>Habitat</b>	Sandplain, slopes towards lake in east in SE direction at 5% gradient. elevated rocky outcrop to the west (fair distance).		
<b>Soil</b>	7.5YR 4/3 and 3/3 brown clayey loam (small percentage of sand; 70% loam, 20% clay, 10% sand).		
<b>Rock Type</b>	Scattered very fine quartz and sandstone. Surface layer of sandy granites, 1-25% pebble, 51-75% gravel.		
<b>Vegetation</b>	<i>Eucalyptus dundasii</i> open forest over <i>Eucalyptus urna</i> , <i>Eucalyptus platycorys</i> , <i>Eucalyptus salubris</i> low woodland (juveniles) over <i>Dodonaea stenozyga</i> , <i>Acacia hemiteles</i> open shrubland over <i>Acacia merrallii</i> , <i>Eremophila ionantha</i> , <i>Ricinocarpos stylosus</i> , <i>Acacia camptoclada</i> low open shrubland over scattered herbs.		
<b>Veg Condition</b>	Pristine.		
<b>Fire Age</b>	Very long unburnt.		
<b>Notes</b>	Fire 15-20 years.		

Species	Cover (%)	Height (cm)	Specimen
<i>Acacia camptoclada</i>	1	65	LSC06-12
<i>Acacia erinacea</i>	0.25	40	LSC03-12=
<i>Acacia hemiteles</i>	1.5	190	LSC01-11=
<i>Acacia merrallii</i>	2	60	LSC06-07
<i>Billardiera lehmanniana</i>	0.1	130	LSC06-16
<i>Calotis hispidula</i>	0.1	5	LSC06-14
<i>Crassula</i> sp.	0.1	5	
<i>Dianella revoluta</i> var. <i>divaricata</i>	0.1	45	
<i>Dodonaea stenozyga</i>	4	110	LSC06-05
<i>Eremophila ionantha</i>	2	45	LSC06-09
<i>Eremophila scoparia</i>	0.1	40	LSC05-06=
<i>Eucalyptus dundasii</i>	18	1200	LSC06-01
<i>Eucalyptus platycorys</i>	9	350-400	LSC06-04
<i>Eucalyptus salubris</i>	9	350-400	LSC06-02
<i>Eucalyptus urna</i>	9	350-400	LSC06-03
<i>Exocarpos aphyllus</i>	0.1	60	LSC05-08=
<i>Grevillea acuaria</i>	0.1	30	OPPABS=
<i>Gunniopsis quadrifida</i>	0.1	10	LSC02-09=
<i>Melaleuca lanceolata</i>	0.1	30	LSC06-06
<i>Melaleuca teuthidoides</i>	0.5	140	LSC06-13
<i>Olearia muelleri</i>	0.1	10	LSC01-04=
<i>Pterostylis mutica</i>	0.1	15	LSC06-15
<i>Ricinocarpos stylosus</i>	0.1	40	LSC06-08
<i>Ricinocarpos stylosus</i>	2	45	LSC06-11
<i>Scaevola spinescens</i>	0.1	20	LSC02-03=
<i>Westringia rigida</i>	0.1	40	LSC06-10
<i>Westringia</i> sp.	0.1	25	LSC-SW06=





**LSC06 – Overstorey**



**LSC06 – Understorey**

<b>Site</b>	LSC07		
<b>Described by</b>	SW, ABS	<b>Date</b> 13-Aug-20	<b>Type</b> Quadrat 20 x 20 m
<b>MGA Zone</b>	384892 mE	6409559 mN	
<b>Habitat</b>	Island; raised plain surrounded by salt lake and depression to the west.		
<b>Soil</b>	5YR 4/6 yellowish red sandy clay loam.		
<b>Rock Type</b>	Scattered very fine quartz and sandstone. Surface layer of sandy granites; 1-25% pebble, 1-25% gravel.		
<b>Vegetation</b>	<i>Eucalyptus salicola</i> , <i>Eucalyptus dundasii</i> , <i>Eucalyptus gracilis</i> open forest over <i>Exocarpos aphyllus</i> , <i>Alyxia buxifolia</i> tall open shrubland over <i>Cratystylis conocephala</i> , ( <i>Acacia prainii</i> ) open shrubland over <i>Dodonaea stenozyga</i> , <i>Chenopodium nitrariaceum</i> , <i>Olearia</i> sp. <i>Eremicola</i> (Diels & Pritzel s.n. PERTH 00449628), <i>Scaevola spinescens</i> low open shrubland over scattered herbs and sedges.		
<b>Veg Condition</b>	Pristine.		
<b>Fire Age</b>	No sign of recent fire.		

Species	Cover (%)	Height (cm)	Specimen
<i>Acacia prainii</i>	0.5	180	LSC02-04=
<i>Alyxia buxifolia</i>	1	210	LSC01-10=
<i>Atriplex nana</i>	0.1	60	LSC07-11
<i>Calotis hispidula</i>	0.1	2	LSC07-07
<i>Chenopodium nitrariaceum</i>	1.5	25	LSC05-09=
<i>Cratystylis conocephala</i>	6	110	LSC05-03=
<i>Dodonaea stenozyga</i>	1.5	45	LSC06-05=
<i>Eremophila deserti</i>	0.1	40	LSC05-10=
<i>Eremophila psilocalyx</i>	0.1	110	LSC07-10
<i>Eremophila scoparia</i>	0.1	130	LSC05-06=
<i>Eucalyptus dundasii</i>	13	1200	LSC07-01
<i>Eucalyptus gracilis</i>	16	900	LSC07-03
<i>Eucalyptus salicola</i>	22	1300	LSC07-02
<i>Exocarpos aphyllus</i>	4	210	LSC07-06
<i>Grevillea acuaria</i>	0.1	30	OPPABS=
<i>Gunniopsis quadrifida</i>	0.1	15	LSC02-09=
<i>Olearia muelleri</i>	0.25	60	LSC01-04=
<i>Olearia</i> sp. <i>Eremicola</i> (Diels & Pritzel s.n. PERTH 00449628)	1	50	LSC07-05
<i>Podolepis capillaris</i>	0.1	10	LSC07-04
<i>Ptilotus holosericeus</i>	0.1	5	LSC07-13
<i>Scaevola spinescens</i>	1	20	LSC02-03=
<i>Sclerolaena diacantha</i>	0.1	5	LSC07-08
<i>Senna artemisioides</i>	0.1	100	LSC07-09
<i>Thysanotus manglesianus</i>	0.1	10	LSC01-07=
<i>Triglochin nana</i>	0.1	10	LSC07-12



**LSC07 – Overstorey**



**LSC07 – Understorey**

**Site** LSC08  
**Described by** SW, ABS **Date** 13-Aug-20 **Type** Quadrat 20 x 20 m  
**MGA Zone** 384849 mE 6409690 mN  
**Habitat** Salt lake margin, ~50 m away from raised *Eucalyptus* woodland.  
**Soil** 10%: 10YR 3/2 very dark grayish brown loamy sand (saline).  
 25% 7.5YR 4/6 strong brown loamy sand.  
 65% 7.5YR 5/4 very slightly brown loamy sand.  
**Rock Type** Salt  
**Vegetation** *Melaleuca subalaris* tall shrubland over *Tecticornia halocnemoides* subsp. *caudata*, *Maireana* sp., *Maireana amoena*, *Frankenia irregularis* low open samphire heath.  
**Veg Condition** Pristine.  
**Fire Age** No sign of recent fire.

Species	Cover (%)	Height (cm)	Specimen
<i>Chenopodium desertorum</i> subsp. <i>microphyllum</i>	0.1	10	LSC02-12=
<i>Exocarpos aphyllus</i>	0.1	45	LSC01-06=
<i>Frankenia irregularis</i>	3	15	LSC02-02=
<i>Maireana amoena</i>	3	20	LSC02-11=
<i>Maireana</i> sp.	9	20	LSC02-15=
<i>Melaleuca subalaris</i>	16	300	LSC02-05=
<i>Rhagodia ulicina</i>	0.1	10	LSC02-06=
<i>Roycea divaricata</i>	0.1	50	LSC08-01
<i>Tecticornia halocnemoides</i> subsp. <i>caudata</i>	27	60	LSC02-07=



LSC08 – Overstorey



LSC08 – Understorey

<b>Site</b>	LSC09		
<b>Described by</b>	SW, ABS	<b>Date</b> 14-Aug-20	<b>Type</b> Quadrat 20 x 20 m
<b>MGA Zone</b>	384387 mE 6409281 mN		
<b>Habitat</b>	Plain, outcropping stone, 3-5% gradient slope towards east. Boulders on crest of hill 300m to the W, exposed basal outcropping, close to breakaway peak.		
<b>Soil</b>	7.5YR 4/4 brown loamy sand.		
<b>Rock Type</b>	Basal, outcropping 10-25%.		
<b>Vegetation</b>	<i>Eucalyptus spreta</i> low open woodland over <i>Melaleuca hamata</i> , ( <i>Acacia hemiteles</i> ) tall closed scrub over <i>Westringia cephalantha</i> var. <i>cephalantha</i> , <i>Melaleuca laxiflora</i> , <i>Eremophila maculata</i> ., <i>Acacia andrewsii</i> low shrubland over scattered sedges, herbs and grasses.		
<b>Veg Condition</b>	Pristine.		
<b>Fire Age</b>	No sign of recent fire (fire age 10-15 years).		

Species	Cover (%)	Height (cm)	Specimen	
<i>Acacia andrewsii</i>	1	60	LSC-SW11=	
<i>Acacia hemiteles</i>	3	200	LSC09-12	
<i>Allocasuarina campestris</i>	0.1	80	LSC09-14	
<i>Austrostipa</i> sp.	0.1	20	LSC09-13	
<i>Cryptandra wilsonii</i>	0.1	50	LSC09-17	
<i>Dianella revoluta</i> var. <i>divaricata</i>	0.1	100		
<i>Diuris</i> sp.	0.1	10		
<i>Eremophila maculata</i>	5	60	LSC09-03	
<i>Eucalyptus spreta</i>	6	250	LSC09-01	
<i>Grevillea acuaria</i>	0.25	20	LSC09-16	
<i>Lepidosperma</i> sp.	0.1	30	LSC09-15	♀ sp. Bandalup Scabrid
<i>Melaleuca hamata</i>	68	150		
<i>Melaleuca laxiflora</i>	7	60	LSC09-10	
<i>Phebalium tuberculosum</i>	0.1	40	LSC09-11	
<i>Pterostylis</i> sp.	0.1	0.1		
<i>Thysanotus patersonii</i>	0.1	30	LSC09-16a	
<i>Westringia cephalantha</i> var. <i>cephalantha</i>	13	60	LSC09-02	



LSC09 – Overstorey



LSC09 – Understorey

**Site** LSC10  
**Described by** SW, ABS **Date** 14-Aug-20 **Type** Quadrat 20 x 20 m  
**MGA Zone** 384254 mE 6408889 mN  
**Habitat** Low-lying secondary salt lake catchment, 0-3% gradient east to west, not well drained with signs of intermittent inundation.  
**Soil** 7.5YR 4/3 brown loamy sand (eastern half).  
 7.5YR 4/6 strong brown weakly loamy sand (western half).  
 Soil is heavily compacted below surface, with erosion to the west coming off the woodland (runoff). Algal mats present under top layer of white saline sandy soil.  
**Vegetation** *Melaleuca subalaris* tall open shrubland over *Tecticornia lylei*, *Melaleuca thyoides* shrubland over scattered low samphire shrubs.  
**Veg Condition** Pristine.  
**Fire Age** No sign of recent fire.

Species	Cover (%)	Height (cm)	Specimen
<i>Disphyma crassifolium</i>	0.1	10	
<i>Gunniopsis quadrifida</i>	0.1	30	LSC02-09=
<i>Maireana amoena</i>	0.5	20	LSC10-03
<i>Melaleuca subalaris</i>	3.5	300	LSC10-01
<i>Melaleuca thyoides</i>	9	120	LSC02-14=
<i>Tecticornia halocnemoides</i> subsp. <i>caudata</i>	0.25	40	LSC02-07=
<i>Tecticornia lylei</i>	16	120	LSC10-02



LSC10 – Overstorey



LSC10 – Understorey

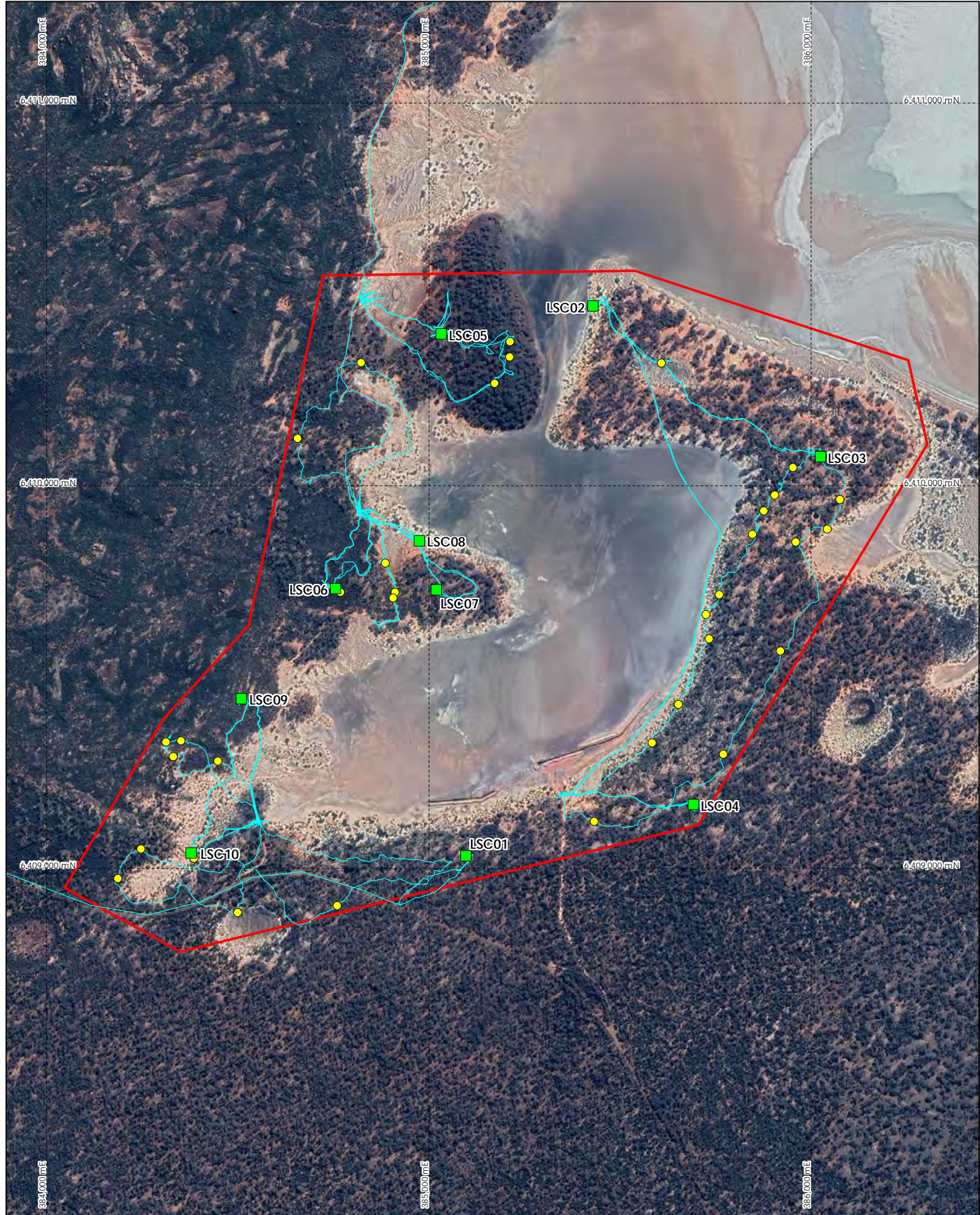
# Appendix 6

## Survey Effort

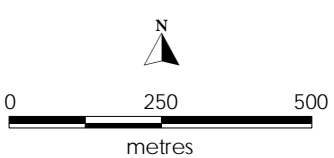








- Study area
- GPS tracklog
- Quadrat site location
- Mapping note location



## Norseman Gold (Scotia) Survey Effort





# Appendix 7

## Combined Vascular Flora List from the Study area





Family	Name	Cons. Status	Biota (August 2020)	Mattiske (Autumn 2020)
Aizoaceae	<i>Disphyma crassifolium</i>		☑	
	<i>Gunniopsis glabra</i>		☑	
	<i>Gunniopsis quadrifida</i>		☑	
Amaranthaceae	<i>Ptilotus holosericeus</i>		☑	
	<i>Ptilotus obovatus</i>		☑	
Apocynaceae	<i>Alyxia buxifolia</i>		☑	☑
Asparagaceae	<i>Chamaexeros fimbriata</i>		☑	
	<i>Thysanotus manglesianus</i>		☑	
	<i>Thysanotus patersonii</i>		☑	
Asteraceae	<i>Calotis hispidula</i>		☑	
	<i>Cratystylis conocephala</i>		☑	
	? <i>Cratystylis conocephala</i>			☑
	<i>Hyalochlamys globifera</i>		☑	
	<i>Olearia muelleri</i>		☑	☑
	<i>Olearia</i> sp. <i>Eremicola</i> (Diels & Pritzel s.n. PERTH 00449628)		☑	☑
	<i>Podolepis capillaris</i>		☑	
	Asteraceae sp. (inadequate material)		☑	☑
Boraginaceae	<i>Halgania andromedifolia</i>		☑	
Boryaceae	<i>Borya constricta</i>		☑	
Brassicaceae	<i>Lepidium rotundum</i>		☑	
Casuarinaceae	<i>Allocasuarina acutivalvis</i> subsp. <i>acutivalvis</i>		☑	
	<i>Allocasuarina acutivalvis</i> (subsp. not determined)		☑	
	<i>Allocasuarina campestris</i>		☑	
Centrolepidaceae	<i>Centrolepis polygyna</i>		☑	
Chenopodiaceae	<i>Atriplex nana</i>		☑	

Family	Name	Cons. Status	Biota (August 2020)	Mattiske (Autumn 2020)
	<i>Atriplex nummularia</i>		☑	
	<i>Atriplex ?vesicaria</i>			☑
	<i>Chenopodium desertorum</i> subsp. <i>microphyllum</i>		☑	
	<i>Chenopodium nitrariaceum</i>		☑	
	<i>Enchylaena tomentosa</i>		☑	
	<i>Maireana amoena</i>		☑	
	<i>Maireana oppositifolia</i>		☑	
	<i>Maireana</i> sp. (inadequate material)		☑	
	<i>Rhagodia ulicina</i>		☑	
	<i>Roycea divaricata</i>		☑	
	<i>Sclerolaena diacantha</i>		☑	☑
	<i>Tecticornia halocnemoides</i> subsp. <i>caudata</i>		☑	
	<i>Tecticornia lylei</i>		☑	
	<i>Chenopodiaceae</i> sp.			☑
Colchicaceae	<i>Wurmbea tenella</i>		☑	
Crassulaceae	<i>Crassula</i> sp. (inadequate material)		☑	
Cupressaceae	<i>Callitris preissii</i>		☑	
Cyperaceae	<i>Lepidosperma ? lyonsii</i> (unable to be confirmed due to taxonomic revision)	P1	☑	
	<i>Lepidosperma</i> sp. (inadequate material and/or lack of taxonomic framework)		☑	☑
	<i>Cyperaceae</i> sp. (inadequate material)			☑
Droseraceae	<i>Drosera andersoniana</i>		☑	
Ericaceae	<i>Conostephium drummondii</i>			☑
	<i>Conostephium preissii</i>		☑	
	<i>Leucopogon</i> sp. Kau Rock (M.A. Burgman 1126)		☑	
	<i>Leucopogon</i> sp. outer wheatbelt (M. Hislop 30)		☑	

Family	Name	Cons. Status	Biota (August 2020)	Mattiske (Autumn 2020)
Euphorbiaceae	<i>Beyeria lechenaultii</i>		☑	
	<i>Beyeria sulcata</i> var. <i>sulcata</i>		☑	
Fabaceae	<i>Acacia acuminata</i>		☑	
	<i>Acacia andrewsii</i>		☑	
	<i>Acacia assimilis</i> subsp. <i>assimilis</i>			☑
	<i>Acacia camptoclada</i>		☑	
	<i>Acacia erinacea</i>		☑	
	<i>Acacia hemiteles</i>			
	<i>Acacia jibberdingensis</i>		☑	
	<i>Acacia lasiocalyx</i>		☑	
	<i>Acacia merrallii</i>		☑	☑
	<i>Acacia ?nyssophylla</i>			☑
	<i>Acacia pachypoda</i>		☑	
	<i>Acacia prainii</i>		☑	
	<i>Acacia</i> sp. (inadequate material)			☑
	<i>Bossiaea barbarae</i>		☑	☑
	<i>Bossiaea walkeri</i>		☑	
	<i>Daviesia argillacea</i>			☑
<i>Senna artemisioides</i>		☑		
Frankeniaceae	<i>Frankenia desertorum</i>		☑	
	<i>Frankenia irregularis</i>		☑	
Geraniaceae	<i>Erodium cygnorum</i>		☑	
Goodeniaceae	<i>Scaevola spinescens</i>		☑	☑
Hemerocallidaceae	<i>Dianella revoluta</i>			☑
	<i>Dianella revoluta</i> var. <i>divaricata</i>		☑	

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Juncaginaceae	<i>Triglochin nana</i>		☑	
Lamiaceae	<i>Prostanthera grylloana</i>		☑	
	<i>Westringia cephalantha</i> var. <i>cephalantha</i>		☑	
	<i>Westringia rigida</i>		☑	
	? <i>Westringia rigida</i>			☑
	<i>Westringia</i> sp. (inadequate material)		☑	
Lauraceae	<i>Cassytha pomiformis</i>		☑	
Myrtaceae	<i>Eucalyptus aspratilis</i>		☑	
	<i>Eucalyptus dundasii</i>		☑	☑
	<i>Eucalyptus eremophila</i>		☑	
	<i>Eucalyptus</i> ? <i>flocktoniae</i> subsp. <i>flocktoniae</i>			☑
	<i>Eucalyptus gracilis</i>		☑	☑
	<i>Eucalyptus griffithsii</i>		☑	
	<i>Eucalyptus lesouefii</i>		☑	
	<i>Eucalyptus</i> ? <i>lesouefii</i>			☑
	<i>Eucalyptus salicola</i>		☑	
	<i>Eucalyptus</i> ? <i>salicola</i>			☑
	<i>Eucalyptus salubris</i>		☑	
	<i>Eucalyptus spreta</i>		☑	☑
	<i>Eucalyptus torquata</i>		☑	
	<i>Eucalyptus transcontinentalis</i>		☑	
	<i>Eucalyptus urna</i>		☑	
	<i>Eucalyptus</i> sp. (inadequate material)		☑	☑
	<i>Leptospermum incanum</i>		☑	
<i>Melaleuca eleuterostachya</i>		☑		



Family	Name	Cons. Status	Biota (August 2020)	Mattiske (Autumn 2020)
	<i>Melaleuca hamata</i>		☑	
	<i>Melaleuca ?hamata</i>			☑
	<i>Melaleuca lanceolata</i>			☑
	<i>Melaleuca lateriflora</i>		☑	
	<i>Melaleuca laxiflora</i>		☑	
	<i>Melaleuca pauperiflora</i> subsp. <i>pauperiflora</i>		☑	
	<i>Melaleuca quadrifaria</i>		☑	
	<i>Melaleuca ?sheathiana</i>			☑
	<i>Melaleuca subalaris</i>		☑	
	<i>Melaleuca teuthidoides</i>		☑	
	<i>Melaleuca thyoides</i>		☑	
	<i>Melaleuca</i> sp. (inadequate material)		☑	
Orchidaceae	<i>Diuris hazeliae</i>		☑	
	<i>Diuris</i> sp. (inadequate material)		☑	
	<i>Pterostylis mutica</i>		☑	
	<i>Pterostylis sargentii</i>		☑	
	<i>Pterostylis setulosa</i>		☑	
	<i>Pterostylis</i> sp. (inadequate material)		☑	
Pittosporaceae	<i>Billardiera lehmanniana</i>		☑	☑
	<i>Pittosporum angustifolium</i>		☑	
	<i>Pittosporum</i> sp. (inadequate material)		☑	
Poaceae	<i>Aristida contorta</i>		☑	
	<i>Austrostipa juncifolia</i>		☑	
	<i>Austrostipa trichophylla</i>		☑	
	<i>Austrostipa</i> sp. (inadequate material)		☑	

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	<i>Eragrostis dielsii</i>		☑	
	* <i>Pentameris airoides</i>		☑	
	Poaceae sp.			☑
Proteaceae	<i>Grevillea acuaria</i>		☑	☑
	<i>Grevillea cagiana</i>		☑	
	<i>Persoonia helix</i>		☑	
Pteridaceae	<i>Cheilanthes austrotenuifolia</i>		☑	
Rhamnaceae	<i>Cryptandra wilsonii</i>		☑	
Rutaceae	<i>Phebalium tuberculosum</i>		☑	
Santalaceae	<i>Exocarpos aphyllus</i>		☑	☑
	<i>Exocarpos sparteus</i>		☑	
	<i>Santalum acuminatum</i>		☑	☑
Sapindaceae	<i>Dodonaea lobulata</i>		☑	
	<i>Dodonaea microzyga</i> var. <i>acrolobata</i>		☑	
	<i>Dodonaea stenozyga</i>		☑	
Scrophulariaceae	<i>Eremophila decipiens</i> subsp. <i>decipiens</i>		☑	
	<i>Eremophila deserti</i>		☑	
	<i>Eremophila glabra</i> subsp. <i>glabra</i>		☑	
	<i>Eremophila ionantha</i>		☑	
	<i>Eremophila maculata</i> subsp. <i>brevifolia</i>		☑	
	<i>Eremophila maculata</i> (subsp. not determined)		☑	
	<i>Eremophila psilocalyx</i>		☑	
	<i>Eremophila</i> ? <i>psilocalyx</i>			☑
	<i>Eremophila purpurascens</i>	P3	☑	
	<i>Eremophila scoparia</i>		☑	☑

<b>Family</b>	<b>Name</b>	<b>Cons. Status</b>	<b>Biota (August 2020)</b>	<b>Mattiske (Autumn 2020)</b>
Solanaceae	<i>Solanum nummularium</i>		☑	
Stylidiaceae	<i>Stylidium dielsianum</i>		☑	
Thymelaeaceae	<i>Pimelea</i> sp. (inadequate material)		☑	
Zygophyllaceae	<i>Roepera apiculata</i>		☑	