

**10M PTY LTD**

# **WOOLBUNG PEAK PROJECT**

## **SUPPORTING DOCUMENT**

### **FOR CLEARING PERMIT**

#### **APPLICATION**

**M59/768 & L59/202**

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# 1 INTRODUCTION

## 1.1 BACKGROUND

Pty Ltd (10M) recently commenced exploration activities at the Woolbung Peak Iron Ore Project (Project) which is one of a number of potential iron ore prospects within the larger overall Twins Peaks Project area. The prospect is a defined and continuous, high grade Direct Shipping Ore (DSO) hematite deposit.

Exploration to date has been limited to areas of former exploration disturbance, however, 10M intends to undertake additional drilling across the Project area. The type of ore on the lease is a not common form of recrystallised microplaty, this form of iron ore was present in the Tom Price and Paraburdoo ore bodies when they were first mined in the late sixties and early seventies. At those sites, the ore was pelletised or sintered and used in blast furnaces.

The Woolbung Peak mineralisation is more in the form of lump and the smelting characteristics of this ore in lump form are unknown in an Electric arc furnace. As the economics of shipping a smaller batch of ore are commercially unviable to the end user, 10M recently submitted a Programme of Work (PoW) and excess tonnage application to extract 60,000 t of material to the end user to commercially test the ore smelting characteristics (Arc furnace trial). The first phase of scree harvesting was completed in September 2022.

As exploration works have identified an economic deposit, 10M intend to develop the Woolbung Peak iron ore deposit as the first stage of operations at the overall Twin Peaks Project.

## 1.2 OBJECTIVE

This document is to complement the clearing permit application relating for a maximum of 70 ha of native vegetation clearing within an overall clearing boundary of 124 ha.

As required by the DMIRS, the ten clearing principles and background information has been provided in this document relating to the site location, ownership, hydrology, vegetation, fauna and land degradation issues.

To assist in the DMIRS's assessment of this clearing permit application, a summary of the relevant environmental information for the Project area has been included in this document in addition to the biological survey reports.

## 1.3 LOCATION

The Project area is located approximately 200km northeast of Geraldton and approximately 9.5 km northeast of the Twin Peaks homestead in Western Australia (Figure 1).

## 1.4 OWNERSHIP AND TENURE

The Project is located on M59/768 and L59/202, which are owned by Deepsea Australia Limited (Figure 2).

10M has approval to access and undertake mining activities on these tenements (Appendix 1 – Letter of Authority).

The Project is located within the Murchison Shire on the Wooleen (mine area) and Billabalong Pastoral Leases. The northern boundary of the Twin Peaks Pastoral Lease is located 2.3km south of the Project.

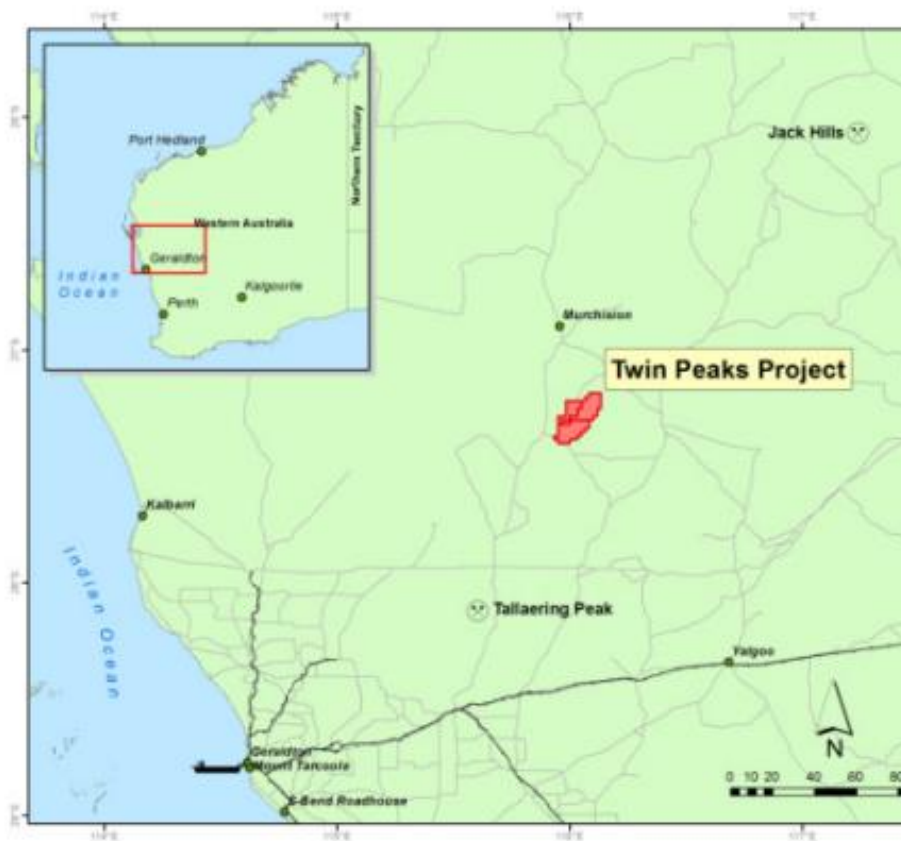


Figure 1: Location of Project



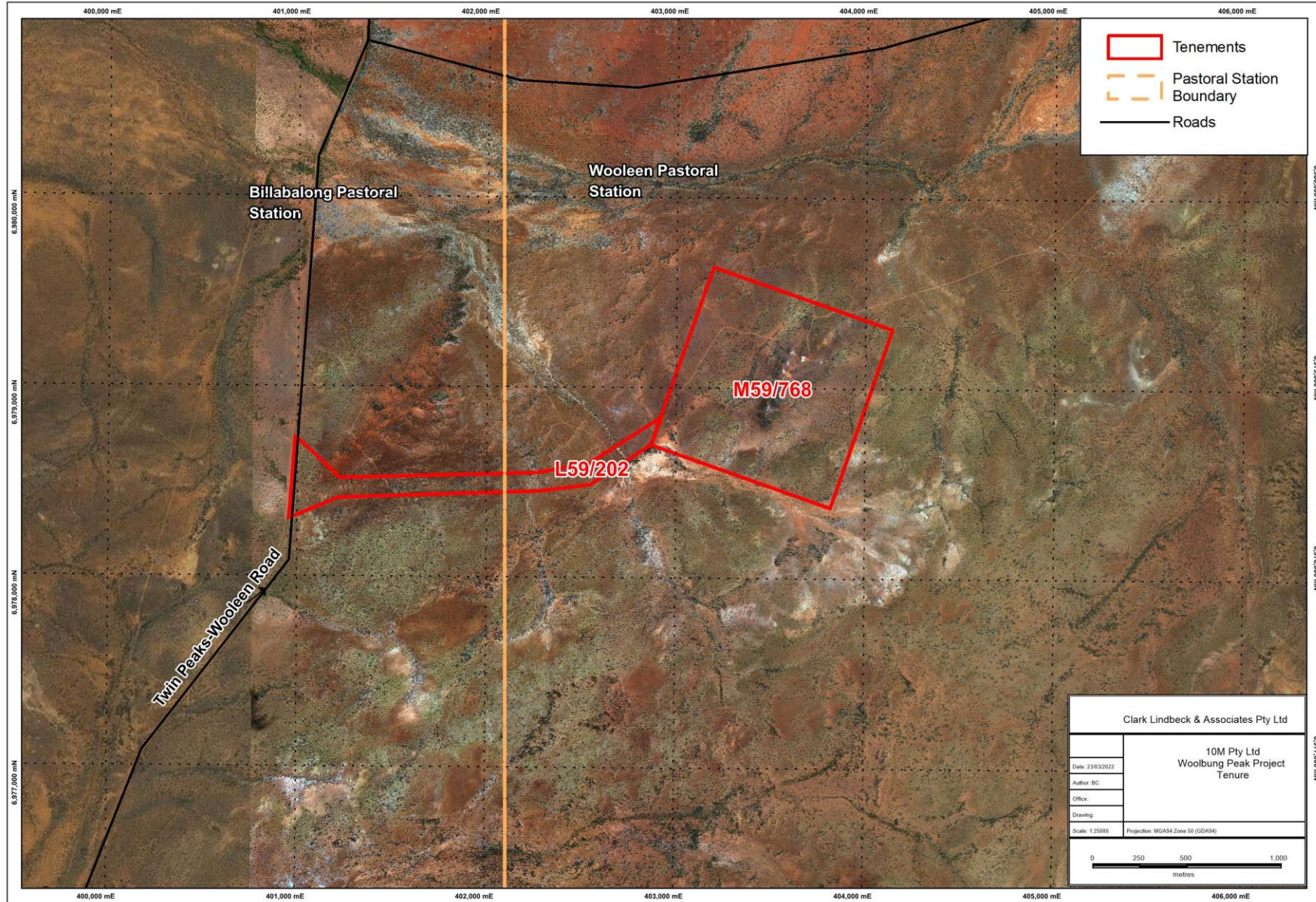


Figure 2: Location of Project tenements and the Woolbung Peak Project area

## 2 PROPOSED CLEARING

### 2.1 PROJECT INFRASTRUCTURE

10M intend to develop the Woolbung Peak iron ore deposit via an open pit with construction of associated mine infrastructure (Figure 3). Table 1 provides a summary of the elements proposed.

**Table 1: Mining infrastructure proposed**

Proposed infrastructure	Description
Open pit	Mining of the pit will involve removal of Woolbung Peak and development of an open pit to depth of ~60 m (maximum). Approximately 1.1 Mt of ore will be mined over a period of 12-18 months.
Waste Rock Dump	Waste Rock Dump (WRD) to store mined waste from the pit with capacity of 1.6M LCM. Low-grade ore will also be stored in the WRD footprint.
ROM	Mined material will be transported to the ROM by off road dump trucks for processing.
Crushing/screening plant	Ore from mining of the open pit will be treated through a mobile three stage crushing/screening plant at a throughput of 1 M tpa.
Stockyard (ore stockpile)	Ore processed through the plant will be stockpiled in the stockyard and transported by road train offsite to Geraldton Port for export.
Turkeys nest dam	HDPE lined dam for storage of water for dust suppression and plant usage.
Borefield	Bores (TP02, TP03) to supplement water supply for the Project and an associated pipeline.
Topsoil stockpiles	Stockpiles of top ~0.1-0.2m of growth medium from all disturbance areas for later rehabilitation use.
Borrow pits	To source borrow material to sheet access roads and plant /vehicle hardstand areas.
Associated mine infrastructure	Office, workshop, fuel storage, washdown bay, laydown/hardstand, magazine, haul/access roads, drainage trench.

### 2.2 CLEARING

To allow for construction of the proposed Project infrastructure, 10M is seeking approval to clear a maximum of 70 ha of native vegetation within an overall area of 124 ha (Figure 3).



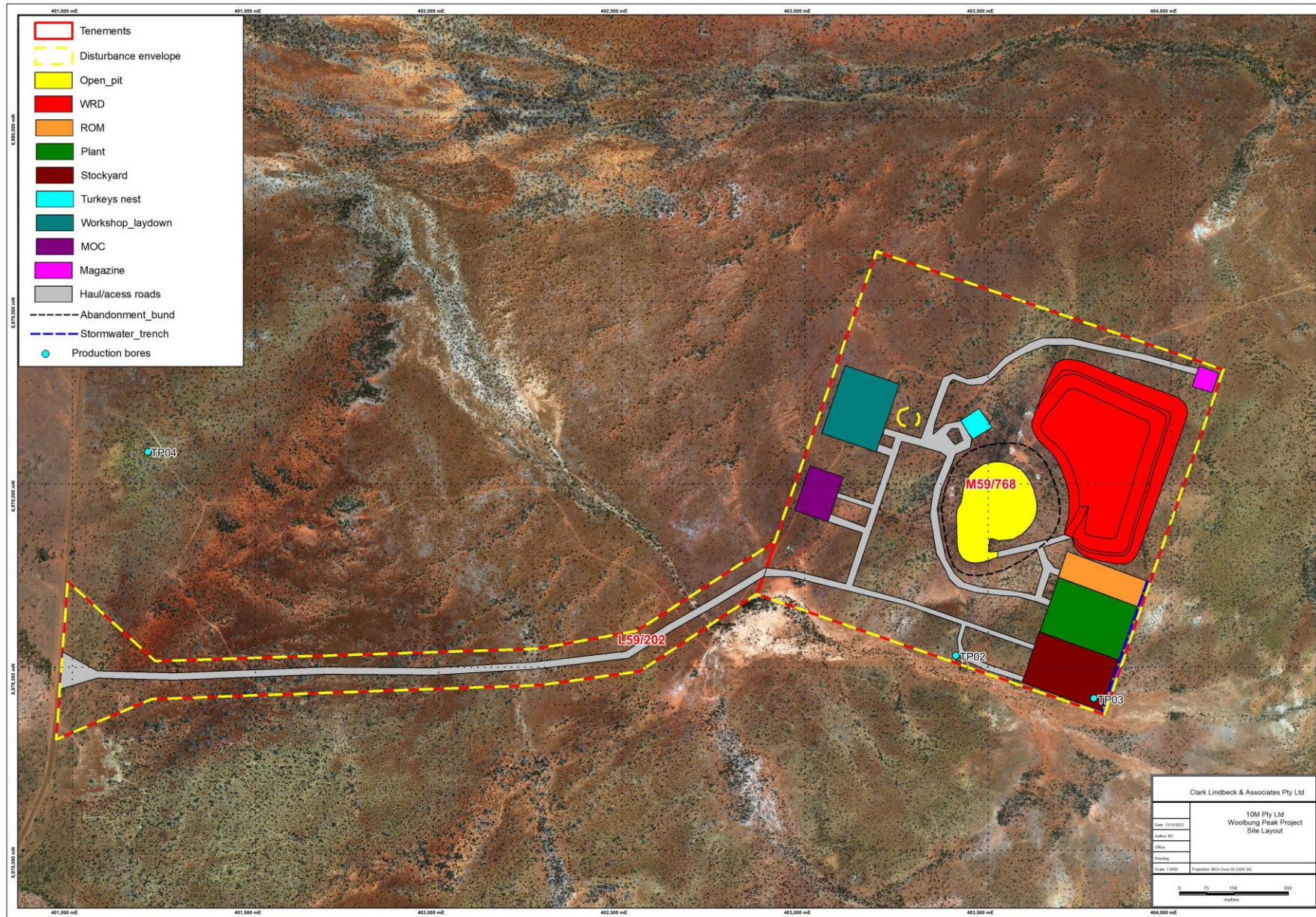


Figure 3: Site layout showing areas of proposed infrastructure



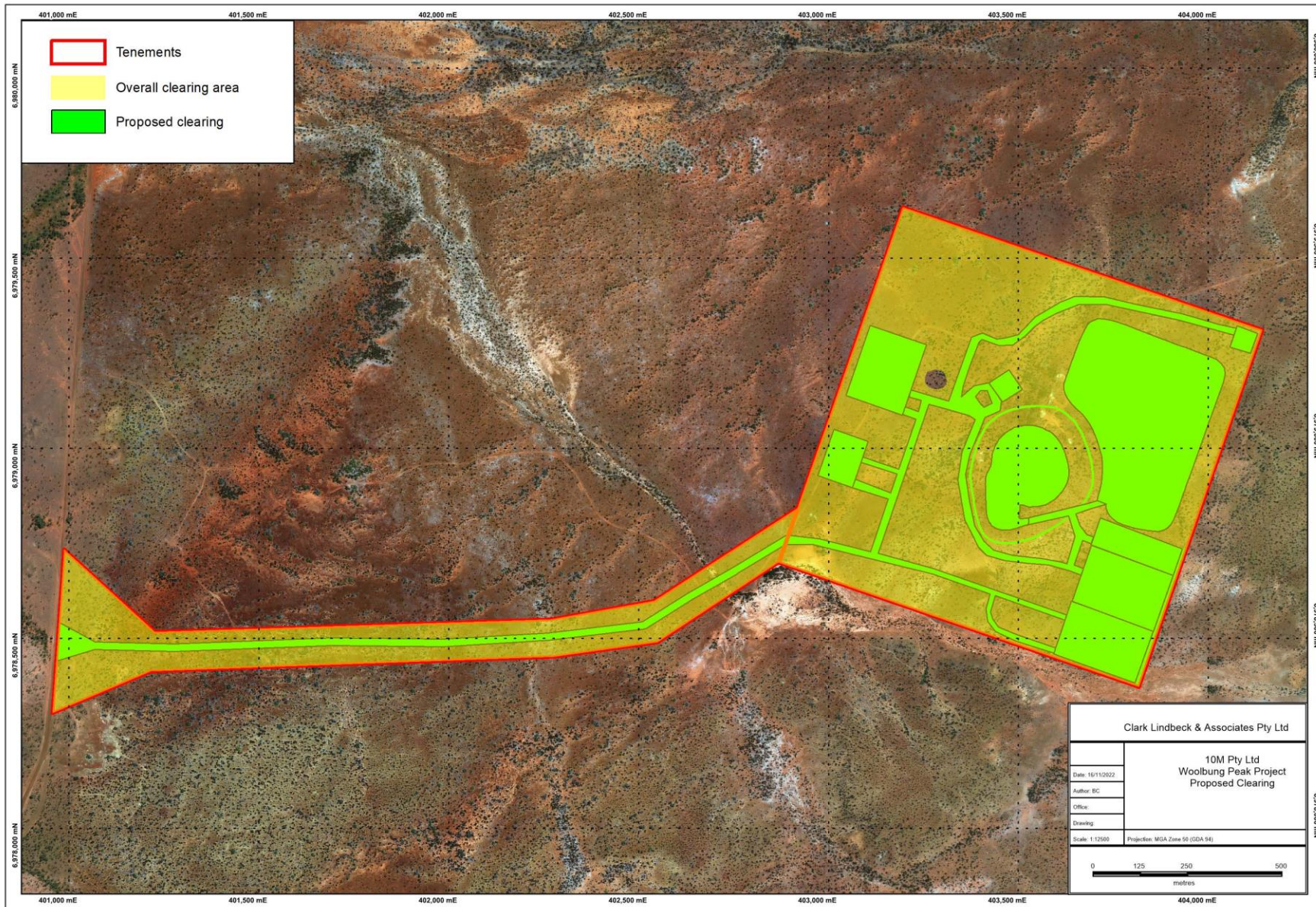


Figure 4: Proposed clearing and overall clearing are for the Project

### 3 EXISTING ENVIRONMENT

#### 3.1 CLIMATE

The climate of the region is classified as arid and characterised by hot, dry summers and mild winters.

Rainfall is bimodal, with significant rainfall events occurring in winter and summer (Beard 1976). The average annual rainfall is 227.1 mm (measured at Murchison), with the average monthly rainfall ranging from 4.8 mm in November to 32.6 mm in February.

There are two wet periods during the year, in summer from January to March and in winter from May-August. The more significant winter rains are generally associated with low pressure systems originating in the Southern Ocean, which weaken considerably by the time they reach the region. Summer rains are associated with cyclonic activity off the northwest coast of WA.

The highest mean maximum temperatures occur in summer (January 39.3°C), with the lowest mean maximum temperatures recorded in July (21.2°C).

#### 3.2 LANDFORM

##### 3.2.1 IBRA Region

The Interim Biogeographic Regionalisation for Australia (IBRA) is a landscape based approach to classifying the land surface of Australia. The Project area is located within the Western Murchison (MUR2) IBRA sub-region. This sub-region is characterised by the Western Murchison is the 'Murchison' Terrains part of the Yilgarn Craton, and contains the headwaters of the Murchison and Wooramel Rivers, which drain the subregion westwards to the coast (Desmond *et al*, 2003).

The region is made up of mulga low woodlands (usually with bunch grasses and often rich in ephemerals) on outcrop, and fine-textured Quaternary alluvial and eluvial surfaces (extensive hardpan washplains that dominate and characterise the subregion) mantling granitic and greenstone strata. Surfaces associated with the occluded drainage occur throughout, with hummock grasslands on Quaternary sandplains, saltbush shrublands on calcareous soils and *Halosarcia* low shrublands on saline alluvia (Desmond *et. al*, 2003).

##### 3.2.2 Land System

Woolbung Peak is located within the Violet land system which comprises: gently undulating gravelly plains on greenstone, laterite and hardpan, with low stony rises and minor saline plains; supporting groved mulga and bowgada shrublands and occasionally chenopod shrublands (Curry *et. al.*, 1994) (Figure 5).

The main Banded Iron Formation (BIF) of the Twin Peaks Greenstone belt (5 km north of Woolbung Peak) is located within the Gabinantha land system (Figure 5), which is characterised as ridges, hills and footslopes of various greenstone, supporting sparse *Acacia* and other mainly halophytic shrublands (Meissner and Wright 2010).

#### 3.3 GEOLOGY

The Project area is located with the Twin Peaks greenstone belt occurring within the Youanmi Terrane of the Yilgarn Craton. The area is associated with Banded Iron Formation (BIF) which occurs within the Windaning Formation, which is defined as a succession of jaspilite BIF and grey-white chert units interlayered with felsic volcanic, volcanoclastic, and volcanogenic rocks, and minor amounts of basalt (Watkins & Hickman 1990).

The main exposure of BIF in the Twin Peak Greenstone Belt is represented by a range approximately 8 km long as a relatively low strike ridge along a northeast bearing. The exposure of BIF at Mt Hope (located 5km southwest of the Project) is poor and very weathered.



Woolbung Peak occurs as an isolated peak approximately 23 m in height extending over a length of approximately 400 m (Plate 1). The prospect has identified continuous DSO hematite from surface to a depth of 145 m. The Project is approximately 5 km south of the main 8 km BIF range referred to above.



**Plate 1: Woolbung Peak and surrounds – looking from the south**

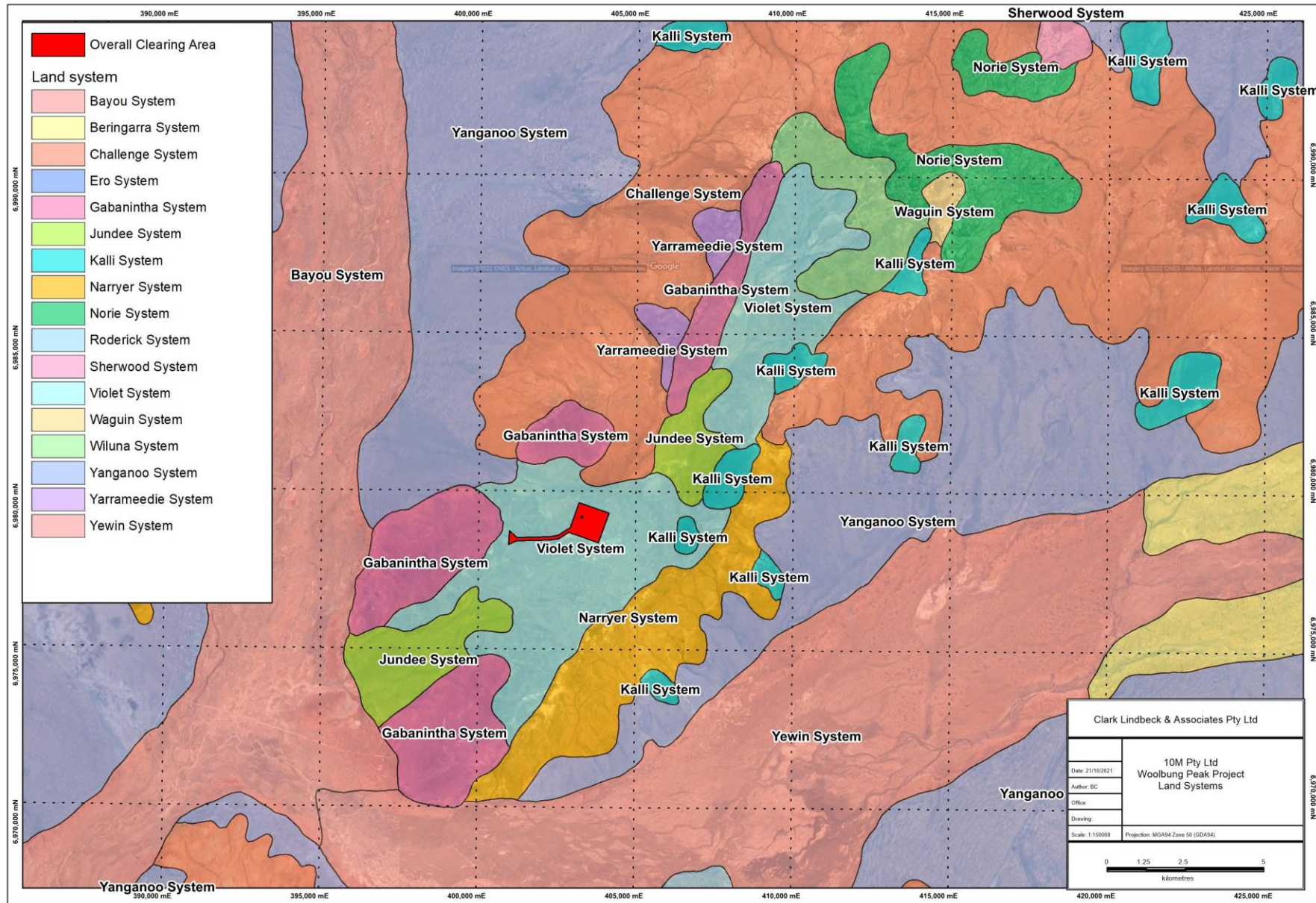


Figure 5: Land systems in Project area and surrounds



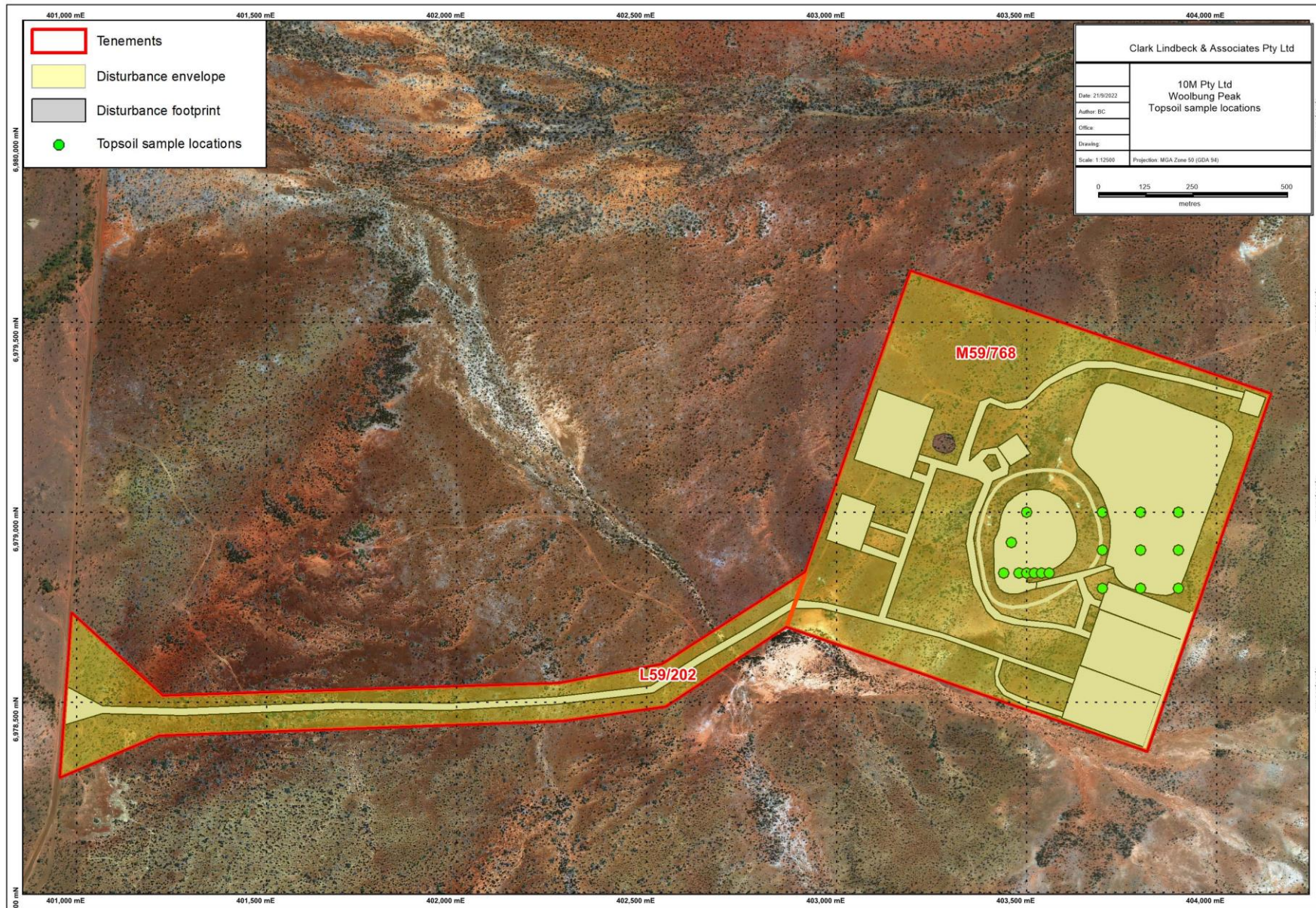


Figure 6: Location of topsoil samples collected

### 3.4 SOILS

#### 3.4.1 Regional soils

The soils in the Project area are predominantly red earthy sands, natural red earths with variable ironstone content and shallow calcareous earthy loams underlain weathered rock at shallow depths (Ashton and McKenzie, 2001).

The mapped soil unit based on the Atlas of Australian Soils in the proposed clearing area is Unit 'Fa4' which is described as: 'Ranges with numerous rock outcrops containing basic igneous rocks (greenstones): chief soils seem to be stony shallow loams (Um5.51) (Northcote et al., 1960-1968).

#### 3.4.2 Project soils

10M collected 23 topsoil samples from the mine area to assess the suitability of the topsoil to promote successful rehabilitation (Figure 6).

The topsoil ranges from non-saline to slightly saline with a pH ranging from 5.7-7.7 (circumneutral) with the majority of the samples slightly acidic.

The topsoil is dominated by sand and gravels with a low % of finer particles. There does not appear to be any limiting factors for rehabilitation.

### 3.5 GROUNDWATER

Three (3) production water bores (TP02, TP03 and TP04) were drilled and tested along a minor stream bed on a low lying valley area at the Project, with constructed depths ranging from 38 to 95 m. In addition, resource drilling was also conducted in the elevated Central Zone banded iron formation on M59/768.

The static water level (SWL) in the production bores in the valley area was about 10 to 22 metres below ground level (mBGL), while on the on the Central Zone (i.e. open pit area) the SWL was 85 to 88 mBGL, being beneath the proposed excavation depth.

The crystalline Twin Peaks Archaean greenstone and banded iron rocks offer virtually non-existent aquifer permeability and storage characteristics. Most groundwater in the area occurs within secondary porosity contained in structural defects, such as joints, faults, and shears; enhanced by the saprolite weathering profile. The thin alluvial deposits on the tenement are mostly dry.

Groundwater sampled from three bores at the Project showed the groundwater is neutral-slightly alkaline and of good quality at TP02 and TP03 (TDS 680-750 mg/L) and slightly brackish at TP04 (TDS 2000 mg/L).

### 3.6 SURFACE WATER

The Murchison River and its tributary, Sanford River are located 10 km west and south of the Project, respectively (Figure 7).

There are no water bodies or drainage lines in the Project area.

Rockwater Pty Ltd (2022b) completed hydrological and hydraulic analyses to assess the potential impact of flood flows on the Project area and to determine whether there are any bunding or drainage requirements (Figure 8). The project area lies on a ridge with minor drainage lines to the east, south and north of the project area.

The mining area is elevated on the north-western side of a hill which forms part of a north-easterly trending range just upstream of the confluence of the Murchison and Sanford Rivers. Surface water flow occurs largely as sheet flow and flows south adjacent to the peak and then overall in a westerly direction.

There is one large catchment ("Large") which drains water south-westwards to another westwards drainage north of the mining area (Figure 8) and four small catchments (A to D, Figure 9) within and close to the mining area with the potential for peak flows to impact the planned pit and infrastructure including the haul road. There is also a minor drainage line – with a very small catchment located to the west of the

planned pit and WRD – that will not impact the pit or WRD: in high rainfalls the drainage would overflow to the west, downslope.

**Table 2: Project catchment characteristics**

Catchment	Area (km <sup>2</sup> )	Length (km)	Av Gradient (m/m)
Large	64.6	15.1	0.0014
A	0.4	1.07	0.0165
B	1.1	1.49	0.0069
B+C	2.6	2.21	0.0118
D	1.1	1.84	0.0540



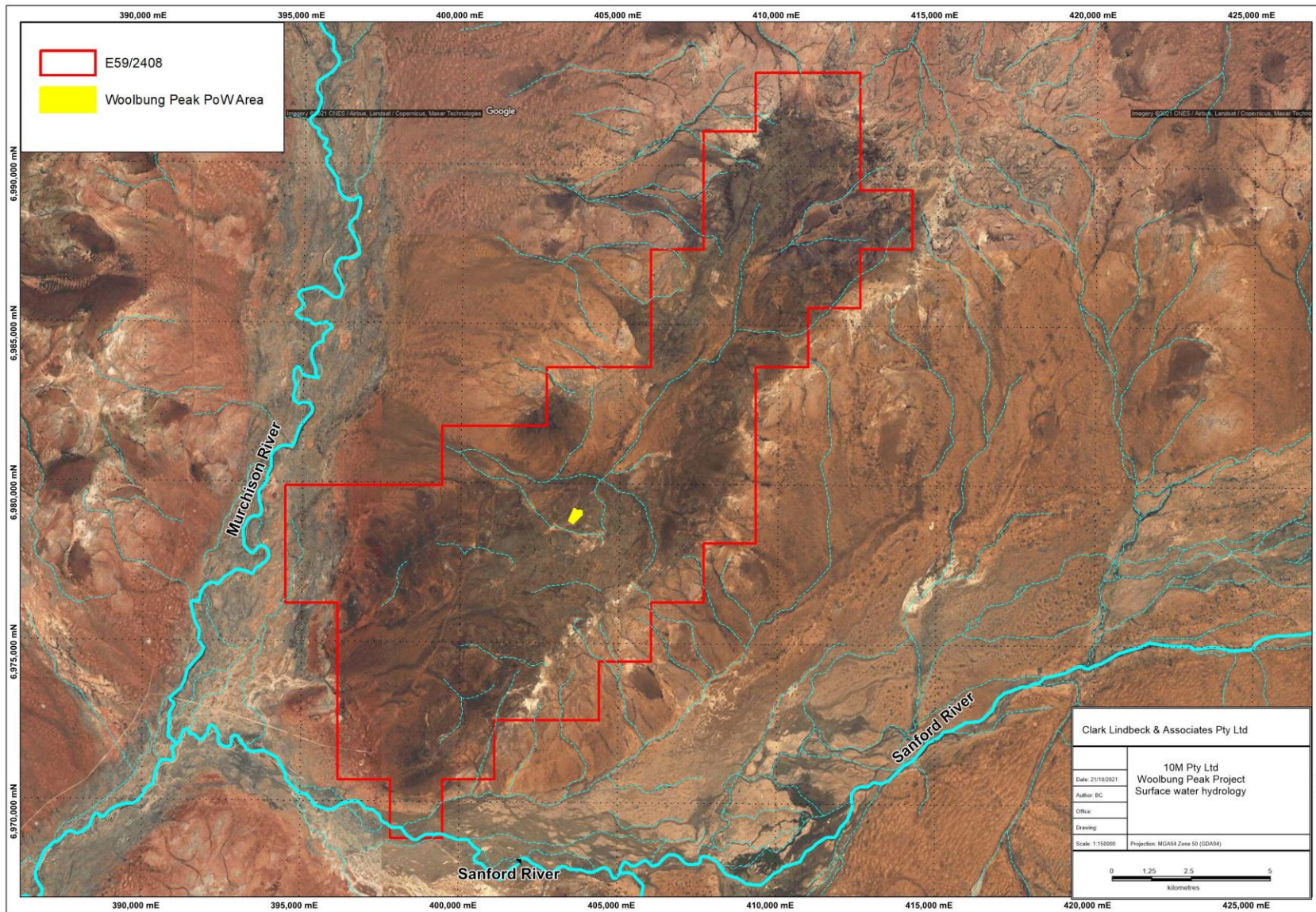


Figure 7: Surface water lines within 10M's tenements

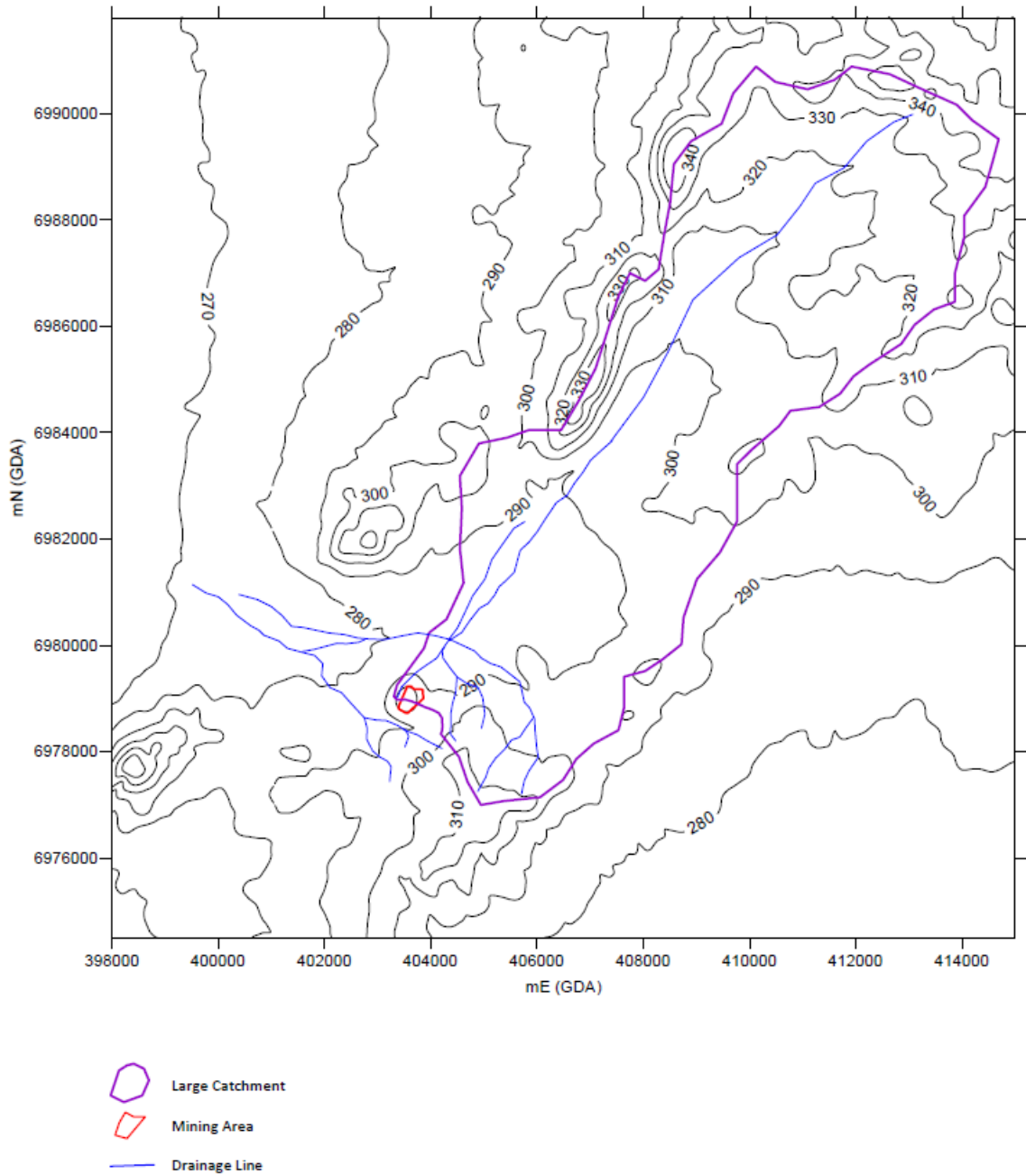


Figure 8: 'Large' catchment and mining area (from Rockwater 2022b)



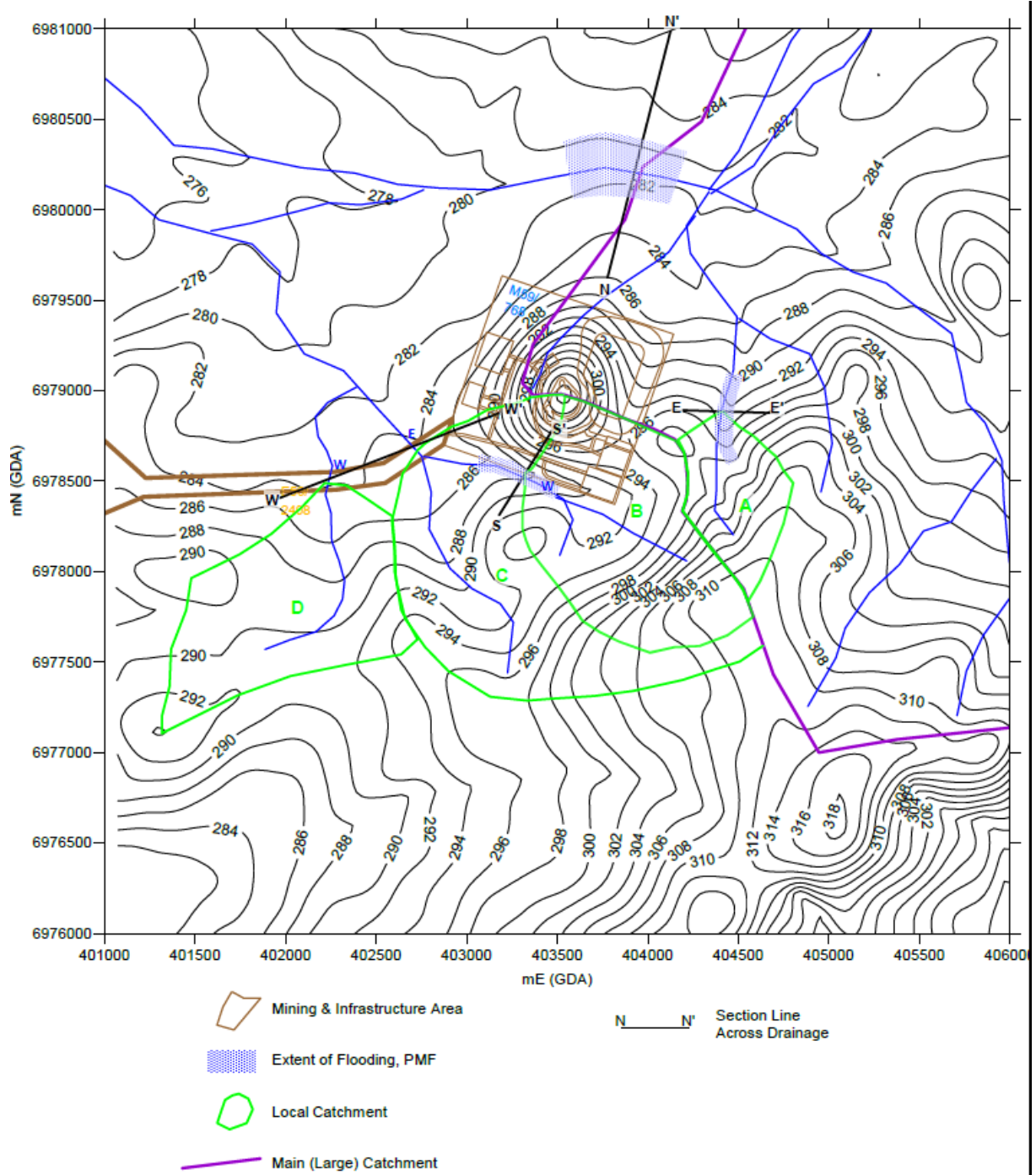


Figure 9: Local catchments and flood extent areas (from Rockwater 2022b)



### 3.7 BIODIVERSITY - FLORA

#### 3.7.1 Regional Vegetation

The pre-European vegetation associations mapped by Beard (1976) encompassing the Project and wider area are presented in Table 3 and Figure 11.

The Project area is mapped as Vegetation Association 125 'Low woodland over scrub; *Acacia aneura* over *A. ramulosa* and *A. cyperophylla* scrub'.

The larger extent of BIF to the north of the Project area is mapped as *Acacia* open shrubland – *Acacia aneura* and *Acacia quadrimarginea* scrub.

**Table 3: Pre-European Vegetation associations**

Veg Assoc	Description
18	Low woodland – Mulga: <i>Acacia</i> open shrubland/ <i>Eremophila-Acacia</i> mixed shrubland
29	Sparse low woodland; mulga, discontinuous in scattered groups
39	Shrublands; mulga scrub
125	Bare areas; salt lakes
160	Shrublands; snakewood & <i>Acacia victoriae</i> scrub
183	Low woodland – <i>Acacia aneura</i> and <i>A. ramulosa</i>
184	Shrublands – <i>Acacia aneura</i> and <i>A. ramulosa</i> scrub
202	<i>Acacia</i> open shrubland – <i>Acacia aneura</i> and <i>Acacia quadrimarginea</i> scrub
204	Succulent steppe with open scrub; scattered mulga & <i>Acacia sclerosperma</i> over saltbush & bluebush
326	Low woodland over scrub; <i>Acacia aneura</i> over <i>A. ramulosa</i> and <i>A. cyperophylla</i> scrub
1125	Succulent steppe with scrub; <i>Acacia victoriae</i> & snakewood over saltbush & bluebush
2081	Shrublands; bowgada and associated spp. scrub

#### 3.7.2 Significant Ecological Communities

The Project is located within a Priority 1 Priority Ecological Community (PEC), the 'New Forest (Including Twin Peaks and Barloweerie Range) vegetation complexes (banded ironstone formation)' PEC (Figure 12).

The PEC comprise the two BIF ranges (Twin Peaks/Barloweerie) and is approximately 26,109 ha in size. The Twin Peak portion of the PEC is 21,980 ha in size and the Project area represents <0.1% of the PEC area. The results of the DEC survey (now DBCA) completed in 2008 is provided in Section 3.7.3.1.

#### 3.7.3 Previous Vegetation Surveys

##### 3.7.3.1 BIF survey by DEC

The DEC completed an assessment of the vegetation on the BIF of the Twin Peaks and Mount Barloweerie Greenstone Belts in August 2008 (Messner and Wright 2010). Fifty one 20 x 20 m quadrats were established on the crests, slopes and foot slopes of the Twin Peaks and Mount Barloweerie Greenstone Belts (Figure 10). Data collected included:

- Presence/ absence of all vascular plants, growth form, height and cover for dominant taxa in each stratum.
- Topographical position, disturbance, abundance, size and shape of coarse fragments on surface,
- Abundance of rock outcrops cover of leaf litter and bare ground.

- Collection of 22 soil samples from the top 10 cm.

A total of 199 taxa, including 91 genera from 36 families, were recorded from the Twin Peaks and Mount Barloweerie Greenstone Belt. These were dominated by Asteraceae (27 taxa), Mimosaceae (25), Chenopodiaceae (20), Poaceae (17), Myoporaceae (11) and Caesalpiniaceae (10). The dominant genera were *Acacia* (24), *Eremophila* (nine), *Senna* (10), *Ptilotus* (eight) and *Maireana* (eight). Ninety ephemerals and four introduced taxa were recorded (Messner and Wright 2010).

Three plant communities were described for the Twin Peaks and Barloweerie Ranges (Messner and Wright 2010):

- Community 1 - found on the crest and upper slopes of both ranges and has isolated to sparse shrublands of *A. aneura* and *A. ramulosa* over open to sparse shrublands of *Thryptomene decussata*, *Eremophila latrobei*, *Eremophila glutinosa* and *Acacia scleroclada* over open to sparse shrublands and grasslands of *Sida sp. Golden calyces glabrous* (H.N. Foote 32), *P. obovatus*, *P. schwartzii*, *Eriachne pulchella* and *Aristida contorta*.
- Community 2 - occurred mainly on the lower slopes and footslopes of the Twin Peaks Greenstone Belt. It is characterised by open to sparse shrublands of *A. aneura* and *A. ramulosa* over open to sparse shrublands of *Acacia tetragonophylla*, *Senna artemisioides subsp. helmsii*, *Senna sp. Meekatharra* (E. Bailey 1–26), *Eremophila* spp. (*E. macmillaniana*, *E. simulans* and *E. glutinosa*) over mid-dense to open forbland and grassland of *P. obovatus*, *Aristida contorta* and *Eriachne pulchella*.
- Community 3 - occurred on laterite breakaways surrounding Mount Barloweerie and is described as open to sparse shrublands of *A. aneura* and *A. aulacophylla* over open to sparse shrublands of *Philotheca sericea* over sparse shrublands and forblands of *P. schwartzii* and *Stylidium longibracteatum*.

The main communities found on the ranges roughly correspond to the Rocky Hill Mixed Shrublands and Stony Mixed Mulga Shrublands vegetation types (Curry *et al.* 1994).

Seven Priority flora species were recorded during the survey and are included in the DBCA database search results presented in Section 3.7.4.

In this survey, (Messner and Wright 2010) acknowledged the high numbers of priority taxa were recorded from the BIF ranges, with the highest number from Mount Barloweerie (Figure 10). The larger BIF extents are located north of the proposed clearing area (Figure 10).

### 3.7.3.2 2007 Assessment

A Level 1 survey of the Twin Peaks Prospect was undertaken on 8- 11 January 2007 by Ecotec (2007). The survey extent encompassed E59/2408 in which Woolbung Peak is located.

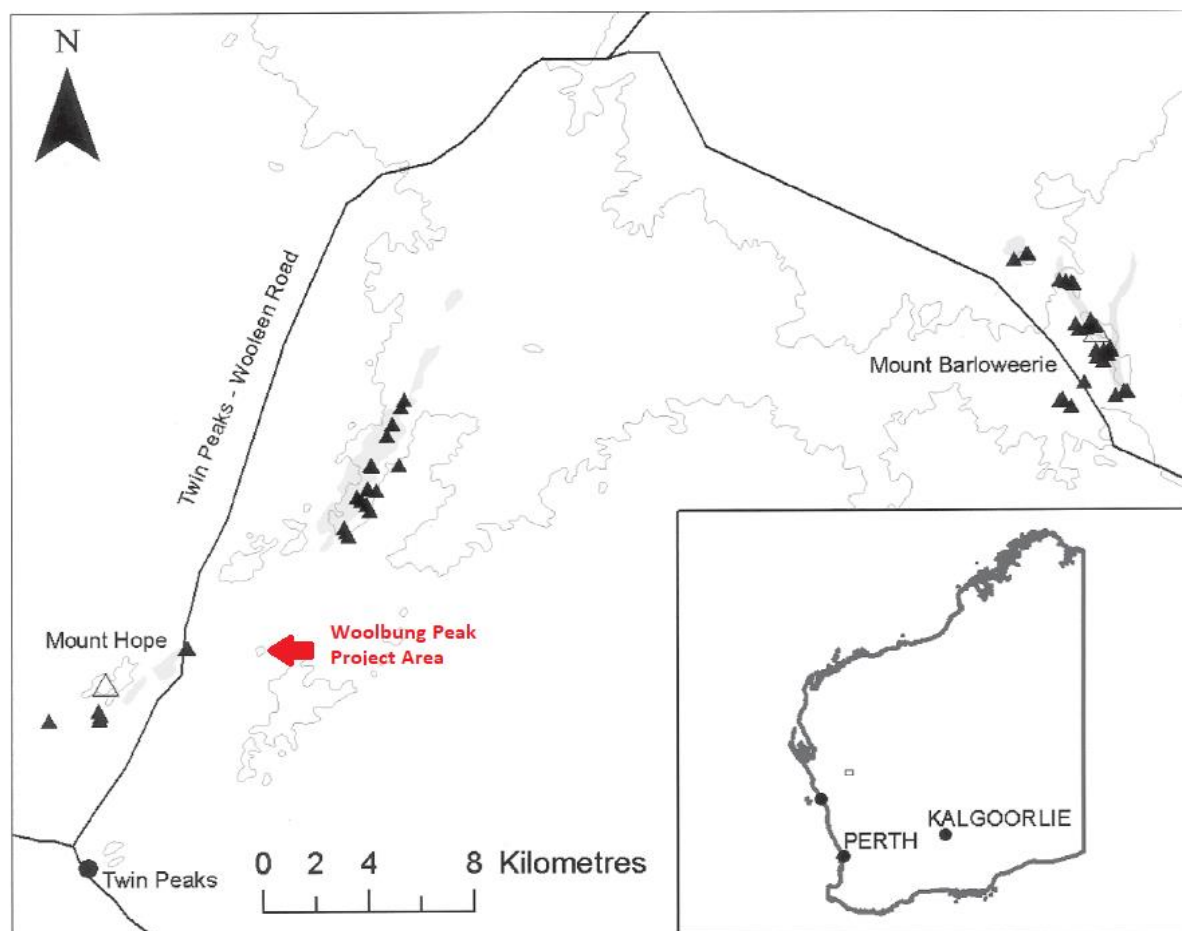
Ecotec (2007) used 50 m x 2 m transects throughout the survey area at regular intervals and where significant vegetation or landforms were noted. A total of 24 transects as well as incidental sightings were used to complete the survey.

Ecotec (2007) identified the dominating landform was a series of banded iron hills (BIF) running in a north-south direction in the centre of the survey area. A number of isolated hills, including Twin Peaks, surround this ridge. These hills are typically stony with little topsoil and sparse vegetation. Most of the area surrounding the BIF was noted as broad flat plains with shallow to deep clay-loam soil and low vegetation.

The main vegetation type encountered in the Ecotec (2007) survey area was 'Acacia Shrubland' which was associated predominately with the clay-loam soils. The vegetation type 'Acacia Woodland' was noted in areas with deep clay loam soils where water is more abundant and larger vegetation is supported. *Acacia* Low Shrubland was also located around the eastern fringe of a large flood plain.

The survey also identified 'Rocky hills', which had little topsoil and sparse vegetation. Flora species present were generally consistent with the surrounding low lying areas, comprising predominately *Acacia*, *Eremophila* and grass species.

The flora survey resulted in a total of 113 native and introduced flora species from 28 families (Ecotec 2007).



**Figure 10: Plots assessed by DEC in 2010 at Twin Peaks and Barloweerie Ranges relative to the Project area (line is 300m RL contour) highlighting the large BIF extent outside of the proposed clearing area**

### 3.7.4 Conservation Significant Flora – Database Search

A search of the DBCA Threatened flora database identified 14 species of conservation significance within the Project tenements, PEC and surrounding areas (DBCA 2021a) (Figure 11). Figure 11 also includes the results of detailed survey work commissioned by 10M which accounts for the large number of records in these areas surveyed (Section 3.7.5). The majority of these records are not located on BIF.

Priority flora records are concentrated in the Twin Peaks and Mount Barloweerie BIF ranges.

### 3.7.5 Project Vegetation and Flora Survey

10M commissioned Native Vegetation Solutions (NVS) to complete several surveys at the Project from 2021-2022 which have included:

- Targeted Threatened and Priority flora survey of the overall Project area on 23-24 August 2021 focusing on Woolbung Peak area and surrounds (NVS 2021) (Appendix 2).
- A detailed vegetation and flora survey which encompassed Woolbung Peak, Woolbung South and Pleiades in Spring 2021 and Autumn 2022 (NVS 2022a) (Appendix 3).
- Targeted Threatened and Priority flora survey of the overall Project area in August 2022 targeting *Hibiscus* sp. Perrinvale Station (P1) (NVS 2022b) (Appendix 4).

Six vegetation groups were identified during the NVS (2022a) survey, largely following topographical features and dominant species, of which three were identified within the disturbance envelope (**Figure 13**):

- Mulga shrubland over BIF.

- Mulga shrubland.
- Mulga creekline vegetation (this vegetation is not ‘riparian’).

Table 4 shows the extent of the vegetation groups in the areas surveyed by NVS and the proposed overall clearing area. NVS (2022a) considered the ‘Mulga shrubland over BIF’ correlates to the vegetation within the PEC.

10M estimates a maximum of 14.5 ha of ‘Mulga shrubland over BIF’ will be cleared (Table 4). This comprises 29.5% of the total area of this vegetation group surveyed by NVS (2022a) which does not take into account the entire BIF extent surrounding Pleiades which was not part of the survey area (Figure 14) and part of the DEC PEC survey i.e. its extent is not limited to the Project area and will be not be significantly impacted.

**Table 4: Vegetation group survey areas and areas in the overall clearing area**

Vegetation Group (NVS 2022a)	Area of each Vegetation Group recorded by NVS (2022A)	Area of each Vegetation Group recorded by NVS in overall clearing area (ha)*	% Vegetation group recorded by NVS in overall clearing area**	Area of each Vegetation Group recorded by NVS to be cleared (ha) -	% Vegetation group recorded by NVS to be cleared**
Mulga shrubland over Granite outcropping	15.702	Nil	Nil	Nil	Nil
Mulga shrubland over stony plains	30.576	Nil	Nil	Nil	Nil
Mulga shrubland over BIF	49.791	18.99*	38.14	14.5***	29.5
Mulga shrubland	311.72	88.88	28.51	48.1	15.9
Mulga Creekline vegetation	34.472	2.71	7.86	1.2	3.5
Mulga shrubland over Laterite breakaways	79.756	13.22	16.58	6.2	7.7
<b>TOTAL</b>	<b>522.017</b>	<b>123.8</b>		<b>70.0</b>	

\*Total area surveyed prior to exploration works completed by NVS

\*\* does not take into account areas of this vegetation group extending outside of the NVS survey areas, in particular the larger extent of BIF north and south of Pleiades

\*\*\* considered upper limit of clearing in this vegetation group

Vegetation condition was generally ‘Good’ to ‘Very Good’, with some areas rated as ‘Excellent’ (Keighery 1994). Disturbance was present within the survey area mostly attributed to historic access tracks, exploration related activities, and also grazing (NVS 2022a).

The survey identified 142 species recorded within the survey area with 135 species recorded within quadrats (NVS 2022a).

Six Priority flora were recorded by NVS (2021; 2022a; 2022b) of which two were recorded in the proposed clearing envelope (Figure 13):

- *Hibiscus* sp. Perrinvale Station (P1) – one individual recorded (represents 0.8% of total 122 plants recorded by the NVS (2022b) survey. This individual on M59/768 was removed by 10M during approved exploration works (prior to its identification being known).
- *Eremophila simulans* subsp. *megacalyx* (P3) – one individual recorded (represents 0.6% of total 176 plants recorded by NVS (2021; 2022a).

The conservation significance of these species will not be impacted by the Project.

The NVS (2022b) targeted survey identified a number of 26 new records of *Hibiscus* sp. Perrinvale Station (P1) and *Acacia* sp. Muggon Station (P2) >2 km north of the proposed clearing area near Pleiades (Figure

14). These areas were associated with the larger extent of BIF to the north, the area that DEC (now DBCA) established transects (Section 3.7.3.1; Figure 10).



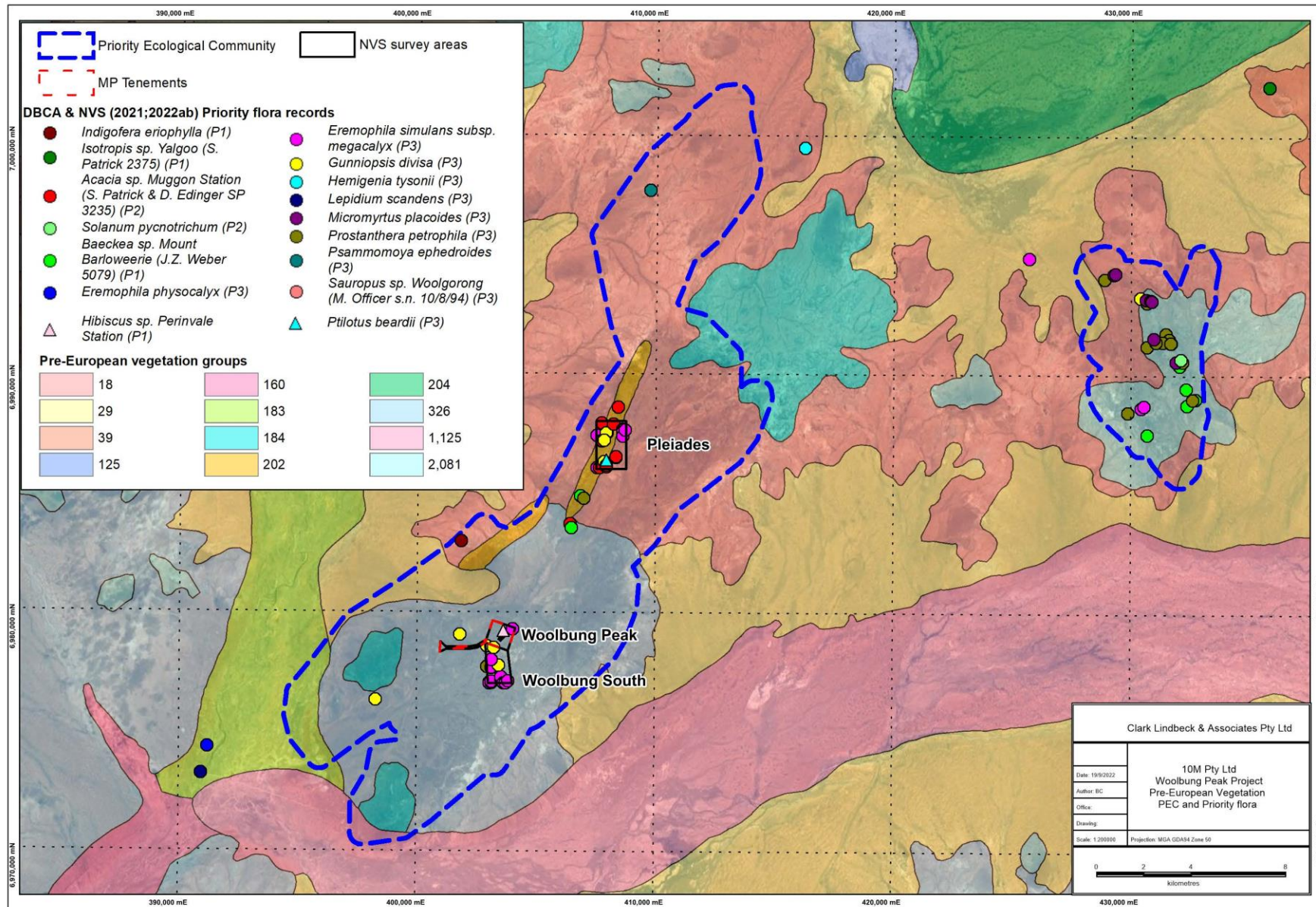


Figure 11: Pre-European vegetation groups, PEC and Priority flora records Vegetation associations and Priority flora in Project area and surrounds



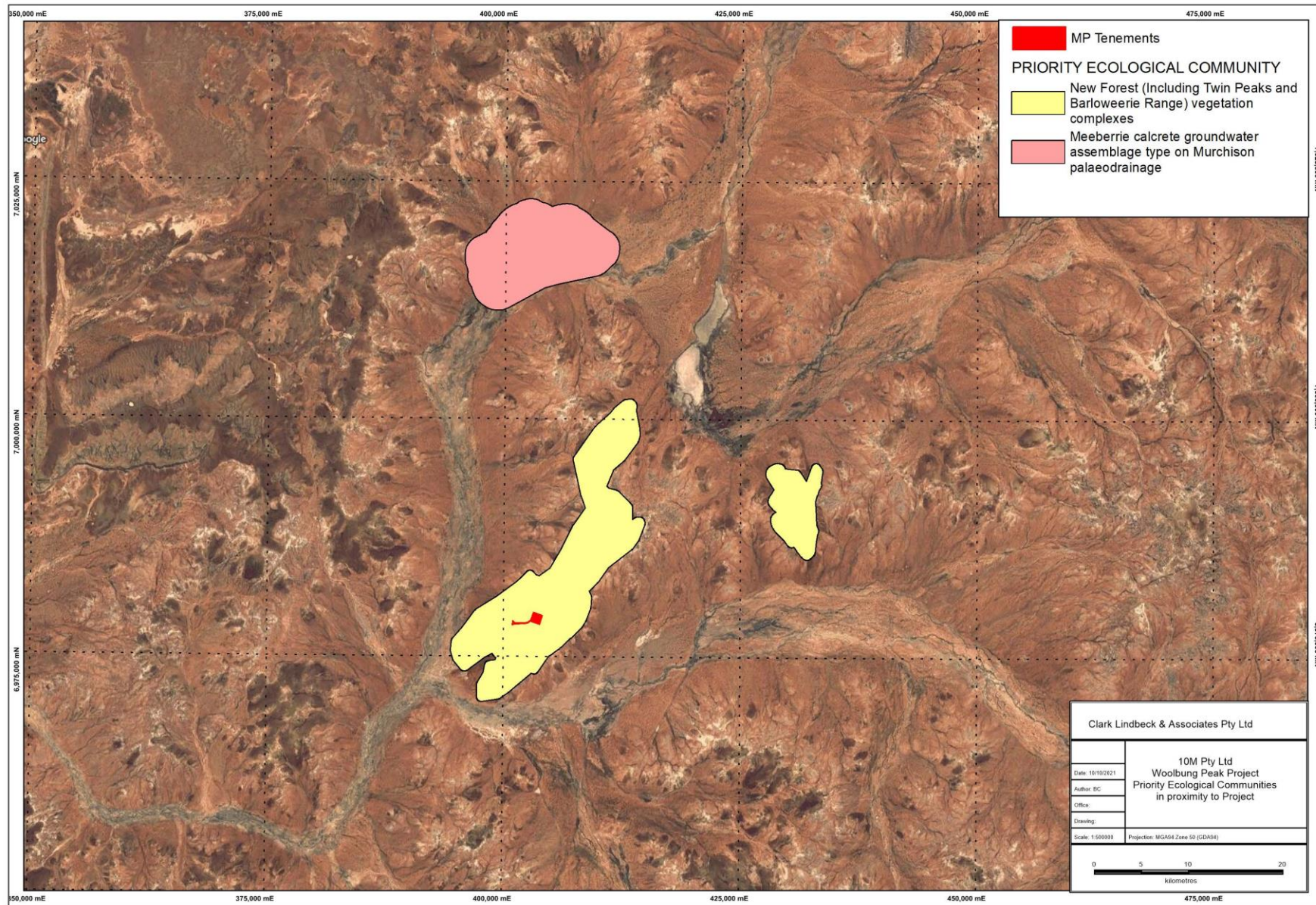


Figure 12: Location of PEC's in proximity to the Project



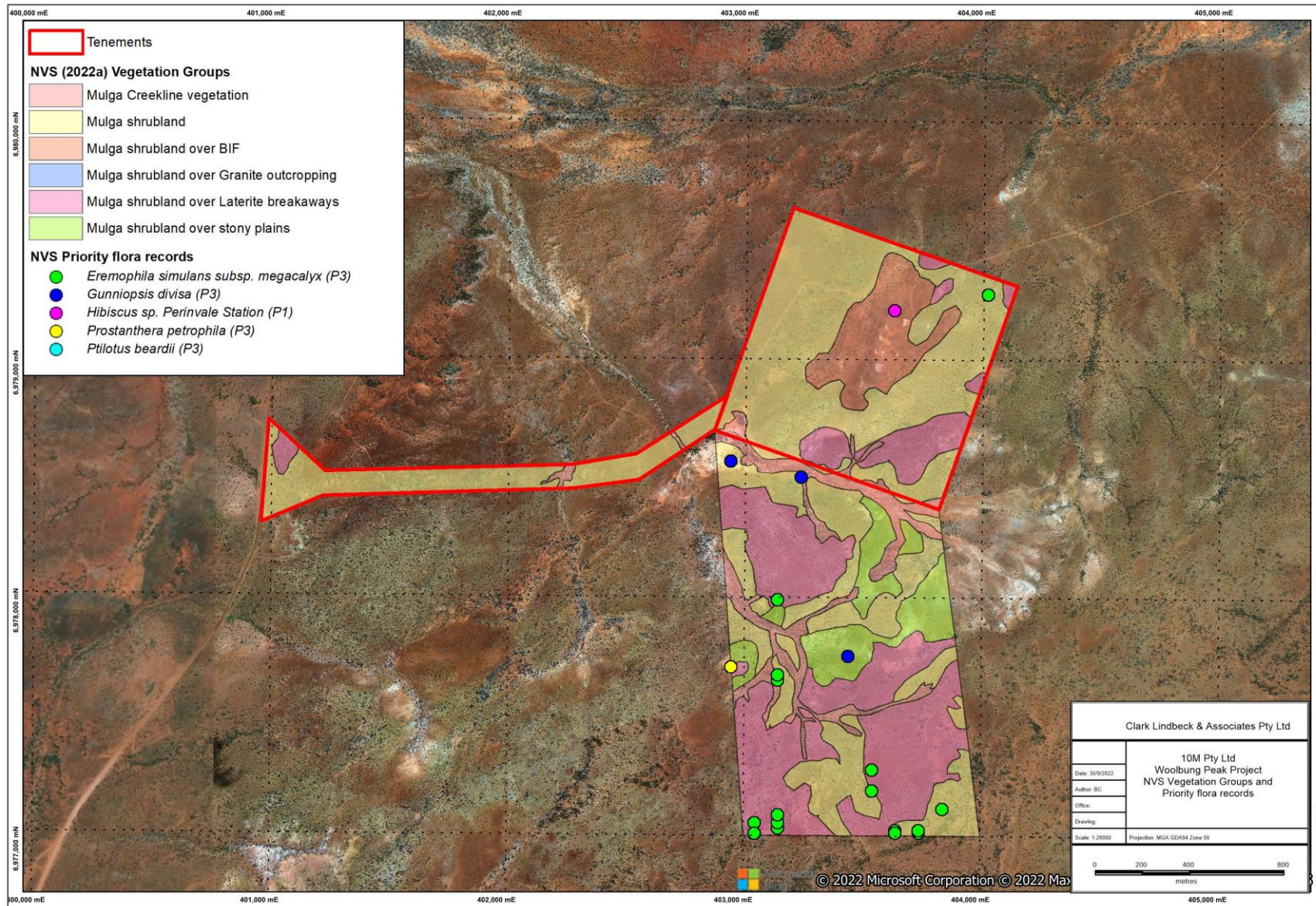


Figure 13: Vegetation groups mapped at Woolbung Peak and Priority flora records (and Woolbung South) as mapped by NVS (2022a)



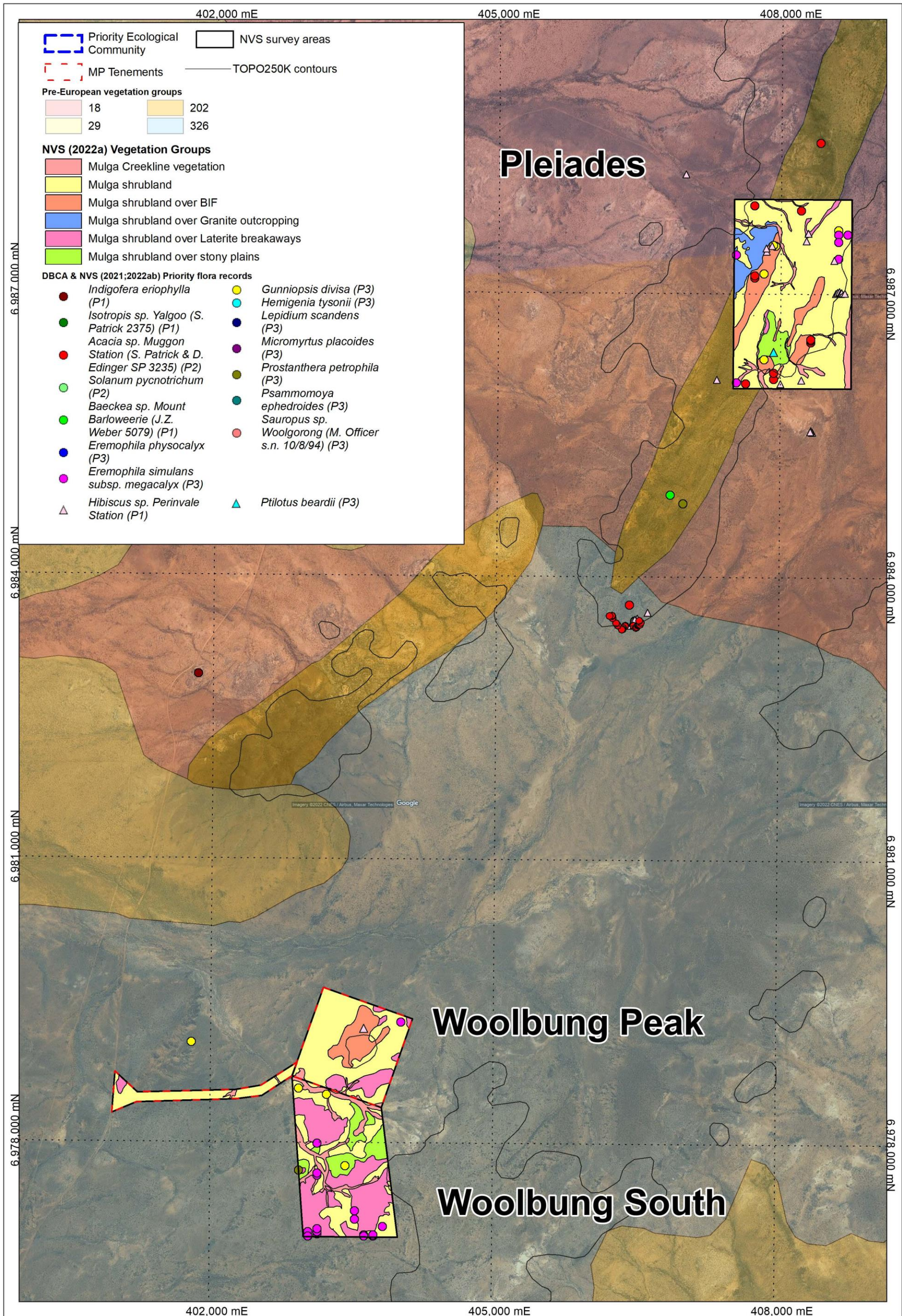


Figure 14: Vegetation groups and Priority flora with 250K contours showing elevated areas of BIF to the north of the proposed clearing area



## 3.8 BIODIVERSITY – FAUNA

### 3.8.1 Terrestrial Fauna

#### 3.8.1.1 Previous Fauna Assessments

A Level 1 fauna assessment was undertaken by Ecotec (2007) in conjunction with the flora assessment (refer to Section 3.7.3.2).

The assessment was at reconnaissance level based on the vegetation/habitat identified in the wider Project tenement i.e. *Acacia* shrubland, *Acacia* woodland, Rocky hills, Creeklines etc.

Ecotec (2007) noted the survey area has been degraded to some degree by grazing (sheep, cattle and feral goats). While Wooleen Station has reduced stock numbers in recent years to focus on tourism, native vegetation is in noticeably better condition on Wooleen Station when compared to Twin Peaks Station which is stocked at a much higher rate.

#### 3.8.1.2 Conservation Significant Fauna – Database search

A search of the EPBC Protected Matters Tool and DBCA Threatened fauna database identified 12 fauna species of conservation significance recorded, or, that could potentially occur with the Project area and an 80 km buffer (DBCA 2021b, DAWE 2021) (Table 5, Figure 15). As the Project will not involve disturbance of water bodies, migratory and marine species were omitted.

As the Project area is located within the medium priority survey area for the Night Parrot (*Pezoporus occidentalis*) and potential range of the Arid Bronze Azure Butterfly (*Ogyris subterrestris petrina*) these are included in Table 5.

An assessment of the potential occurrence/impact of the Project on these species is provided in Table 5.

10M considered that Malleefowl (*Leiopoa ocellata*) could potentially occur at the Project given there is a record 12.5 km northwest of the Project area and commissioned a targeted Malleefowl survey (Section 3.8.1.3).

Additional fauna survey work was completed at the Project in March 2022 (Section 3.8.2).

#### 3.8.1.3 Targeted Malleefowl Survey

Western Ecological (2021) completed a targeted Malleefowl assessment of a 12 ha area within the Project area (to support a Programme of Work) on 24 September 2021. A copy of the survey report is attached as Appendix 5.

The area surveyed consisted broadly of very open Mulga Shrubland on very rocky (outcrops) to a rocky substrate on relatively gentle slopes. Western Ecological (2021) considered the habitats present in the survey area unsuitable for Malleefowl as:

- The area is too rocky and open and has very little to no vegetation cover in the upper storey for Malleefowl to build their mounds.
- There are also very few to no shrub species in the mid-storey habitats of the survey area which might provide a food source.

Overall Western Ecological (2021) concluded that in the absence of suitable habitat in the survey area and close by for Malleefowl to construct their mounds, or to forage in, the likelihood of Malleefowl occurring in the survey area is considered highly unlikely.

### 3.8.2 Level 1 and Level 2 Fauna Survey

Subsequent to their 2021 survey, a basic fauna assessment and Level 2 targeted assessment was completed by Western Ecological on 22-26 March 2022 (Western Ecological 2022 – Appendix 6). The assessment included a targeted threatened species assessment, based on DBCA searches and the previous site visit, for the:

- Western Spiny-tailed Skink

- Malleefowl
- Night Parrot
- Long-tailed Dunnart.
- Northern Shield-backed trapdoor Spider.

No evidence of any of these species was recorded during the survey (Western Ecological 2022).

In addition, a habitat assessment was undertaken of the Project area to define and delineate the main broad habitat types present. Two broad fauna habitats were identified:

- Rocky Mulga Shrubland (88.7% of survey area)
- Scattered Mulga Shrubland (11.3% of survey area).

These two habitat types are relatively widespread and common in areas adjacent to the project area and, more broadly, across the region (Western Ecological 2022).

### **3.8.3 Short-Range Endemic Invertebrates**

An assessment of the occurrence of the Northern Shield-backed Trapdoor spider was completed by Western Ecological (2022).

Some limited suitable habitat was identified in the survey area, i.e., limited areas with leaf litter under some of the *Acacia* trees and shrubs that are on plains, low slopes or on rocky slopes. However, during the assessment for the species, the distinctive burrow entrance with its two tufts of leaf litter radiating out from the centre of the burrow rim, similar to a moustache, were not observed.

Based on this, Western Ecological (2022) concluded the species is unlikely to occur in the survey area.

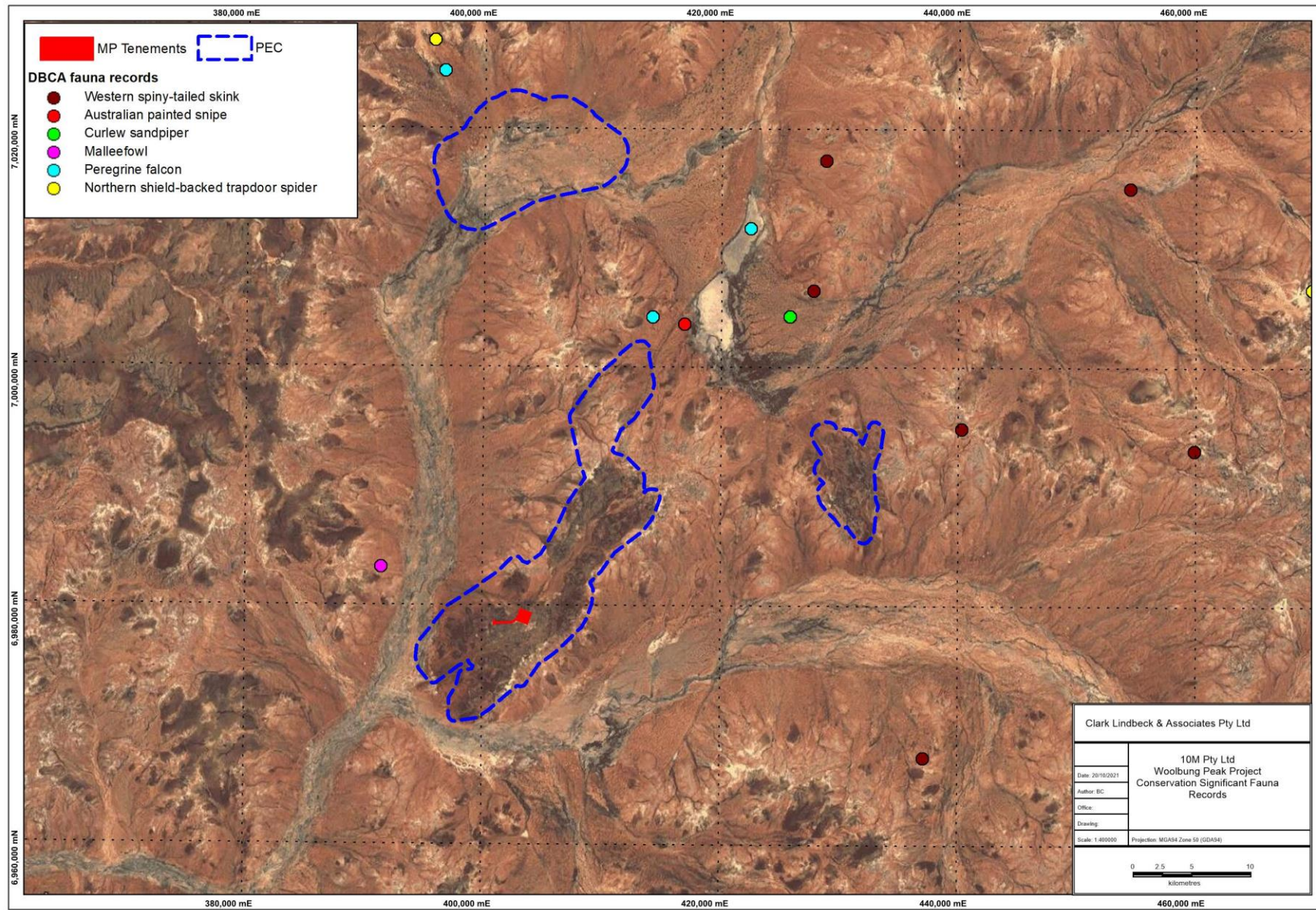


Figure 15: DBCA records of fauna of conservation significance in the Project tenement, PEC and surrounds

Table 5: Potential impact on potentially occurring fauna of conservation significance

SPECIES	CONSERVATION STATUS		LIKELIHOOD OF OCCURRENCE/POTENTIAL IMPACT
	DAWE*	DBC**	
<b>FISH</b>			
<i>Hypseleotris aurea</i> (Golden gudgeon)		P2	The records of this fish species are from the Murchison River, Billyoo Bridge in water As there are no water bodies in the Project area this species is considered highly unlikely to occur.
<b>AVIFAUNA</b>			
<i>Calidris acuminata</i> (Curlew sandpiper)	CR	CR	This species requires both coastal and or inland wetland habitat which is not present in the survey area (Garnett <i>et al.</i> 2011).
<i>Falco peregrinus</i> (Peregrine Falcon)		OS	The Peregrine Falcon is an uncommon but wide-ranging bird across Australia (Barrett <i>et al.</i> 2003). It occurs mainly along rivers and ranges as well as wooded watercourses and lakes and nests primarily on cliffs, granite outcrops and quarries. If this species did occur, given the mobility of this species, it would not be impacted by the Project.
<i>Leipoa ocellata</i> (Malleefowl)	VU	VU	Malleefowl prefer habitat with a dense canopy and an open ground layer in which they can construct their mounds (Benshemesh 2007). No evidence of this species was recorded by Western Ecological at the Project (2021; 2022).
<i>Polytelis alexandrae</i> (Princess Parrot)	VU	P4	The Princess Parrot inhabits sand dunes and sand flats in the arid zone of western and central Australia. It occurs in open savanna woodlands and shrublands that usually consist of scattered stands of <i>Eucalyptus</i> (including <i>E. gongylocarpa</i> , <i>E. chippendalei</i> and mallee species), <i>Casuarina</i> or <i>Allocasuarina</i> trees; an understorey of shrubs such as <i>Acacia</i> (especially <i>A. aneura</i> ), <i>Cassia</i> , <i>Eremophila</i> , <i>Grevillea</i> , <i>Hakea</i> and <i>Senna</i> ; and a ground cover dominated by <i>Triodia</i> species (DoE 2020b). This habitat is not located in the Project area, thus, this species is considered unlikely to occur.
<i>Polytelis occidentalis</i> (Night Parrot)	EN	CR	The broad habitat requirements of night parrots include areas of old-growth spinifex ( <i>Triodia</i> ) for roosting and nesting, together with foraging habitats that are likely to include various native grasses and herbs, and may or may not contain shrubs or low trees. These may be in expanses or isolated patches, but sometimes associated with other vegetation types, such as dense chenopod shrub (Western Ecological 2022). As the Project area contains no spinifex and little understorey, this species is considered unlikely to occur.
<i>Rostraltula australis</i> (Australian painted snipe)	EN	EN	The species is usually found in shallow inland wetlands, either freshwater or brackish, that are either permanently or temporarily filled. Record from Wooleen Pastoral Station near wetland. As this habitat is not present in the Project area it is considered unlikely to occur.
<b>REPTILES</b>			
<i>Egenernia stokesii badia</i> (Western spiny tailed-skink)	EN	EN	Typically the skink habitat includes isolated stands of granite boulders or more extensive clusters of rock that have crevices and cracks present, including lateritic breakaways. The Project area has limited areas of rocky habitat in the form of banded ironstone where there are limited cracks and crevices in which it could shelter. Given the lack of suitable habitat in the survey area this species is considered highly unlikely to occur (Western Ecological 2022). The Western Ecological (2022) assessment found no evidence of this species at the Project.
<b>MAMMALS</b>			
<i>Dasyurus geoffroyi</i> (Chuditch)	VU		Listed in EPBC search results – this species is not known to occur in this region.



SPECIES	CONSERVATION STATUS		LIKELIHOOD OF OCCURRENCE/POTENTIAL IMPACT
	DAWE*	DBCAs**	
<i>Sminthopsis longicaudata</i> (Long-tailed Dunnart)		P4	This species prefers rocky habitats that support low open woodlands or Acacia shrublands with an understorey of Spinifex. Records from Muggon >50km from the Project area. No evidence of this species was recorded by Western Ecological (2022).
<b>INVERTEBRATES</b>			
<i>Idiosoma clypeatum</i> (Northern shield-backed trapdoor spider)		P3	This species could potentially occur in the Project area. As it has a known extent of occurrence of over 120,000 km <sup>2</sup> , it is not considered to be a short range endemic species by the definition of Harvey (2002) and the small size of the Project is not expected to impact the conservation significance of this species (if it did occur). No evidence of this species was recorded by Western Ecological (2022).
<i>Ogyris subterrestris petrina</i> (Arid Bronze Azure Butterfly).	CR	CR	The species (and host ant) preferred habitat is woodland with smooth barked eucalypts. This habitat is not located in the Project area thus it is considered this species does not occur.

\* – listed under the *Environmental Protection and Biodiversity Conservation Act 1999*

\*\* - under *Biodiversity Conservation Act 2016*

### **3.9 ECOLOGICAL COMMUNITIES**

As referred to previously, the Project area is located within the New Forest (Including Twin Peaks and Barloweerie Range) vegetation complexes (banded ironstone formation) PEC.

A search of the DBCA Threatened Ecological Community (TEC) database identified no TEC or additional PEC in the Project area. The Priority 1 'Meeberrie calcrete groundwater assemblage type on Murchison palaeodrainage' PEC is located 34 km north of the Project area and relates to subterranean fauna communities and will not be impacted by the Project Figure 12.

### **3.10 CONSERVATION AREAS IN ADJACENT AREAS**

The closest nature reserve is Toolanga Nature Reserve which is located >70 km northwest of the Project.

The Twin Peaks Pastoral Station (northern boundary located 2km south of Project) is managed for conservation and will not be impacted.

### **3.11 LANDUSE AND DEGRADATION**

Existing disturbance within the survey comprises exploration activity completed historically, and more recently by 10M for drilling and their bulk sample Program (Figure 16). An existing pastoral track runs on the western and northern part of M70/1417.

The Project is located on the Wooleen (mine area) and Billabalong Pastoral stations which were once subject to grazing.

### **3.12 REHABILITATION**

10M has produced a Mine Closure Plan (MCP) to address the rehabilitation and closure works to return the area to its pre-mining land use. This MCP (Reg ID 114394) is currently being assessed by DMIRS.

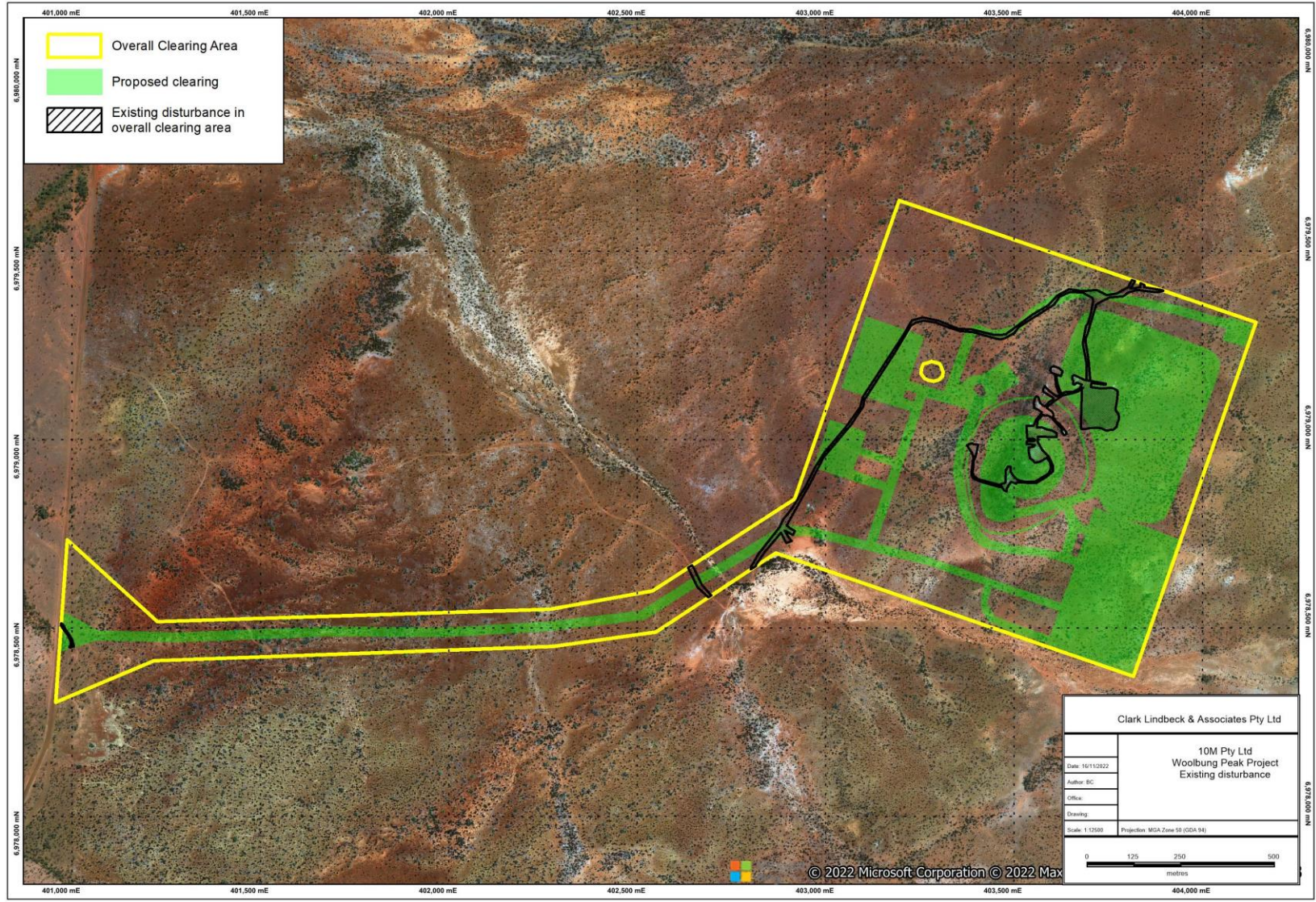


Figure 16: Existing disturbance in overall clearing area



## 4 CLEARING PERMIT PRINCIPLES

### a) Native vegetation should not be cleared if it comprises a high level of biological diversity

The Project lies within the Western Murchison (MUR1) Interim Biogeographic Regionalisation for Australia (IBRA) Sub Region of the Murchison Biogeographic Region which totals over 7.8 million hectares (Cowan, 2001).

The Project area is mapped as Vegetation Association 125 'Low woodland over scrub; *Acacia aneura* over *A. ramulosa* and *A. cyperophylla* scrub'.

These vegetation associations are well represented, with more than 98% of pre-European levels of native vegetation remaining within the State and Bioregion (Government of Western Australia, 2019; GIS Database).

10M estimates a maximum of 14.5 ha of 'Mulga shrubland over BIF' will be cleared (please see table below). This comprises 29.5% of the total area of this vegetation group surveyed by NVS (2022a) which does not take into account the entire BIF extent surrounding Pleiades which was not part of the survey area (Figure 14) and part of the DEC survey.

The proposed clearing will not significantly reduce the extent of any of the vegetation groups surveyed.

Vegetation Group (NVS 2022a)	Area of each Vegetation Group recorded by NVS to be cleared (ha) -	% Vegetation group recorded by NVS to be cleared**
Mulga shrubland over Granite outcropping	Nil	Nil
Mulga shrubland over stony plains	Nil	Nil
Mulga shrubland over BIF	14.5***	29.5
Mulga shrubland	48.1	15.9
Mulga Creekline vegetation	1.2	3.5
Mulga shrubland over Laterite breakaways	6.2	7.7
<b>TOTAL</b>	<b>70.0</b>	

\*Total area surveyed prior to exploration works completed by NVS

\*\* does not take into account areas of this vegetation group extending outside of the NVS survey areas, in particular the larger extent of BIF north and south of Pleiades

\*\*\* upper limit of clearing in this vegetation group

It is expected that all fauna habitats within the Project area are common within the locality and occur contiguously with the same habitat types outside of the clearing area.

Based on the above, the proposed clearing is not considered to comprise a high level of biological diversity. All vegetation groups are represented outside the proposed clearing area and the proposed clearing is not expected to reduce the biodiversity of the area.

Based on the above, the proposed clearing is not at variance to this Principle.

### (b) Native vegetation should not be cleared if it comprises the whole, or part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia.

No evidence of conservation significant fauna has been recorded in fauna survey work completed at the Project.

Given the mobility of fauna species it is considered the proposed clearing would have no impact on the conservation significance of fauna species.

All fauna habitats within the proposed clearing envelope are common in the local area and occur contiguously with the same habitat types outside of the proposed clearing area.

In relation to SRE species, the habitats identified within the study area are typical of those occurring in the wider subregion and they are also contiguous with very similar habitat extending beyond the study area.

An assessment of the occurrence of the Northern Shield-backed Trapdoor spider was completed by Western Ecological (2022). Some limited suitable habitat was identified in the survey area, i.e., limited areas with leaf litter under some of the *Acacia* trees and shrubs that are on plains, low slopes or on rocky slopes, however, no evidence of this species was recorded.

10M considers that the proposed clearing area is not necessary for the on-going maintenance of any significant fauna habitat and that equal or higher quality vegetation and fauna habitats exist throughout the surrounding area.

In addition, the proposed clearing will not significantly reduce the extent of flora or fauna habitats at the Project or in the region. Given the above, the proposed clearing will not be at variance to this Principle.

---

**(c) Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, rare flora.**

No plant taxa located in the proposed clearing area are gazetted as Threatened under the EPBC Act or BC Act.

Six Priority flora were recorded by NVS (2021; 2022a; 2022b) of which two were recorded in the proposed clearing envelope (Figure 13):

- *Hibiscus* sp. Perrinvale Station (P1) – one individual recorded (represents 0.8% of total 122 plants recorded by the NVS (2022b) survey. This individual on M59/768 was removed by 10M during approved exploration works (prior to its identification being known).
- *Eremophila simulans* subsp. *megacalyx* (P3) – one individual recorded (represents 0.6% of total 176 plants recorded by NVS (2021; 2022a)).

The conservation significance of these species will not be impacted by the Project.

Given the above, the proposed clearing will not be at variance to this Principle.

---

**(d) Native vegetation should not be cleared if it comprises the whole or part of, or is necessary for the maintenance of a Threatened Ecological Community (TEC).**

No TEC's are listed under the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* or endorsed by the Western Australian Minister for the Environment for the Project area.

Therefore, the proposed clearing is not at variance to this Principle.

---

**(e) Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.**

The proposed clearing comprises one Beard Vegetation Association which has approximately 98% of their pre-European extent remaining.



Given the above, the vegetation proposed to be cleared cannot be considered significant as a remnant in an area that has been extensively cleared.

Therefore, the proposed clearing will not be at variance to this Principle.

---

**(f) Native vegetation should not be cleared if it is growing, in, or in association with, an environment associated with a watercourse or wetlands.**

Surface drainage is largely via sheet flow with surface water flow only following periods of heavy rainfall. Ephemeral drainage lines are present in the overall clearing area and surface runoff within these drainage lines only flows following heavy rainfall associated with thunderstorms or cyclonic activity. The vegetation in these drainage lines is not considered to be riparian vegetation.

There is, therefore, no vegetation growing in association with a water course or wetland. The proposed clearing is not at variance to this Principle.

---

**(g) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.**

The clearing permit area is broadly mapped as the Violet land system which comprises: gently undulating gravelly plains on greenstone, laterite and hardpan, with low stony rises and minor saline plains.

The proposed clearing of 70 ha of vegetation is not likely to lead to land degradation issues such as salinity, water logging or acidic soils and therefore is not at variance to this Principle.

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**(h) Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.**

There are no conservation or nature reserves within the Project area.

The closest reserve, Nature Reserve is approximately 70 km northwest of the proposed clearing area.

As indicated previously, the Project will not have a significant impact on the PEC.

Given the distance to the nature reserve, the proposed clearing will not have any impact on the environmental values of the area. The proposed clearing, therefore, is not at variance to this Principle.

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**(i) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water.**

Surface water in the Project area is sourced from direct precipitation and surface runoff following rainfall events. The Murchison area often receives considerable rainfall from degenerating cyclonic depressions from the northern parts of the State. However, overall, the mean annual rainfall is only 266.2 mm.

Evaporation rates in the region vary from 3000-3200 mm annually.

With such high annual evaporation rates, there is little surface flow during normal seasonal rains. Given the low annual rainfall and high evaporation rate there is expected to be minimal rainfall re-charge that would impact the groundwater levels or the quality of the groundwater in the local region.

There is no surface water of significance, large drainage lines, lakes or swamps in or in close proximity to the proposed clearing area.

The area proposed to be cleared does not fall within a Public Drinking Water Source Area (PDWSA) or PDWSA Protection Zone ([www.dow.wa.gov.au](http://www.dow.wa.gov.au)).

The clearing of 70 ha of native vegetation is not likely to cause deterioration in the quality of surface or groundwater and, therefore, the proposed clearing is not at variance to this Principle.

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**(j) Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence of flooding.**

The area proposed to be cleared is surrounded by native vegetation. The climate of the Eastern Murchison subregion is arid, with a variable bimodal rainfall that usually falls in winter (Cowan, 2001). Annual average rainfall is only 227.1 mm with little surface flow during normal seasonal rains.

As there is little surface flow during normal rains, the proposed clearing of 70 ha is not likely to cause or exacerbate the incidence or intensity of flooding. Therefore, the proposed clearing is not at variance to this Principle.



## 5 BIBLIOGRAPHY

Beard J.S. (1976). *Vegetation Survey of Western Australia*. Murchison 1:1000000 Vegetation Series. Explanatory Notes to Sheet 6. Vegetation of the Murchison Region. University of Western Australia Press, Perth.

Benshemesh, J. (2007). *National Recovery Plan for Malleefowl (Leipoa ocellata)*. Department for Environment and Heritage.

Commonwealth of Australia (2011). *Survey guidelines for Australia's threatened reptiles*.

Curry, P J, Payne, A L, Leighton, K A, Hennig, P, and Blood, D A. (1994). *An inventory and condition survey of the Murchison River catchment, Western Australia*. Department of Agriculture, Perth. Technical Bulletin 84.

Department of Biodiversity, Conservation and Attractions (2021a). *Threatened and Priority Flora Database Search in Murchison Area*. Prepared by the Species and Communities DBCA ref 53-0821FL.

Department of Biodiversity, Conservation and Attractions (2021b). *Threatened and Priority Fauna Database Search for shapefile area in the Murchison Area*. Prepared by the Species and Communities DBCA ref FAUNA#6853.

Department of Biodiversity, Conservation and Attractions (2021c). *Threatened and Priority Ecological Communities Database Search for shapefile area in the Murchison Area*. Prepared by the Species and Communities program.

Department of Planning, Lands and Heritage (2021). Aboriginal Heritage Inquiry database System database search. [Aboriginal Heritage Inquiry System \(dplh.wa.gov.au\)](http://dplh.wa.gov.au) (accessed September 2021).

Department of Primary Industries and Regional Development (2022) Declared Plants Register. <https://www.agric.wa.gov.au/pests-weeds-diseases/weeds/declared-plants> (accessed 23 April 2022).

DWER (2022). DWER Water Register. [Water Register](#) (accessed August 2022).

Desmond, A., Cowan, M. & A. Chant (2003). *Murchison 2 (MUR2 – Western Murchison subregion) IN: A Biodiversity Audit of Western Australia's 53 Biogeographical Subregions in 2002*, (edited by J.E. May & N.L. McKenzie). Department of Conservation and Land Management, 2003.

Ecotec (WA) Pty Ltd (2007). *Flora and Vegetation Assessment of the Twin Peaks Prospect*. Unpublished report prepared for Jabiru Metals Limited, January 2007.

Ecotec (WA) Pty Ltd (2007). *Fauna Assessment of the Twin Peaks Prospect*. Unpublished report prepared for Jabiru Metals Limited, January 2007.

Government of Western Australia. (2019). *2018 Statewide Vegetation Statistics incorporating the CAR Reserve Analysis (Full Report)*. Current as of March 2019. WA Department of Biodiversity, Conservation and Attractions, Perth. <https://catalogue.data.wa.gov.au/dataset/dbca-statewide-vegetation-statistics>

Government of Western Australia. (2021). Inherit Database search. <https://inherit.stateheritage.wa.gov.au> (updated 23 April 2021).

Meissner, R. & J.Wright (2010). Flora and vegetation of banded iron formations of the Yilgarn Craton: Barloweerie and Twin Peaks Greenstone Belts. *Conservation Science W.A.* 7 (3): 557-570.

Native Vegetation Solutions (2021). *Targeted Threatened Flora Search of the Woolbung Peak Prospect- August 2021*. Unpublished Report Prepared for 10M Pty Ltd, June 2022.

Native Vegetation Solutions (2022a). *Detailed Flora and Vegetation Survey of the Pleiades, Woolbung Peak and Woolbung South Prospects*. Unpublished Report Prepared for 10M Pty Ltd.

Native Vegetation Solutions (2022b). *Targeted Threatened Flora Survey – Twin Peaks Project*. Memo report prepared for 10M Pty Ltd, October 2022.

Pennington Scott (2022). *H1 Bore Completion Report – Woolbung Peak Water Supply Borefield*. Unpublished report prepared for 10M Pty Ltd, April 2022.

Rockwater Pty Ltd (2022a). *Woolbung Peak Project Subterranean Fauna Desktop Assessment*. Unpublished report prepared for 10M Pty Ltd, October 2022.

Rockwater Pty Ltd (2022b). *Woolbung Peak Project Surface Water Assessment*. Unpublished report prepared for 10M Pty Ltd, April 2022.

Shepherd, D.P., Beeston, G.R., and Hopkins A.J.M. (2002). *Native Vegetation in Western Australia – Extent, Type and Status*. Resource Management Technical Report 249. Department of Agriculture, Western Australia, South Perth.

Watkins, K.P. & A.H. Hickman (1990). *Geological evolution and mineralization of the Murchison province Western Australia*. Geological Survey of Western Australia Bulletin 137, Perth.

Western Ecological (2021). *Malleefowl Assessment – Woolbung Peak*. Unpublished report prepared for 10M Pty Ltd.

Western Ecological (2022). *Basic and Targeted Fauna Assessment – Woolbung Peak*. Unpublished report prepared for 10M Pty Ltd, May 2022.



## **APPENDIX 1: LETTER OF AUTHORITY**

**Deepsea Australia Pty Ltd**

**ACN 648 344 941**

**Lot 101 Turnbull St**

**Harvey WA 6220**

**Email: [mark@roesner.com.au](mailto:mark@roesner.com.au)**

**Mobile: 0417 891135**

**16/10/2022**

The Environment Officer  
Department of Mines and Petroleum  
Mineral House  
100 Plain Street  
East Perth WA 6004

Dear Sir/Madam,

**RE: E59/2408 - M59/768 - L59/202 - CLEARING PERMITS, MINING PROPOSALS AND MINE CLOSURE PLANS.**

Deepsea Australia Pty Ltd is the registered holder of Mining Lease E59/2408.

Please be advised that Deepsea Australia gives authority to 10M Limited to access E59/2408 M59/768 L59/202. 10M Limited is responsible for the submission and management of any Clearing Permits, Mining Proposals and Mine Closure Plans submitted in relation to E59/2408 M59/768 L59/202.

Yours Sincerely



Jeffrey Roesner

Managing Director

Deepsea Australia Pty Ltd



## **APPENDIX 2: TARGETED PRIORITY FLORA SURVEY REPORT (NVS 2021)**

11<sup>th</sup> October 2021

**Belinda Clark**  
**Director and Manager- Approvals**  
**Clark Lindbeck & Associates**  
**PO Box 144**  
**BULL CREEK WA 6149**  
**Tel: 08 9332 0671**  
**Mob: 0409 109 360**  
**Web: [www.clarklindbeck.com.au](http://www.clarklindbeck.com.au)**

**TARGETED THREATENED FLORA SEARCH OF THE WOOLBUNG PEAK PROSPECT-  
AUGUST 2021**

Dear Belinda,

Native Vegetation Solutions (NVS) is pleased to provide the results of a targeted threatened flora search for the Woolbung Peak Prospect Area ('survey area'). The survey area searched was approximately 79.10ha within the Exploration Tenement E 59/2408.

Eren Reid from NVS conducted a site visit from the 23rd to 24th August 2021, to confirm the occurrence of any threatened flora within the survey area. The assessment was completed on foot. The survey area is shown in Appendix 1 below.

The Threatened and Priority Flora Databases managed by the Department of Biodiversity, Conservation and Attractions (DBCA, 2021a) was searched for Threatened and Priority flora within a 20km radial area of the study area.

NVS conducted a likelihood assessment to identify Priority flora species that have potential to occur within the study area. The likelihood of a species occurring is based on the following attributes, as listed on FloraBase (WAHERB, 2021), tailored to Murchison populations and including information from recent nearby surveys and the current field observations.

The attributes were:

- broad soil type usually associated with the species;
- broad landform usually associated with the species;
- usual vegetation (characteristic species) with which the species is usually associated; or
- species having previously been recorded from within approximately 20 km of the Project area (considered as 'nearby').

The likelihood rating is assigned using the categories listed in Table 1 below.



**Table 1: Categories for likelihood of occurrence of conservation significant flora**

Likelihood	Categories
Recorded	Species recorded within the study area
Possible	May occur within the study area (but has not been recorded); broadly, 2-4 of the required attributes (but always including records from nearby) are present in the study area
Unlikely	Could occur but is not expected; 1-3 of the required attributes are present in the Project area but: <ul style="list-style-type: none"><li>• it is not known from nearby, or</li><li>• it is known from nearby but has no other required attributes, or</li><li>• it is known from nearby but has at least one well-defined attribute that does not occur in the Project area (e.g., it is associated with a specific landform or soil type that does not occur in the Project area)</li></ul>
Highly Unlikely	The species characteristics include only one or none of the required attributes of soil, landform, associated vegetation and having previously been recorded nearby, or a critical element (often landform) is not within the Project area and as such it almost certainly does not occur.

The relevant ecological attributes of these species are indicated in Appendix 2, with attributes largely taken from FloraBase (WAHERB, 2021) and field observations.

Fifteen hours in total were spent covering the entire survey area on foot. No Threatened Flora were recorded in the survey area during the field assessment.

One Priority Flora, *Eremophila simulans* subsp. *megacalyx* (P3) was recorded in the survey area at one location (Table 2 and Appendix 1).

**Table 2: Priority Flora located within the survey area**

TAXONNAME	SITENAME	ABUNDANCE	WACONSTAT	DATEOBS	LONGITUDE	LATITUDE
<i>Eremophila simulans</i> subsp. <i>megacalyx</i>	wpt061	1	P3	24/08/2021	116.029921	-27.306159

One plant of *Eremophila simulans* subsp. *megacalyx* (P3) was recorded from 1 location in the north-eastern border of the survey area. It is recommended that the area be avoided when conducting exploration.

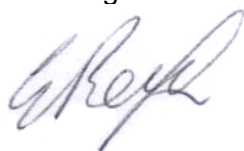
The Threatened and Priority Ecological Communities (TECs and PECs) database was searched to determine the presence of PECs or TECs, with Geographic Information System (GIS) data supplied for assessment, within a 25km radial area of the study area.

The survey area is contained within the known Priority 1 PEC 'New Forest (Including Twin Peaks and Barloweerie Range) vegetation complexes (banded ironstone formation)' (DBCA, 2021). The banded ironstone formation is restricted to the central section of the survey area.

An IBSA Data Package has been provided as a separate attachment including the survey area and a GPS Tracklog of the field survey.

If you have any queries regarding this work completed, please do not hesitate to contact me on the above-mentioned contact details.

Kind Regards



**Eren Reid**  
Director/Botanist

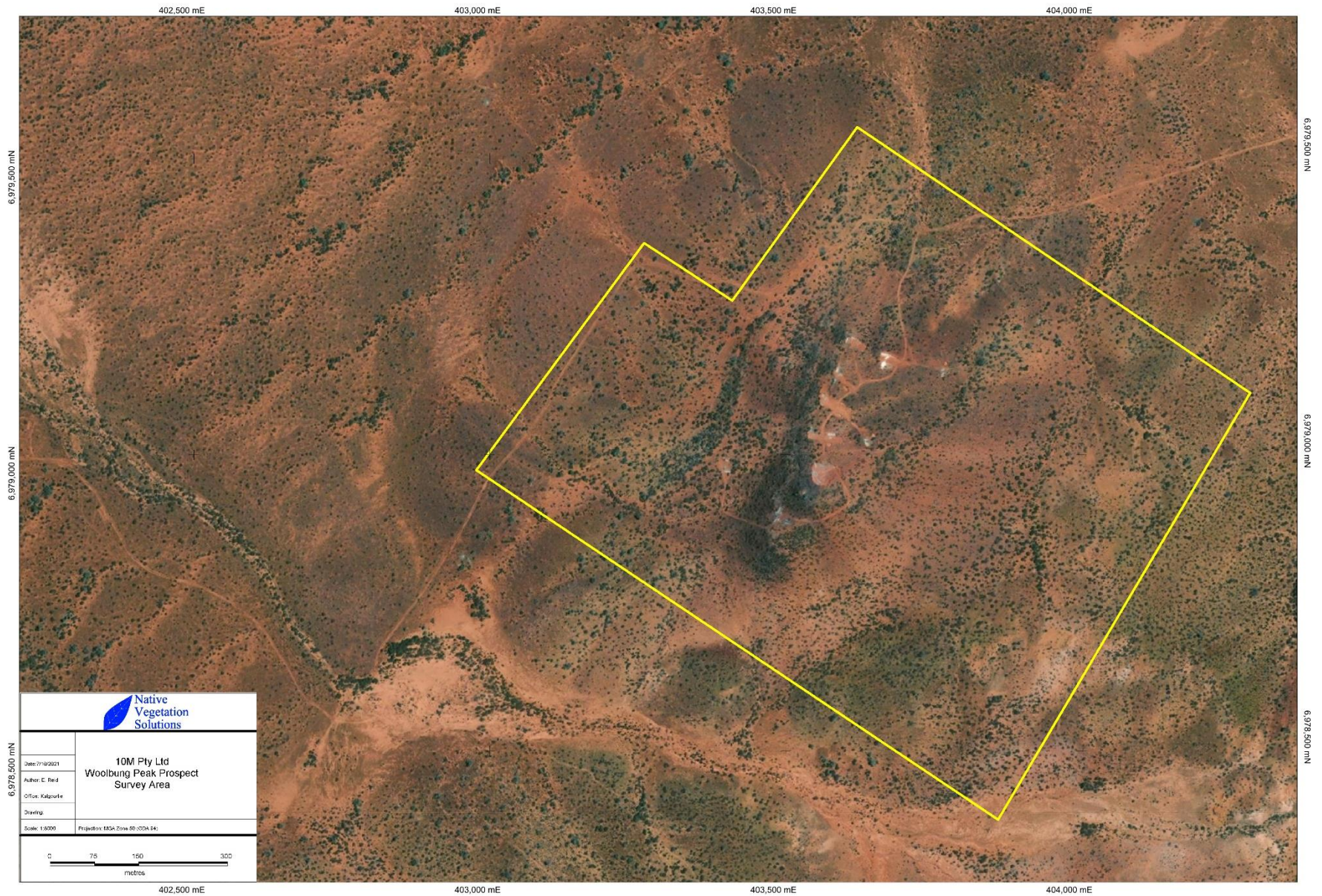
## References

DBCA, (2021), *TEC/PEC Database Results (Ref: 23-0821EC)*, Department of Biodiversity, Conservation and Attractions

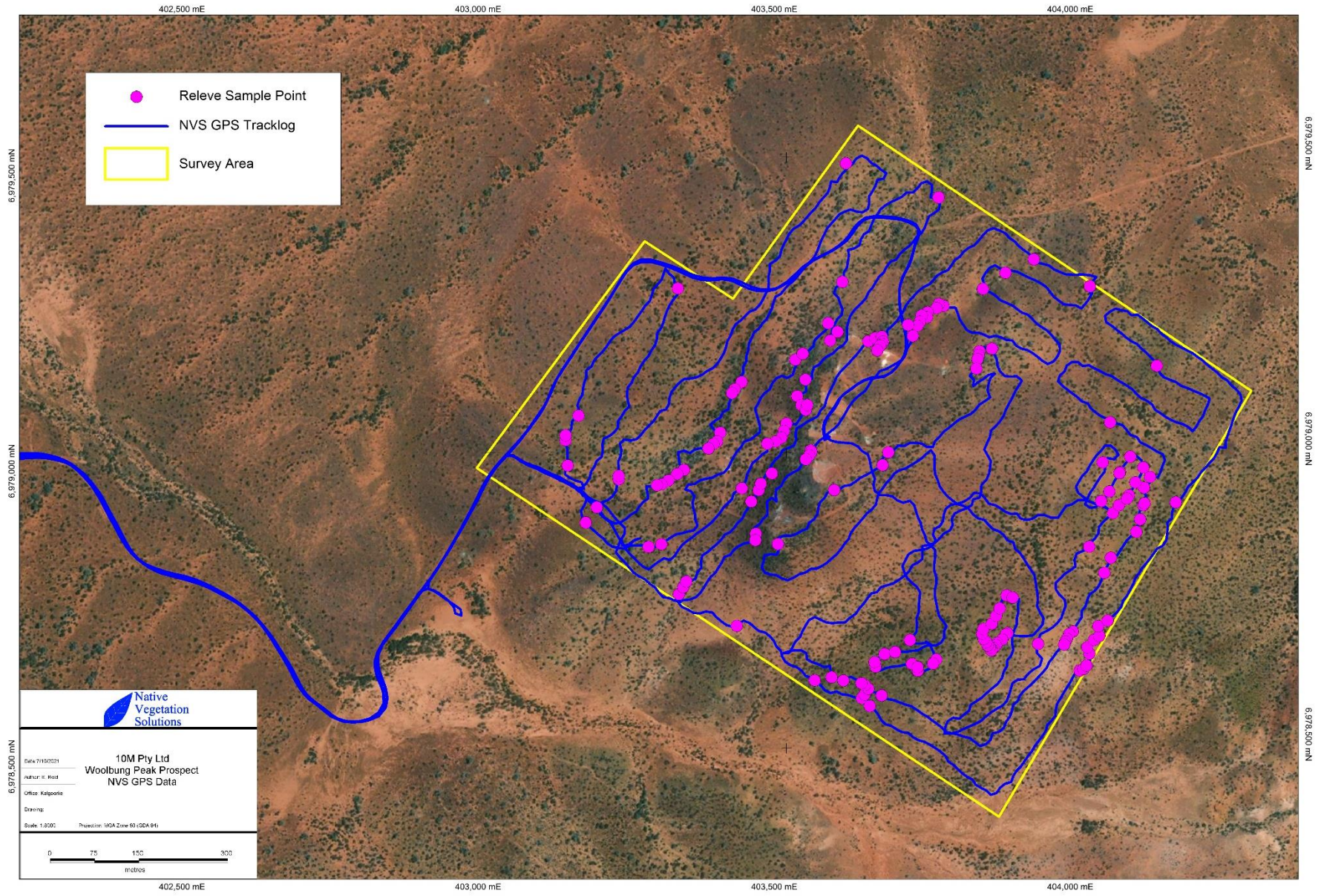
DBCA, (2021a), *Threatened Flora Database Search Results- Ref: 53-0821FL*, Department of Biodiversity, Conservation and Attractions

## Appendix 1: Maps

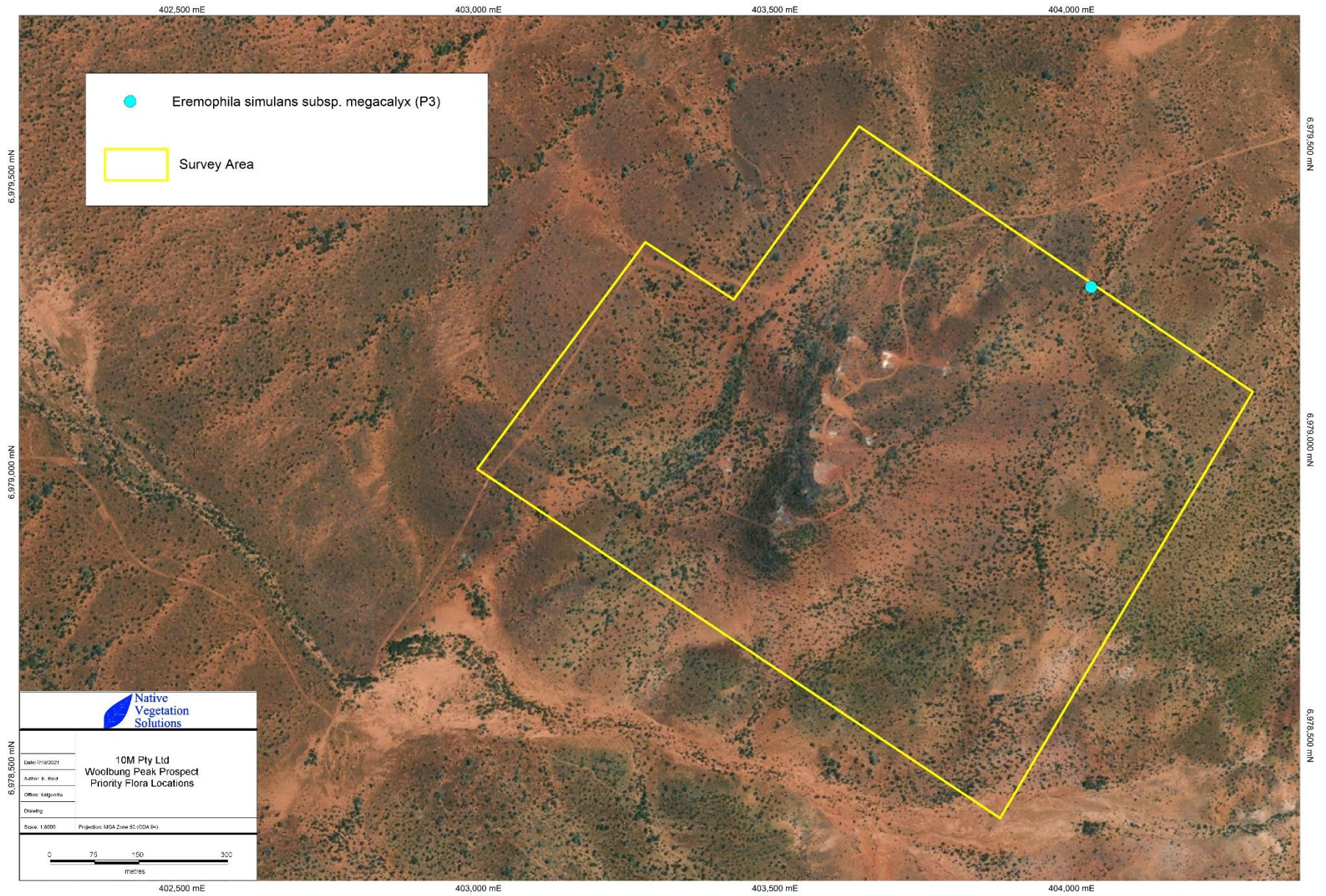














## Appendix 2: Threatened Flora Database Search Results (DBCA, 2021a)

Taxon	Status	Likelihood of occurring in the Survey Area
<i>Acacia</i> sp. Muggon Station (S. Patrick & D. Edinger SP 3235)	P2	Possible- similar landforms and soils available, characteristic species not prominent.
<i>Baeckea</i> sp. Mount Barloweerie (J.Z. Weber 5079)	P1	Possible- similar landforms and soils available, characteristic species not prominent.
<i>Eremophila physocalyx</i>	P3	Highly Unlikely- no suitable habitat
<i>Gunniopsis divisa</i>	P3	Possible- similar landforms and soils available, characteristic species not prominent.
<i>Hemigenia tysonii</i>	P3	Highly Unlikely- no suitable habitat
<i>Indigofera eriophylla</i>	P1	Unlikely- similar landforms available but sandy patches not available amongst granite outcrops
<i>Lepidium scandens</i>	P3	Highly Unlikely- no suitable habitat
<i>Prostanthera petrophila</i>	P3	Possible- similar landforms and soils available, characteristic species not prominent.
<i>Psammomoya ephedroides</i>	P3	Unlikely- similar landforms available but sandy patches not available amongst granite outcrops
<i>Sauropus</i> sp. Woolgorong (M. Officer s.n. 10/8/94)	P3	Highly Unlikely- no suitable habitat

## **APPENDIX 3: VEGETATION SURVEY REPORT (NVS 2022A)**



**DETAILED FLORA AND**  
**VEGETATION SURVEY OF THE**  
**PLEIADES, WOOLBUNG PEAK AND**  
**WOOLBUNG SOUTH PROSPECTS**  
**April 2022**

Prepared for:



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**V1.0**  
**June 2022**



## EXECUTIVE SUMMARY

10M Pty Ltd (10M) is a locally owned iron ore explorer with tenements in the Mid West-Murchison region in Western Australia and is the operator of its Pleiades, Woolbung Peak and Woolbung South prospects in Western Australia. 10M provided Native Vegetation Solutions (NVS) with a survey area which encompasses exploration areas as well as other infrastructure related to mining the Pleiades, Woolbung Peak and Woolbung South mineral resources. The location of this survey area is approximately 150km north of Mullewa, at the north-eastern extent of WA's Wheatbelt in the Murchison Bioregion of Western Australia.

The survey area for the purposes of this report, encompasses three prospects; The northern area named Pleiades and two southern areas named Woolbung Peak and Woolbung South; totalling approximately 522 ha. The area encompasses Mining Licence M 59/0768 and portions of Exploration Licences E 59/2408 and E 59/2630. At this stage, the final footprint of mining related disturbances is yet to be finalised, however will be encompassed entirely within the survey area.

The survey area is located in the Western Murchison Interim Biogeographic Regionalisation for Australia (IBRA) subregion. The vegetation of the Western Murchison botanical subregion consists of Mulga low woodlands, often rich in ephemerals (usually with bunch grasses), hummock grasslands on Quaternary sandplains, saltbush shrublands on calcareous soils and *Tecticornia* low shrublands on saline alluvia (CALM, 2002).

The *Environment Protection and Biodiversity Conservation (EPBC) Act 1999* Protected Matters Search Tool revealed that the survey area may contain habitat for the invasive weed species *Cenchrus ciliaris* (Buffel Grass) and *Prosopis* spp. (Mesquite) (DAWE, 2021). The EPBC Protected Matters report indicated no Threatened Ecological Communities (TECs) or Commonwealth Reserves within the requested search area.

The DBCA database searches revealed a potential for 0 Threatened and 31 Priority Flora species to occur within a 50 km radius of the survey area (DBCA, 2021a). The searches revealed one record of the species *Gunniopsis divisa* (P3) is present in the Pleiades survey area. No known locations of Threatened Flora occur within the survey area.

The Priority Ecological Communities (PEC) and Threatened Ecological Communities (TEC) search revealed the area lies within the New Forest Priority 1 Ecological Community (DBCA, 2021). The New Forest PEC is listed as threatened by Mining (DBCA, 2017).

The PEC/TEC search revealed no TECs within the survey area (DBCA, 2021).

The survey area does not lie within or contain any ESA's or Conservation Reserves (DWER, 2022).

No water bodies were identified within the survey area via the CPS Map Viewer (DWER, 2022).

The survey area lies south of the 26<sup>th</sup> parallel, however receives average annual rainfall of approximately 227.1 mm (BOM, 2022). There is no record of *Phytophthora cinnamomi* establishing in natural ecosystems in regions receiving less than 400 mm rainfall per annum (CALM, 2003). Therefore, Dieback is not considered an issue for this survey area, however all measures should be taken to prevent any possible soil contamination (seeds of non-native species etc.) which poses a risk in the survey area during seasonally favourable conditions.

Six vegetation groups were identified during this survey, largely following topographical features and dominant species. Mapping of the 6 vegetation groups, as well as the quadrat locations can be seen in Appendix C. Photographs of each quadrat and the relevant vegetation group can be seen in Appendix F.

One hundred and forty-two species were recorded within the survey area with 135 species recorded within quadrats. Thirty-one families and 63 genera were found. These are listed in Appendix E, per

Quadrat as well as per vegetation group. Of the native species, Fabaceae had the highest representation, with 31 species from 4 genera. The next best represented family was Chenopodiaceae with 16 species, followed by Scrophulariaceae (12 species), and Asteraceae (11 species).

Of the 142 taxa recorded three were introduced weed species. *Cuscuta planiflora* (Red Dodder) recorded in Quadrats 14 and 23, *Mesembryanthemum nodiflorum* (Slender iceplant) recorded in Quadrats 1 and 2 and *Spergula pentandra* (Five Anther Spurry) recorded in Quadrat 1. These species are not listed as declared pests in the state of Western Australia by DPIRD (2022).

The most common and widespread species were *Acacia aneura* and *Solanum lasiophyllum* which were both recorded within 24 quadrats.

There were 36 taxa recorded from within a single site, Q2.

No Threatened species were recorded during the survey.

There were six Priority flora recorded via fieldwork in the survey area. *Acacia* sp. Muggon Station (P2) found in one quadrat and at 12 other locations within the survey area, *Eremophila simulans* subsp. *megacalyx* (P3) found in two quadrats as well as at 24 locations within the survey area, and *Gunniopsis divisa* (P3) found at seven quadrats. *Hibiscus* sp. Perrinvale Station (P1), *Prostanthera petrophila* (P3), and *Ptilotus beardii* (P3) were each found in a separate quadrat.

Vegetation condition was generally 'Good' to 'Very Good', with some areas rated as 'Excellent' (Keighery 1994). Disturbance was present within the survey area mostly attributed to historic access tracks, exploration related activities, and also grazing.

The Environmental Protection Authority's (EPA) objective for flora and vegetation is to maintain the abundance, species diversity and geographical distribution of flora and vegetation as well as protect Threatened flora, consistent with the provisions of the *Biodiversity Conservation Act 2016*.

The proposed clearing of vegetation will result in the loss of some individuals from the local area; however, the impact will not be great enough to remove whole communities or populations. Most of the species and communities recorded during this survey are widespread throughout the Western Murchison subregion and adjoining regions, and therefore the loss of a small proportion from this area will not be significant.

This report summarises the results of the detailed flora and vegetation survey, incorporating the Spring survey of 2021 and the Autumn survey of 2022.

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# 1 INTRODUCTION

## 1.1 BACKGROUND

10M Pty Ltd (10M) is a locally owned iron ore explorer with tenements in the Mid West-Murchison region in Western Australia and is the operator of its Pleiades, Woolbung Peak and Woolbung South prospects in Western Australia. 10M provided Native Vegetation Solutions (NVS) with a survey area which encompasses exploration areas as well as other infrastructure related to mining within the Pleiades, Woolbung Peak and Woolbung South prospects. The location of this survey area is approximately 150km north of Mullewa, at the north-eastern extent of WA's Wheatbelt in the Murchison Bioregion of Western Australia (Figure 1).

This report will support numerous applications including mining proposals and clearing permits submitted to relative Government Departments.

The survey area for the purposes of this report, encompasses three prospects; The northern area named Pleiades and two southern areas named Woolbung Peak and Woolbung South; totalling approximately 522 ha. The area encompasses Mining Licence M 59/0768 and portions of Exploration Licenses E 59/2408 and E 59/2630. At this stage, the final footprint of mining related disturbances is yet to be finalised, however will be entirely within the survey area, and is expected to be less than 522 hectares.



Figure 1: Regional Location of the survey area



## 1.2 PURPOSE AND SCOPE

The objective of this report is to record and analyse the results of the flora and vegetation component of a Detailed assessment conducted in accordance with the following documents:

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

A Detailed Flora and Vegetation Survey has two components:

- 1) Reconnaissance Survey
  - a) Desktop study which includes a literature review and a search of the relevant databases; and
  - b) Reconnaissance survey of the subject area to verify the desktop survey, undertake low impact sampling, define vegetation groups present in the area, search for species of conservation significance and to determine potential sensitivity to impact.
- 2) Detailed Plot Based Survey
  - a) Detailed survey, comprising multiple visits in main flowering seasons or other seasons and replication of plots in vegetation units incorporating greater coverage than a reconnaissance survey; and
  - b) Comprehensive survey when necessary to: enhance the level of knowledge at the locality or sub-regional scale, in order to provide wider context for the local scale.

Therefore, the scope of work for the Detailed flora and vegetation survey was to:

- Conduct a desktop study that includes a literature review and search of relevant databases
- Conduct a plot-based survey within the survey area (incorporating 20m x 20m quadrats)
- Prepare an inventory of species occurring in the study area
- Conduct PATN<sup>®</sup> analysis of quadrat-based presence/absence data
- Quantify survey intensity via a Species Accumulation Curve
- Describe the vegetation associations in the survey area
- Identify any vegetation communities or flora species of particular conservation significance
- Map broad-scale vegetation groups found within the survey area, including vegetation condition; and
- Provide recommendations, including the management of perceived impacts to flora and vegetation, particularly flora of conservation significance, within the study area.

## 1.3 STATUTORY FRAMEWORK AND GUIDANCE

This assessment took into account relevant sections of Commonwealth and State legislation and guidelines:

- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)
- *Environmental Protection Act 1986* (EP Act)
- *Biodiversity Conservation Act 2016* (BC Act)
- *Biosecurity and Agriculture Management Act 2007* (BAM Act)

The Minister for the Environment publishes lists of flora species in need of special protection because they are considered rare, likely to become extinct, or are presumed extinct. The current listings were published in the Government Gazette on 5 December 2018 (Smith and Jones, 2018) and were taken into account.

As well as those listed above, the assessment took into account relevant sections of:

- EPA (2016) *Statement of Environmental Principles, Factors and Objectives*; and
- EPA (2016a) *Technical Guidance - Flora and Vegetation Surveys for Environmental Impact Assessment*, known as *Flora and Vegetation Technical Guidance*

### **1.3.1 Western Australian Biodiversity Conservation Act 2016**

The Western Australian *Biodiversity Conservation Act 2016* (BC Act, the Act) provides for the conservation, protection and ecologically sustainable use of biodiversity and biodiversity components in Western Australia. The BC Act replaces the *Wildlife Conservation Act 1950*.

Threatened species (both flora and fauna) that meet the categories listed within the Act are highly protected and require authorisation by the Ministerial to take or disturb. These are known as Threatened Flora and Threatened Fauna. The conservation categories of Critically Endangered, Endangered and Vulnerable have been aligned with those detailed in the EPBC Act, as below.

Flora and fauna species may be listed as being of special conservation interest if they have a naturally low population, restricted natural range, are subject to or recovering from a significant population decline or reduction of range or are of special interest, and the Minister considers that taking may result in depletion of the species. Migratory species and those subject to international agreement are also listed under the Act. These are known as specially protected species in the Act.

Threatened Ecological Communities (TEC) are also protected under the Act and are categorised using the same criteria as threatened species.

### **1.3.2 Environmental Protection Act 1986**

The *EP Act 1986* was created to provide for an Environmental Protection Authority (the EPA) that has the responsibility for:

- prevention, control and abatement of pollution and environmental harm
- conservation, preservation, protection, enhancement and management of the environment
- matters incidental to or connected with the above.

The EPA is responsible for providing the guidance and policy under which environmental assessments are conducted. It conducts environmental impact assessments (based on the information included in environmental assessments and provided by the proponent), initiates measures to protect the environment and provides advice to the Minister responsible for environmental matters.

### **1.3.3 Environment Protection and Biodiversity Conservation Act 1999**

At a Commonwealth level, Threatened taxa are protected under the EPBC Act, which lists species and ecological communities that are considered Critically Endangered, Endangered, Vulnerable, Conservation Dependent, Extinct, or Extinct in the Wild (Section 6 below).

### **1.3.4 Flora**

#### **1.3.4.1 Threatened and Priority Flora**

Conservation significant flora species are those that are listed as TF (Threatened Flora) and (within Western Australia) as PF (Priority Flora). TF species are listed as threatened by the

Western Australian Department of Biodiversity, Conservation and Attractions (DBCA) and protected under the provisions of the BC Act. Some State-listed TF are provided with additional protection as they are also listed under the Commonwealth EPBC Act.

Flora are listed as PF where populations are geographically restricted or threatened by local processes, or where there is insufficient information to formally assign them to TF categories. Whilst PF are not specifically listed in the BC Act, some may qualify as being of special conservation interest and these have a greater level of protection than unlisted species.

There are seven categories covering State-listed TF and PF species (DBCA, 2019) which are outlined in Section 9 below. PF for Western Australia are regularly reviewed by DBCA whenever new information becomes available, with species status altered or removed from the list (Smith and Jones, 2018) when data indicates that they no longer meet the requirements outlined in Section 9 below.

#### 1.3.4.2 Other Significant Flora

According to the Flora and Vegetation Technical Guidance (EPA 2016a) other than being listed as Threatened or Priority Flora, a species can be considered as significant if it is considered to be:

- locally endemic or association with a restricted habitat type (e.g. surface water or groundwater dependent ecosystems);
- a new species or has anomalous features that indicate a potential new species;
- at the extremes of range, recently discovered range extensions (generally considered greater than 100 km or in a different bioregion), or isolated outliers of the main range;
- unusual species, including restricted subspecies, varieties or naturally occurring hybrids; and
- relictual status, being representative of taxonomic groups that no longer occur widely in the broader landscape.

#### 1.3.5 Ecological Communities and Vegetation

##### 1.3.5.1 Threatened and Priority Ecological Communities

##### **Nationally Listed Threatened Ecological Communities**

An ecological community is a naturally occurring group of plants, animals and other organisms interacting in a unique habitat. The complex range of interactions between the component species provides an important level of biological diversity in addition to genetics and species. At Commonwealth level, Threatened Flora and Threatened Ecological Communities (TECs) are protected under the Commonwealth EPBC Act. An ecological community may be categorised into one of the three subcategories:

- Critically Endangered, if it is facing an extremely high risk of extinction in the wild in the immediate future;
- Endangered, if it is not critically endangered and is facing a very high risk of extinction in the wild in the near future; and
- Vulnerable, if it is not critically endangered or endangered, and is facing a high risk of extinction in the wild in the medium-term future.

##### **State Listed Threatened Ecological Communities**

The Western Australian DBCA also maintains a list of TECs which are further categorised into three subcategories much like those of the EPBC Act.



### **State Listed Priority Ecological Communities**

DBCA maintains a list of Priority Ecological Communities (PECs). PECs include potential TECs that do not meet survey criteria, or that are not adequately defined.

#### **1.3.5.2 Other Significant Vegetation**

According to the Flora and Vegetation Technical Guidance (EPA 2016a), other than being listed as a TEC or PEC, vegetation can be considered as significant if it is considered to have:

- restricted distribution;
- a degree of historical impact from threatening processes;
- a role as a refuge; and/or
- provides an important function required to maintain ecological integrity of a significant ecosystem.

#### **1.3.5.3 Declared Pest Plants**

The Western Australian Organism List (WAOL) details organisms listed as Declared Pests under the BAM Act). Under the BAM Act, Declared Pests are listed as one of the three categories, or exempt:

- C1 (exclusion), that applies to pests not established in Western Australia; control measures are to be taken to prevent their entry and establishment;
- C2 (eradication), that applies to pests that are present in Western Australia but in low numbers or in limited areas where eradication is still a possibility;
- C3 (management), that applies to established pests where it is not feasible or desirable to manage them in order to limit their damage; or
- Exempt (no category).

## 2 EXISTING ENVIRONMENT

### 2.1 CLIMATE

Typically, the climate of the general survey area is characterised as being arid with mainly winter rainfall and some in summer. The area receives approximately 200 mm of rainfall per year (Beard, 1990; CALM, 2002). The nearest official meteorological weather station with the most complete and up to date information is Murchison Meteorological Station (station number 006099), which is located approximately 43.9 km north of the survey area.

#### 2.1.1 Temperature

Mean annual minimum temperature at Murchison is 14.6°C and mean annual maximum temperature is 30.5°C. The coldest temperatures occur in July (mean minimum temperature 6.4°C), the hottest is January (mean maximum temperature 39.4°C) and diurnal temperature variations are relatively consistent throughout the year (Figure 2).

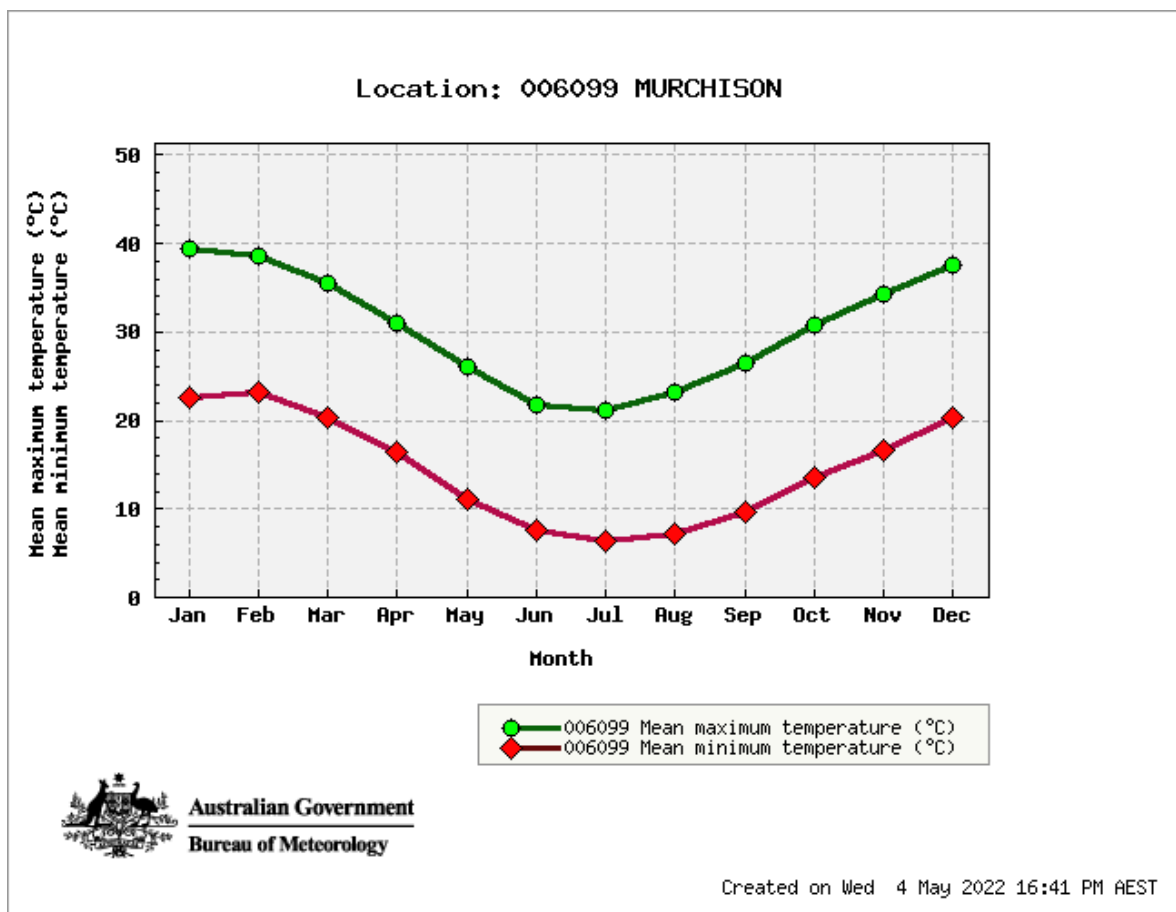
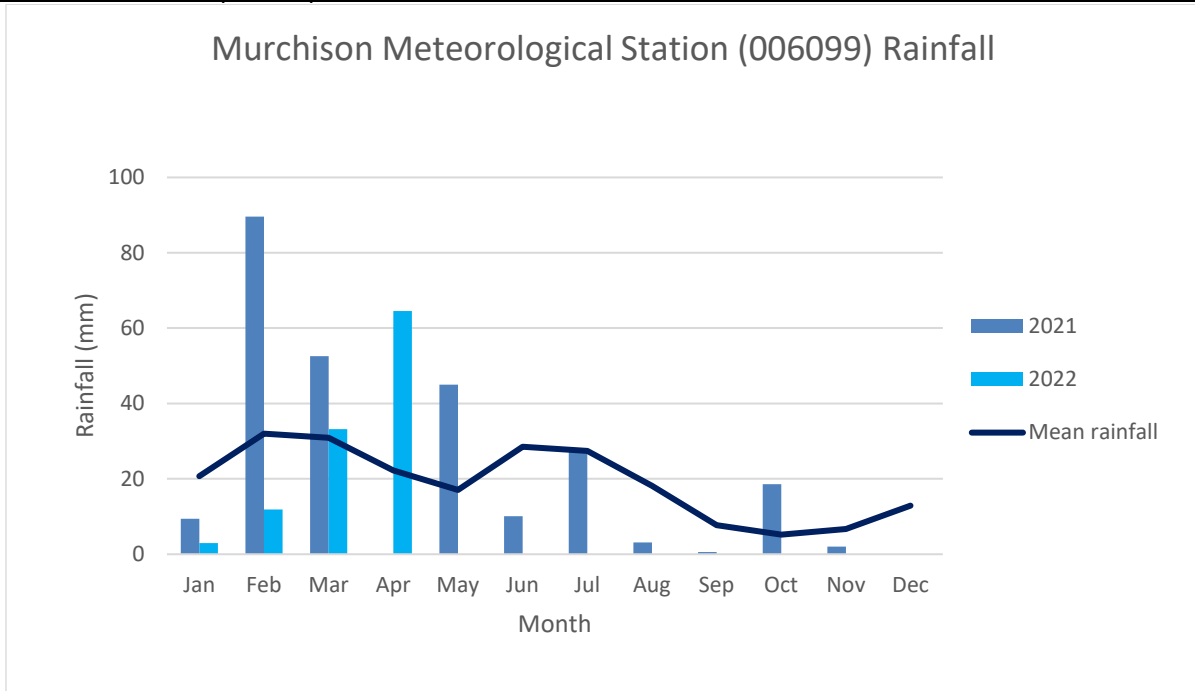


Figure 2: Mean temperature ranges for Murchison Meteorological Station (BOM, 2022)

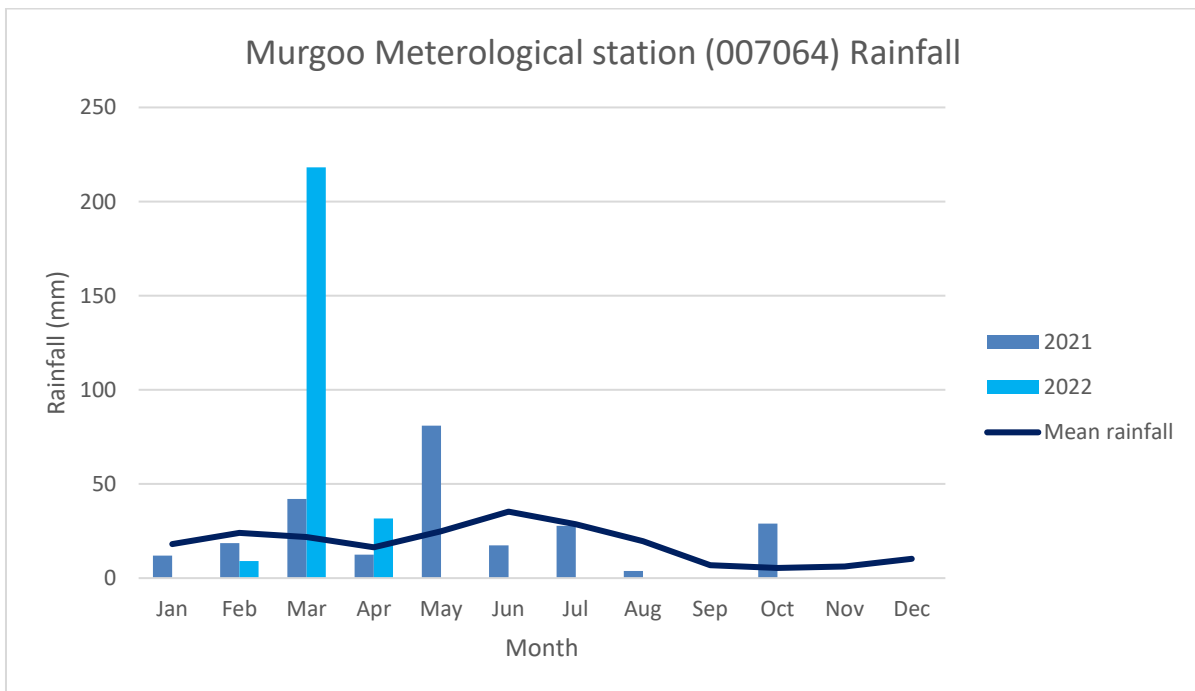
#### 2.1.2 Rainfall

The annual average rainfall at Murchison is 227.1 mm over an average of 31 rain days (BOM, 2022). Average rainfall varies across the months, with larger rainfall events falling between January to March and June to July (Figure 3). Rainfall for 2021 was above average for the months of February, March, May, July and October, and below average for all other months prior to the survey. Rainfall for 2022 prior to the second site visit was above average for March and April and below average for January and February.



**Figure 3: Rainfall data for the Murchison Meteorological Station (BOM, 2022)**

Looking at the Murgoo Meteorological Station (007064), which lies only 38.3 km to the east of the survey area, rainfall recorded above average in March, May and October 2021 prior to the survey, with other months receiving below average. Rainfall for 2022 prior to the second site visit was above average for March and April and below average for January and February (Figure 4).



**Figure 4: Rainfall data for the Murgoo Meteorological Station (BOM, 2022)**



## 2.2 INTERIM BIOGEOGRAPHIC REGIONALISATION OF AUSTRALIA (IBRA) REGION

The IBRA recognises 89 bioregions within Australia and 419 subregions (DAWE, 2021). The project is located in the Western Murchison IBRA subregion (MUR02) which totals over 7 million hectares (CALM, 2002). The Western Murchison subregion is characterised by Mulga woodlands rich in ephemerals on outcrop and fine textured Quaternary alluvial and eluvial surfaces (extensive hardpan wash plains) (CALM 2002).

## 2.3 LANDFORMS AND SOILS

The Western Murchison comprises the northern part of the 'Murchison' Terrains of the Yilgarn Craton, and is characterised by extensive hardpan wash plains, mantling granitic and the greenstone strata of the northern part of the Yilgarn Craton. The subregion contains the headwaters of the Murchison and Wooramel Rivers, which drain the subregion westwards to the coast. Surfaces associated with the occluded drainage occur throughout including Quaternary sandplains. Soils of the region comprise of calcareous soils and saline alluvia (CALM 2002).

## 2.4 BOTANICAL SUBREGION AND EXISTING VEGETATION

The vegetation of the Western Murchison botanical subregion consists of Mulga low woodlands, often rich in ephemerals (usually with bunch grasses), hummock grasslands on Quaternary sandplains, saltbush shrublands on calcareous soils and *Tecticornia* (Samphire) low shrublands on saline alluvia (CALM, 2002).

# 3 METHODS

## 3.1 PERSONNEL AND REPORTING

The following personnel were involved in the detailed flora and vegetation survey (November 2021 and April 2022):

- Mr Eren Reid (*BSc*- Biological Science), Principal Botanist, Native Vegetation Solutions (NVS), undertook field work of the detailed survey in November 2021 and April 2022, vegetation mapping, data collation, identification of flora during field work and preparation and review of the report;
- Ms Adele Thomasz (*BSc*- Conservation and Wildlife Biology), Native Vegetation Solutions, data collation and preparation of the report; and
- Mr Frank Obbens (*BSc*) Consultant Botanist, Bushtech Consultancy, undertook the identification of unknown flora samples collected by NVS in the field. Threatened flora range extensions and new locations were submitted to the WAHERB as per the EPA Technical Guidelines (EPA 2016a).

## 3.2 PRELIMINARY DESKTOP STUDY

A preliminary assessment of the survey area and its potential constraints was undertaken by reviewing relevant government agency managed databases (Sections 3.2.1 to 3.2.6, and Appendices A & D) and consulting with government agencies where necessary. The following sections provide a summary of desktop searches undertaken for the project.

### 3.2.1 *Environment Protection and Biodiversity Conservation Act Protected Matters*

The *EPBC Act* Protected Matters Search tool was utilised to provide results for matters of National Environmental Significance within the survey area using the coordinates displayed within the search results (Appendix A) with a 1 km buffer (DAWE, 2021a).

### 3.2.2 Threatened Flora and Communities

The Threatened and Priority Flora Database managed by the DBCA was searched for threatened and priority flora within a 50 km radial area of the survey area shapefile (DBCA, 2021a).

The presence of Threatened and Priority Ecological Communities (TECs & PECs) was determined by examining Geographic Information System (GIS) data supplied by the DBCA upon request within a 50 km buffer of the survey area shapefile (DBCA, 2021).

### 3.2.3 Environmentally Sensitive Areas (ESAs) and Conservation Reserves

The Department of Water and Environmental Regulation (DWER) Clearing Permit System Map Viewer was used to determine the location of any ESAs and Conservation Reserves (DWER, 2022).

### 3.2.4 Land Systems

As part of the Rangeland resource surveys, the Department of Agriculture mapped the Land Systems of Western Australia (DPIRD, 2017). The purpose of the survey was to provide comprehensive description and mapping of the biophysical resources of the region, together with an evaluation of the condition of the soils and vegetation throughout. The report and the accompanying series of maps at 1:250,000 scale, are primarily intended as a reference for land managers, land management advisers and land administrators, that is, the people most involved in planning and implementing land management practices. The report and complementary maps also provide researchers and the public with a basic reference on the landscape resources in Western Australia.

### 3.2.5 Vegetation Type, Extent and Status

Vegetation extent and status data was sourced from the Department of Agriculture and Food (DAFWA) report and its associated GIS file (Shepherd *et al*, 2002). This data comprises Beard's Pre-European vegetation groups.

DBCA's Statewide Vegetation Statistics (DBCA, 2019) was also referenced for the current extent of Beard's Vegetation Groups. The purpose of examining this information is to determine if the survey area lies within any vegetation groups defined by Beard that may have been subjected to widescale clearing for European settlement. The national objectives and targets for biodiversity conservation recognise that the retention of 30% or more of the pre-clearing extent of a Beard vegetation association is necessary if Australia's biological diversity is to be protected.

### 3.2.6 Wetlands

The potential of wetlands within the project area was determined by examining DWER's Clearing Permit System Map Viewer (DWER, 2022).

### 3.2.7 Dieback

Dieback is only considered a potential issue for any project if both of the below factors are relevant for the project (CALM, 2003):

- The project area lies within the South West Land Division; and
- the mean annual rainfall of the area is greater than 400 mm.

## 3.3 SITE INVESTIGATION

The initial stage of the field survey was conducted by Mr. Eren Reid, Botanist of Native Vegetation Solutions (NVS), from the 14<sup>th</sup> to 17<sup>th</sup> November 2021, which concentrated on the Pleiades and Woolbung South areas. A second visit was conducted on the 29<sup>th</sup> of April 2022 to include the Woolbung Peak area. NVS established a total of 27 quadrats within the survey areas. Ten

quadrats (Q1 - Q10) in the Woolbung South survey area, 13 quadrats (Q11 to Q23) in the Pleiades survey area and four quadrats in the Woolbung Peak survey area (Q24 – Q27). One hundred and forty-two vascular plant species within 6 vegetation types were recorded.

A total of 46 hours was spent on site traversing the survey area in November 2021 and April 2022. While a vehicle was used to reach the site, all traverses were made on foot or via a Yamaha Viking.

The survey was conducted in accordance with relevant EPA's Statements and Guidelines (Section 1.2).

The EPA uses the Interim Biogeographic Regionalisation of Australia (IBRA) as the largest unit for Environmental Impact Assessment decision making in relation to the conservation of biodiversity. Given the scale and nature of the proposed disturbance as well as the existing disturbance, and that the survey area is located within the Coolgardie IBRA region, a detailed flora and vegetation survey was deemed appropriate.

### 3.3.1 Licenses

Flora was collected for identification under the Scientific Collection License FB62000171, held by Mr Eren Reid with expiry 08/10/2022.

### 3.3.2 Field Methods

Prior to the field work, the aerial photography was examined and representative sample sites for quadrat locations were chosen to provide coverage over all viable vegetation types.

20 x 20m quadrats were established at these sites in appropriate locations, taking into account representation of surrounding vegetation and vegetation boundaries.

Each quadrat site was marked in all corners with a 97cm galvanized fence dropper and was defined by tape measures. The location of the North-East (NE) corner was captured on a TwoNav Aventura GPS at  $\pm 4$ m accuracy, using Universal Transverse Mercator location on GDA2020 datum. Digital photographs were taken of each quadrat site from the NE corner.

Data collected at each of the 33 quadrats included:

- Species Present
- Topography
- Rock Type
- Soil Colour and Type
- % Bare Ground and Litter
- Disturbance Level
- Vegetation Condition

A complete list of all species encountered was also recorded, detailing the average height and estimated coverage of the dominant species from the three stratum levels (Tallest, Mid and Lower).

Specimens of taxa not recognised by the Botanist were collected and pressed along with specimens of taxa recognised as, or thought to be, conservation-significant species.

The vegetation structure was assessed using the method developed by Muir (1977). Definitions of the vegetation structure are presented in Appendix B.

The condition of each quadrat was assessed using the method developed by Keighery (1994). Definitions of the condition scale are presented in Appendix B.



Vegetation groups were mapped (section 3.3.4 below).

Relevé sites were used between quadrat sampling points, via wandering traverses, for opportunistic sampling of plant taxa, to collect flora specimens and to aid vegetation group mapping in the survey area. Opportunistic sampled plant taxa are highlighted in the table “Species List per Vegetation Group” in Appendix E.

Maps of all sample sites are included in Appendix C, Map 2, with detailed quadrat information listed in Appendix F.

### **3.3.3 Post-Field Methods**

Unknown specimens collected in the field were identified post field work by Eren Reid and Frank Obbens with reference to published keys and samples held in the Reference Section of the Western Australian Herbarium (WAHERB). Threatened flora range extensions and new locations were submitted to the WAHERB as per the EPA Technical Guidelines (EPA 2016a).

Species information was transferred into Microsoft Excel® worksheets in preparation for PATN analysis (Belbin, 1994), via Bray and Curtis Flexible unweighted pair group method with arithmetic mean (UPGMA).

PATN Analysis was completed on both the dominant species and all species recorded within each quadrat. PATN is a software package that aims to try and display patterns in complex data. Complex in PATN's terms, requires a minimum of 6 objects (i.e., different species) and a suite of more than 4 variables (i.e., different quadrats) that describe the objects. The vegetation groups listed in Section 4.2.1.2 show the grouping of quadrats based on similarities in the flora species that are present or absent in each quadrat. This data is entered into the PATN Analysis software which produces a quantitative estimate of the relationship between species composition of each quadrat.

A Species Accumulation Curve is also generated via input into a computer program (Seaby & Henderson, 2006).

### **3.3.4 Mapping**

Vegetation mapping was produced via GPS recorded information in the field, cross-referenced with vegetation descriptions made in the field, overlaid on aerial imagery of the survey area. The GPS utilized (TwoNav Aventura GPS) displayed aerial imagery, hence real-time mapping of vegetation groups was available during field work.

GPS tracks and waypoints recorded during field work are presented in Appendix C. Vegetation Health Condition was assessed in the field with reference to Keighery (1994).

### 3.3.5 IBSA Data Package

The Environmental Protection Authority (EPA), Department of Water and Environmental Regulation (DWER) and Department of Mines, Industry Regulation and Safety (DMIRS) require Index of Biodiversity Surveys for Assessments (IBSA) Data Packages to be submitted to support assessment and compliance under the *Environmental Protection Act 1986*.

An IBSA data package is a single file in .zip format, containing:

- one **Metadata and Licensing Statement** in .pdf format
- one **survey report** in .pdf format
- one **plain-text survey report** in .txt format
- a set of electronic data files, comprising:
  - one **survey details** spatial dataset in shapefile (.shp, etc.) or MapInfo (.tab, etc.) format
  - one or more **survey data** spatial datasets, as required, in shapefile (.shp, etc.) or MapInfo (.tab, etc.) format

The IBSA Data package for this survey has been submitted via the DWER IBSA Submission Portal.

### 3.4 NOMENCLATURE AND TAXONOMY

Nomenclature follows that used by the WAHERB.

The WAHERB has updated its sequence and arrangement of collections to conform to the systematic sequence of the Angiosperm Phylogeny Group (APGIII), with the result that many Families and Genera have been moved or renamed. This report attempts to follow those changes in relation to species recorded during this survey. Definitions of Threatened Flora are also included in Section 9 below.

### 3.5 LIMITATIONS

Table 1 lists potential limitations that may have affected the survey.

**Table 1: List of potential survey limitations**

Possible Limitation	Constraint	Comment
Competency/experience of the consultant carrying out the survey	No	Experienced and competent personnel conducted the survey. Eren Reid has over 18 years' experience in botanical surveys throughout the Murchison Region and over a variety of environments across Western Australia.
Scope	No	The Scope of work was adequately defined. Vascular flora species were the focus of the survey and were thoroughly sampled.
Proportion of flora identified, recorded and/or collected	No	All taxa not identified in the field were collected and pressed, and later identified by Eren Reid or Frank Obbens. New Threatened flora locations or range extensions were submitted to the WAHERB as per the EPA Technical Guidelines (EPA 2016a). See also Species Accumulation Curves in section 4.2.2.2.
Sources of information	No	Information on flora and vegetation of the region and local area was available from publicly available databases, books and reports.
Proportion of the tasks achieved	No	All tasks completed.
Timing/season	No	This survey was undertaken in November 2021. Local rainfall in 2021 was above average for months March, May and October and below average for all other months prior to the survey. Timing was good as the survey coincided with flowering of many flora species.
Disturbance in survey area	No	Minimal disturbance (historical access tracks and exploration) was observed within the survey area, however, did not compromise the results of the survey as these areas were avoided whilst collecting data.
Intensity of survey effort	No	The survey intensity is considered to have been sufficient for a detailed survey according to EPA (2016) guidelines. Areas most likely to contain threatened and priority species were targeted. Vegetation mapping sites were selected to provide adequate coverage of the survey area.
Resources	No	Resources, in terms of time, equipment, support and personnel were adequate to undertake and complete the detailed survey.
Remoteness and/or access problems	No	All the areas in need of survey were easily accessible from existing tracks, or by foot.
Availability of contextual information for the region	No	Contextual information regarding vegetation and flora around the Western Murchison subregion is readily available. Adequate information was able to be accessed from available databases.



## 4 RESULTS

### 4.1 PRELIMINARY DESKTOP ASSESSMENT

#### 4.1.1 EPBC Protected Matters Search Tool

The EPBC Protected Matters Search Tool revealed that the survey area may contain habitat for the invasive weed species *Cenchrus ciliaris* (Buffel Grass) and *Prosopis* spp. (Mesquite) (DAWE, 2021).

*Cenchrus ciliaris* is native to Africa and India, was widely planted in Western Australian pastoral regions as a pasture grass, and has become a widespread weed of roadsides, creeklines, river edges and most vegetation types from Geraldton to the Pilbara, Kimberley and adjacent desert (Hussey *etc.* 2007). In the Murchison region it often colonises roadside table drains, excluding native everlastings. It seriously alters the fire characteristics of invaded plant cover by generating highly flammable fuel that is prone to more frequent fires.

The EPBC Protected Matters report indicated no TECs or Commonwealth Reserves within the requested search area.

The results of the EPBC Protected Matters search are included in Appendix A.

#### 4.1.2 Threatened Flora and Communities

The DBCA database searches revealed a potential for 0 Threatened and 31 Priority Flora species to occur within a 50 km radius of the survey area (DBCA, 2021a). The searches revealed one record of the species *Gunniopsis divisa* (P3) is present in the Pleiades survey area. No known locations of Threatened Flora occur within the survey area.

Results of the threatened flora database search are included in Appendix D.

The PEC/TEC search (DBCA, 2021) revealed the area lies within the New Forest Priority 1 Ecological Community. The New Forest PEC is listed as threatened by Mining (DBCA, 2017).

There were no TECs within the survey area (DBCA, 2021).

#### 4.1.3 Environmentally Sensitive Areas and Conservation Reserves

The survey area does not lie within or contain any ESA's or Conservation Reserves (DWER, 2022).

#### 4.1.4 Land Systems

As part of the Rangeland resource surveys, the Department of Agriculture mapped the Land Systems of Western Australia (DPIRD, 2017). The Land Systems occurring within the survey area are listed in Table 2 below, and displayed in Appendix C.

**Table 2: Land Systems occurring within the survey area (DPIRD, 2017)**

Land System	Description	Extent of Survey Area	% of Survey Area (%)
Violet System	Gently undulating gravelly plains on greenstone, laterite and hardpan, with low stony rises and minor saline plains; supporting groved mulga and bowgada shrublands and occasionally chenopod shrublands.	334.46	64.24
Gabanintha System	Greenstone ridges, hills and footslopes supporting sparse acacia and other mainly non-halophytic shrublands.	140.68	27.02
Yarrameedie System	Undulating stony interfluves, drainage floors and pediment foothill plains below major ranges, supporting sparse mulga shrublands.	45.54	8.75

#### 4.1.5 Vegetation Type, Extent and Status

Three vegetation units defined by Beard (1990) were identified as part of the desktop assessment. These vegetation units identify the Pre-European extent of vegetation, as mapped by Beard (1990). The national objectives and targets for biodiversity conservation recognise that the retention of 30% or more of the pre-clearing extent of Beard's vegetation associations is necessary if Australia's biological diversity is to be protected.

Information relating to known Beard (1990) vegetation units within the survey area have been summarised in Tables 3 to 6 below. This information has been compiled through both desktop assessments and the site visit. The extent of all three Beard vegetation units within the survey area cover less than 1% of the total area at each scale (Table 3), and each are above the 30% threshold at a State, bioregional and subregional level (Tables 4 to 6).

**Table 3: Extent of Beard Associations within the survey area**

Beard Vegetation Association	Extent within survey area (ha)	% of survey area (%)	% of extent at each scale <sup>^</sup>
18	126.28	24.19%	<1%
202	124.28	23.81%	<1%
326	271.45	52.00%	<1%

<sup>^</sup> By Association (WA) (Shepherd et al., 2002), By Association (WA), By IBRA Region (Murchison), By IBRA Sub-region (Western Murchison) and By LGA (Shire of Murchison) (DBCA, 2019).

**Table 4: Summary of information regarding Pre-European and current vegetation extent of vegetation association 18 within the survey area**

Factor	Value				
Beard Vegetation Association*	18				
Vegetation Association Description*	Low woodland; mulga ( <i>Acacia aneura</i> )				
Pre-European Extent (ha)	Scale				
	By Association (WA)	By Association (WA)	By IBRA Region (Murchison)	By IBRA Sub-region (Western Murchison)	By LGA (Shire of Murchison)
	22,029,557*	19,892,306.46**	12,403,172.30**	2,133,275.86**	858,952.19**
% Pre-European Extent Remaining	100.00%*	99.75%**	99.68%**	99.77%**	100%**
Surrounding Land Use***	Mining, Exploration, Prospecting, Pastoral Lease				
Weed prevalence***	Low				

\* Source: Shepherd et al. (2002) Appendix 2

\*\*Source: DBCA, (2019)

\*\*\* Source: Field Assessment

**Table 5: Summary of information regarding Pre-European and current vegetation extent of vegetation association 202 within the survey area**

Factor	Value				
Beard Vegetation Association*	202				
Vegetation Association Description*	Shrublands; mulga & <i>Acacia quadrimarginea</i> scrub				
Pre-European Extent (ha)	Scale				
	By Association (WA)	By Association (WA)	By IBRA Region (Murchison)	By IBRA Sub-region (Western Murchison)	By LGA (Shire of Murchison)
	365,344*	448,529.31**	339,742.69**	61,127.19**	36,840.39**
% Pre-European Extent Remaining	100%*	99.96%**	99.97%**	99.98%**	100%**
Surrounding Land Use***	Mining, Exploration, Prospecting, Pastoral Lease				
Weed prevalence***	Low				

\* Source: Shepherd *et al.* (2002) Appendix 2

\*\*Source: DBCA, (2019)

\*\*\* Source: Field Assessment

**Table 6: Summary of information regarding Pre-European and current vegetation extent of vegetation association 326 within the survey area**

Factor	Value				
Beard Vegetation Association*	326				
Vegetation Association Description*	Low woodland over scrub; mulga over bowgada & minnieritchie scrub				
Pre-European Extent (ha)	Scale				
	By Association (WA)	By Association (WA)	By IBRA Region (Murchison)	By IBRA Sub-region (Western Murchison)	By LGA (Shire of Murchison)
	987,059*	1,034,327.64**	494,516.87**	494,138.65**	459,560.47**
% Pre-European Extent Remaining	100%*	100%**	100%**	100%**	100%**
Surrounding Land Use***	Mining, Exploration, Prospecting, Pastoral Lease				
Weed prevalence***	Low				

\* Source: Shepherd *et al.* (2002) Appendix 2

\*\*Source: DBCA, (2019)

\*\*\* Source: Field Assessment



#### 4.1.6 Wetlands

No water bodies were identified within the survey area via the CPS Map Viewer. The closest waterbody lies 22 km to the northeast of the survey area (DWER, 2021).

#### Dieback

The survey area receives average annual rainfall of approximately 227.1 mm (BOM, 2022). There is no record of *Phytophthora cinnamomi* establishing in natural ecosystems in regions receiving less than 400mm rainfall per annum (CALM, 2003).

Given the above, Dieback is not considered an issue for this survey area, however all measures should be taken to prevent any possible soil contamination (seeds of non-native species etc.) which poses a risk in the survey area during seasonally favourable conditions.

### 4.2 FIELD ASSESSMENT

#### 4.2.1 Vegetation of the Survey Area

Beard's vegetation associations are very broad and are used over large areas in which there is also a large amount of variation at a more local level. The vegetation groups described below for the survey area fit into the broader Beard description above in section 4.1.4.

The vegetation groups described below were determined visually based on dominant species and topographical features, to form the descriptions taken at the time of the field survey.

Descriptions of all 27 sites/quadrats are presented in Appendix F. For each site the physical features, vegetation description and unit, along with the species lists for the 20 x 20m plots with typical canopy cover and height, are provided.

##### 4.2.1.1 Vegetation Groups

Six vegetation groups were identified during this survey, largely following topographical features and dominant species. Table 7 summarises the vegetation group extent and relative Quadrat and flora information. Mapping of the six vegetation groups, as well as the quadrat locations can be seen in Appendix C, Maps 4 and 5. Photographs of each quadrat and the relevant vegetation group can be seen in Appendix F.

**Table 7: Vegetation Group Extent within Survey Area**

Vegetation Group	Vegetation Group Code	Quadrats	Family	Genus	Species	Area (ha)	Percentage of Survey Area (%)
Mulga shrubland	A	Q1, Q7, Q11, Q20, Q21, Q24, Q27	21	33	73	311.72	59.71
Mulga Creekline vegetation	B	Q2, Q12, Q22	20	38	68	36.63	7.02
Mulga shrubland over Laterite breakaways	C	Q3, Q5, Q6, Q9, Q10, Q17	21	38	66	77.60	14.86
Mulga shrubland over stony plains	D	Q4, Q8, Q19,	12	19	44	30.58	5.86
Mulga shrubland over BIF	E	Q14, Q15, Q16, Q18, Q25, Q26	19	32	58	49.79	9.54
Mulga shrubland over Granite outcropping	F	Q13, Q23	13	22	30	15.70	3.01
<b>total</b>			<b>31*</b>	<b>63*</b>	<b>142*</b>	<b>522.02#</b>	<b>100.00%</b>

\*Denotes total recorded in the survey area (not sum of column)

# Denotes sum of column

#### 4.2.1.2 PATN Analysis of Quadrat Data

PATN analysis was used to determine the similarities or differences between and within the delineated vegetation groups. The results are supplied below in Figure 5 and Figure 6 as dendrograms. Dendrograms demonstrate the hierarchical relationship between objects.

Quadrats representing similar vegetation groups (as depicted in field work by NVS) are based on species composition, density, topographical features and/or lithology. The PATN analysis does not take these factors into account, and only demonstrates similarities based on presence/absence data within each quadrat. Therefore, PATN analysis groupings are not necessarily distinct, when defining vegetation groups. Hence quadrats depicted as outliers are expected when variations in species composition occurs between quadrats of the same predetermined vegetation grouping.

The PATN analysis dendrogram of the dominant species in Figure 5, displays each quadrat with like symbols representing NVS mapped vegetation groups, and coloured lines depicting PATN defined vegetation groups. The dendrogram shows a good association between vegetation groups described in section 4.2.1.1, however there were some outliers (highlighted green). Outliers are quadrats that do not show a good association with other quadrats in the same NVS mapped vegetation group.

These outliers are expected to occur for most vegetation groups. In most cases one or two dominant species will be present within a 20x20 quadrat, but it will not contain all the varieties of dominant species that will occur across that vegetation type, and as such some quadrats of the same vegetation group will be separated when assessed by the PATN Analysis.

Vegetation Group A was well represented via dominant species with Q1, Q7, Q20, Q21 and Q27 grouped together in the PATN Analysis. Q11 and Q24 were outliers and compared more similarly to four quadrats from Vegetation Group C, three quadrats from Vegetation Group E, and one from Vegetation Group B. When all species were analysed via PATN, Vegetation Group A was very varied. Q20 and Q21 were more similar to outliers from Vegetation Groups C, D and E. Q1 was an outlier grouped with Vegetation Group B quadrats and an outlier from vegetation Group D, Q7 was more similar to Q8 from Vegetation Group D, Q11 was more similar to Vegetation Group C quadrats, and Q24 and Q27 were outliers grouped with Vegetation Group E quadrats.

Vegetation Group B was a varied vegetation group. In the dominant species PATN analysis Q12 compared more similarly to quadrats from Vegetations Group C, and outliers from Vegetation Groups E and B, while Q2 and Q22 were compared more similarly to Vegetation Group A quadrats. When all species were analysed via PATN Q2 and Q22 were grouped with outliers from Vegetation group A and D, and Q12 was grouped with Vegetation Group F quadrats.

Vegetation Group C was well represented by the grouping of Q3, Q5, Q6 and Q9 via the dominant species PATN analysis. Q10 and Q17 were outliers. Q10 compared more similarly with Vegetation Group F, while Q17 compared more similarly with outliers from Vegetation Groups D and E. In the all species PATN analysis Q3, Q5, Q6, Q9 and Q10 were grouped together with outliers from Vegetation Groups A and E. Q17 was an outlier comparing more similarly with quadrats from Vegetation Group A, and outliers from Vegetation Groups E and D.

In the dominant species PATN analysis Vegetation Group D was represented by the grouping of Q8 and Q19, while Q4 was an outlier comparing more similarly with outliers Q15 (Vegetation Group E), and Q17 (Vegetation Group C). All Vegetation Group D quadrats were considered significantly different from each other in the all species PATN analysis. Q4 compared more similarly to Vegetation Group B quadrats and an outlier from Vegetation Group A, Q8 compared more similarly to an outlier from Vegetation Group A, while Q19 compared more similarly to Vegetation Group A quadrats and outliers from Vegetation Groups C and E.

Vegetation Group E was quite an expansive and varied vegetation group in the dominant species analysis. Q14 was not considered similar to any other quadrat, Q15 compared more similarly with outliers Q4 (Vegetation Group D), and Q17 (Vegetation Group C), Q16 compared more similarly with quadrats from Vegetation Group A and two outliers from Vegetation Group B, and quadrats Q18, Q25 and Q26 compared more similarly with quadrats from Vegetation Group C and outliers from Vegetation Groups A and B. In the all species PATN analysis Q14 compared more similarly with quadrats from Vegetation Group F and an outlier from Vegetation Group B, Q15 and Q16 compared more similarly with quadrats from Vegetation Group A and outliers from Vegetation groups C and D, Q18 compared more similarly with quadrats from Vegetation Group C and an outlier from Vegetation Group A, while Q25 and Q26 were grouped with outliers from Vegetation Group A.

Vegetation group F was well represented via both all species and dominant species PATN analysis, although in both analyses outliers from other groups were considered more similar to Vegetation group F quadrats.

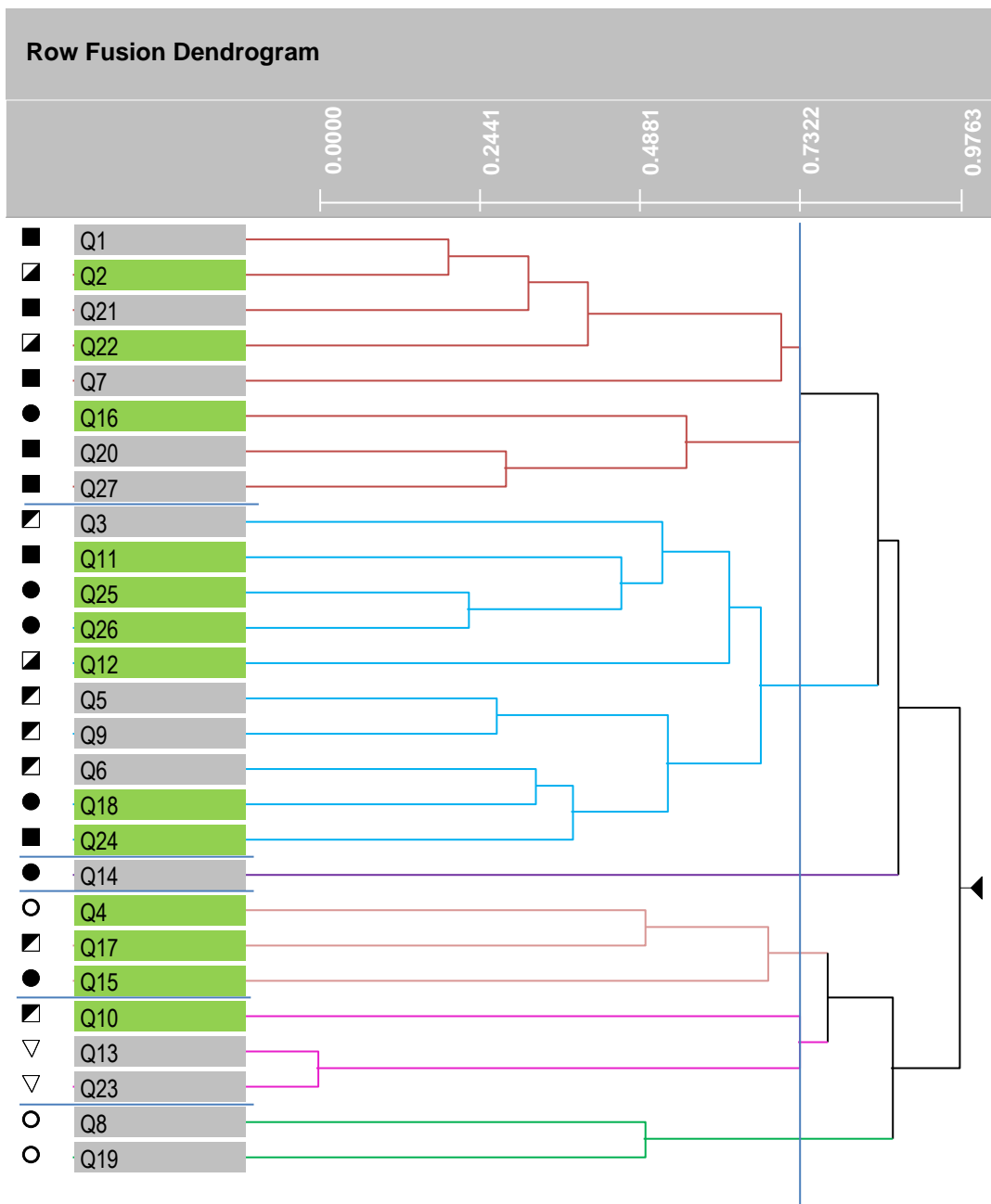


Figure 5: PATN Analysis of Dominant Species into 6 groups



The dendrogram below (Figure 6) of the analysis of all species shows a correlation to pre-grouped quadrats described in section 4.2.1.1. The dendrogram displays each quadrat with like symbols representing NVS mapped vegetation groups, and coloured lines depicting PATN defined vegetation groups. However, there were several outliers, and these are highlighted in green (Figure 5). Outliers are quadrats that do not show a good association with other quadrats in the same NVS mapped vegetation group, which is expected due to the unweighted nature of PATN analysis, which does not take into account topographical/lithological features or the density of key species defining the vegetation group. The PATN analysis (off all species present) demonstrates that some of these quadrats are very similar in species composition, and not necessarily distinct, when predetermined by topographical/lithological variations.

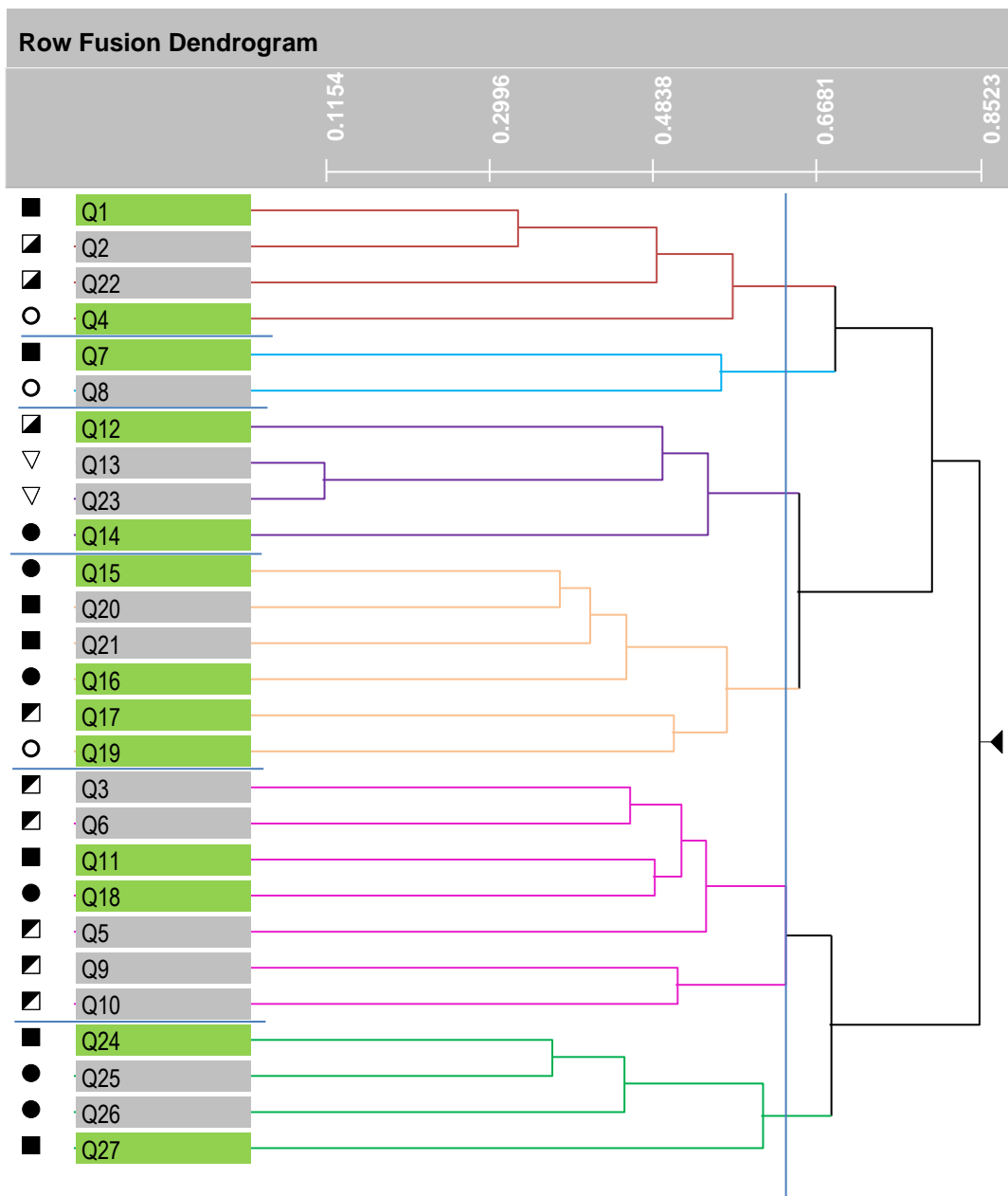


Figure 6: PATN Analysis of All Species into 6 groups

### 4.2.1.3 Vegetation Condition

Vegetation in the survey area has been subjected to historic exploration activities and grazing.

In accordance with the Keighery (1994) scale, most of the sites/quadrats inspected were in Good to Very Good condition, with some areas rated as Excellent condition (Appendix F). Disturbed areas were present within the survey area, mostly attributed to access tracks and exploration activities. The vegetation more than 0.5m off these tracks was mostly in a Good to Very Good condition (Keighery 1994).

As discussed below in Section 4.2.2.4, there were three non-native species recorded in the survey area.

## 4.2.2 Flora of the Survey Area

### 4.2.2.1 General

One hundred and forty-two species were recorded within the survey area with 135 species recorded within quadrats. Thirty-one families and 63 genera were recorded overall. These are listed in Appendix E, per Quadrat as well as per vegetation group. Of the native species, Fabaceae had the highest representation, with 31 species from 4 genera. The next best represented family was Chenopodiaceae with 16 species, followed by Scrophulariaceae (12 species), and Asteraceae (11 species).

Of the 142 taxa recorded, three were introduced weed species. *Cuscuta planiflora* (Red Dodder) recorded in Quadrats 14 and 23, *Mesembryanthemum nodiflorum* (Slender iceplant) recorded in Quadrats 1 and Q and *Spergula pentandra* (Five Anther Spurry) recorded in Quadrat 1. These species are not listed as declared pests in the state of Western Australia by DPIRD (2022).

The most common and widespread species were *Acacia aneura* and *Solanum lasiophyllum* which were both recorded within 24 quadrats.

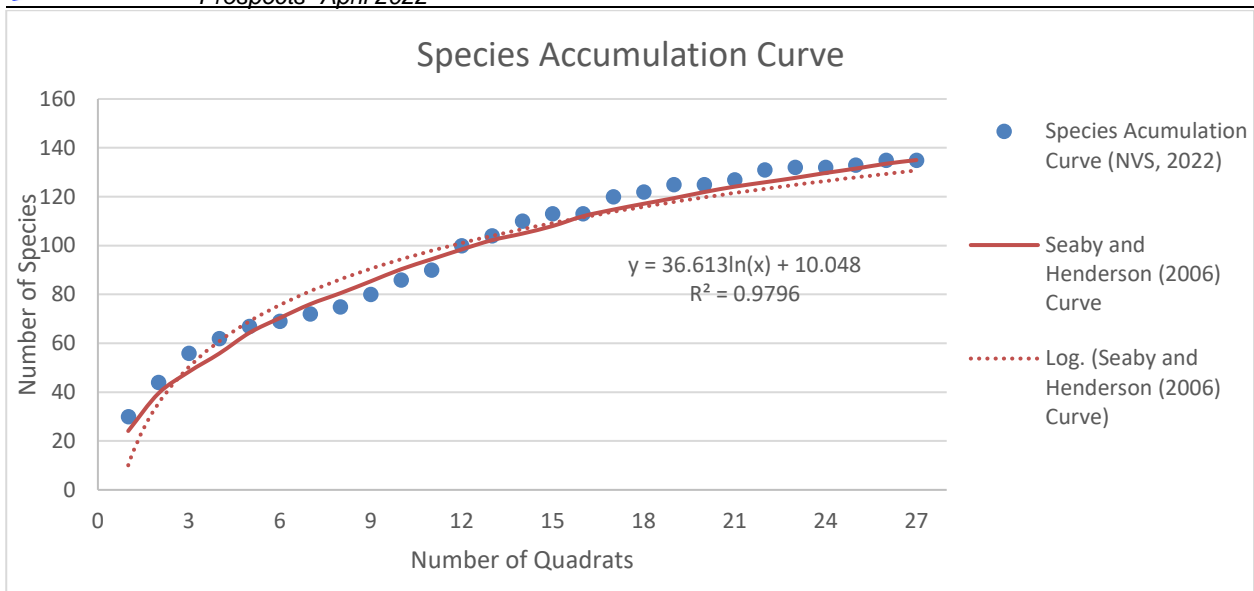
Quadrat 2 had the richest species list with 36 taxa recorded.

### 4.2.2.2 Species Accumulation Curve

A Species Accumulation Curve was generated using the computer programme Species Diversity and Richness- Version 4.1.2 (Seaby & Henderson, 2006). The model assumed 27 random selections of sample order. This curve was then fitted to a logarithmic curve in Excel® (Figure 7). The logarithmic trend line and R<sup>2</sup> values were generated in Excel®. According to the Species Accumulation Curve below, the R<sup>2</sup> value (0.9796) shows an acceptable fit for a logarithmic curve of the total accumulated species per number of quadrats established (Figure 7).

Sufficient sampling was inferred via the effort of intensity (number of quadrats established) versus the return of species collected (total accumulated species). From this fitted logarithmic curve formula, sufficient sampling was determined where the gain of new species was less than 1% for every new quadrat established. Based on this reasoning, sufficient sampling was reached at 29 quadrats, at which the extrapolated total accumulated number of species is 136. Therefore the 135 species collected within the 27 quadrats represents 99.26% of the predicted total abundance.

Hence sufficient quadrat sampling can be assumed for the survey area.



**Figure 7: Species Accumulation Curve for the 27 sampled quadrats**

#### 4.2.2.3 Conservation significant species

No Threatened species were recorded during the survey.

There were six Priority flora recorded during the survey:

- *Acacia* sp. Muggon Station (P2) found in Quadrat 18 and at 12 other locations within the survey area
- *Eremophila simulans* subsp. *megacalyx* (P3) found in Quadrats 6 and 21 as well as at 24 locations within the survey area
- *Gunniopsis divisa* (P3) found in Quadrats 1, 7, 8, 15, 16, 18, and 21
- *Hibiscus* sp. Perrinvale Station (P1) found in Quadrat 26
- *Prostanthera petrophila* (P3) found in Quadrat 5
- *Ptilotus beardii* (P3) found in Quadrat 19

Population numbers and GPS locations of Priority Flora recorded by NVS within the survey area are included in Table 8 below.

**Table 8: Priority flora recorded within the survey area**

Taxon	Abundance	Total observed	Date of observation	Longitude	Latitude	Location
<i>Acacia</i> sp. Muggon Station (P2)	12	70	17/11/2021	116.069039	-27.243022	Q18
<i>Acacia</i> sp. Muggon Station (P2)	40		17/11/2021	116.069039	-27.243022	Survey Area
<i>Acacia</i> sp. Muggon Station (P2)	1		14/11/2021	116.020805	-27.317356	Survey Area
<i>Acacia</i> sp. Muggon Station (P2)	2		15/11/2021	116.066555	-27.245335	Survey Area
<i>Acacia</i> sp. Muggon Station (P2)	10		15/11/2021	116.067528	-27.235221	Survey Area
<i>Acacia</i> sp. Muggon Station (P2)	2		15/11/2021	116.067602	-27.234975	Survey Area
<i>Acacia</i> sp. Muggon Station (P2)	1		16/11/2021	116.068170	-27.228289	Survey Area
<i>Acacia</i> sp. Muggon Station (P2)	5		17/11/2021	116.070403	-27.244289	Survey Area
<i>Acacia</i> sp. Muggon Station (P2)	2		17/11/2021	116.070476	-27.244865	Survey Area
<i>Acacia</i> sp. Muggon Station (P2)	1		17/11/2021	116.073371	-27.228848	Survey Area
<i>Acacia</i> sp. Muggon Station (P2)	1		17/11/2021	116.072908	-27.228792	Survey Area
<i>Acacia</i> sp. Muggon Station (P2)	1		17/11/2021	116.074082	-27.241396	Survey Area
<i>Acacia</i> sp. Muggon Station (P2)	1		17/11/2021	116.074345	-27.241226	Survey Area
<i>Acacia</i> sp. Muggon Station (P2)	3		17/11/2021	116.074414	-27.241057	Survey Area



Taxon	Abundance	Total observed	Date of observation	Longitude	Latitude	Location
<i>Eremophila simulans</i> subsp. <i>megacalyx</i> (P3)	1	176	24/08/2021	116.029921	-27.306159	Survey Area
<i>Eremophila simulans</i> subsp. <i>megacalyx</i> (P3)	2		17/11/2021	116.076809	-27.230702	Q21
<i>Eremophila simulans</i> subsp. <i>megacalyx</i> (P3)	1		14/11/2021	116.020872	-27.317749	Q6
<i>Eremophila simulans</i> subsp. <i>megacalyx</i> (P3)	20		14/11/2021	116.019595	-27.326230	Survey Area
<i>Eremophila simulans</i> subsp. <i>megacalyx</i> (P3)	20		14/11/2021	116.019968	-27.326573	Survey Area
<i>Eremophila simulans</i> subsp. <i>megacalyx</i> (P3)	15		14/11/2021	116.020472	-27.326559	Survey Area
<i>Eremophila simulans</i> subsp. <i>megacalyx</i> (P3)	20		14/11/2021	116.021156	-27.326397	Survey Area
<i>Eremophila simulans</i> subsp. <i>megacalyx</i> (P3)	20		14/11/2021	116.021219	-27.326197	Survey Area
<i>Eremophila simulans</i> subsp. <i>megacalyx</i> (P3)	5		14/11/2021	116.021223	-27.325950	Survey Area
<i>Eremophila simulans</i> subsp. <i>megacalyx</i> (P3)	5		14/11/2021	116.020743	-27.320832	Survey Area
<i>Eremophila simulans</i> subsp. <i>megacalyx</i> (P3)	5		14/11/2021	116.020759	-27.320578	Survey Area
<i>Eremophila simulans</i> subsp. <i>megacalyx</i> (P3)	10		14/11/2021	116.024757	-27.325009	Survey Area
<i>Eremophila simulans</i> subsp. <i>megacalyx</i> (P3)	1		14/11/2021	116.024724	-27.324204	Survey Area
<i>Eremophila simulans</i> subsp. <i>megacalyx</i> (P3)	4		14/11/2021	116.026049	-27.326535	Survey Area
<i>Eremophila simulans</i> subsp. <i>megacalyx</i> (P3)	5		14/11/2021	116.026313	-27.326565	Survey Area
<i>Eremophila simulans</i> subsp. <i>megacalyx</i> (P3)	1		14/11/2021	116.026617	-27.326540	Survey Area
<i>Eremophila simulans</i> subsp. <i>megacalyx</i> (P3)	2		14/11/2021	116.026873	-27.326556	Survey Area
<i>Eremophila simulans</i> subsp. <i>megacalyx</i> (P3)	10		14/11/2021	116.027026	-27.326609	Survey Area
<i>Eremophila simulans</i> subsp. <i>megacalyx</i> (P3)	20		14/11/2021	116.027372	-27.326505	Survey Area
<i>Eremophila simulans</i> subsp. <i>megacalyx</i> (P3)	3		14/11/2021	116.027519	-27.325731	Survey Area
<i>Eremophila simulans</i> subsp. <i>megacalyx</i> (P3)	1		15/11/2021	116.066184	-27.233033	Survey Area
<i>Eremophila simulans</i> subsp. <i>megacalyx</i> (P3)	1		15/11/2021	116.066130	-27.245223	Survey Area
<i>Eremophila simulans</i> subsp. <i>megacalyx</i> (P3)	1		17/11/2021	116.076784	-27.231121	Survey Area
<i>Eremophila simulans</i> subsp. <i>megacalyx</i> (P3)	1		17/11/2021	116.076802	-27.231807	Survey Area
<i>Eremophila simulans</i> subsp. <i>megacalyx</i> (P3)	1		17/11/2021	116.076924	-27.233423	Survey Area
<i>Eremophila simulans</i> subsp. <i>megacalyx</i> (P3)	1		17/11/2021	116.078332	-27.231065	Survey Area
<i>Gunniopsis divisa</i> (P3)	1	7	14/11/2021	116.019067	-27.312452	Q1
<i>Gunniopsis divisa</i> (P3)	1		14/11/2021	116.021998	-27.313092	Q7
<i>Gunniopsis divisa</i> (P3)	1		14/11/2021	116.024318	-27.319890	Q8
<i>Gunniopsis divisa</i> (P3)	1		17/11/2021	116.070009	-27.232090	Q15
<i>Gunniopsis divisa</i> (P3)	1		17/11/2021	116.069277	-27.234804	Q16
<i>Gunniopsis divisa</i> (P3)	1		17/11/2021	116.069039	-27.243022	Q18
<i>Gunniopsis divisa</i> (P3)	1		17/11/2021	116.076809	-27.230702	Q21
<i>Hibiscus</i> sp. Perrinvale Station (P1)	1	1	29/04/2022	116.025520	-27.306827	Q26
<i>Prostanthera petrophila</i> (P3)	10	10	14/11/2021	116.019277	-27.320292	Q5
<i>Ptilotus beardii</i> (P3)	10	10	17/11/2021	116.070354	-27.242336	Q19

Priority Flora species *Acacia* sp. Muggon Station (P2), *Eremophila simulans* subsp. *megacalyx* (P3), *Gunniopsis divisa* (P3), *Prostanthera petrophila* (P3), and *Ptilotus beardii* (P3) were captured in the DBCA database search, within a 50 km radius of the survey area. Of these, one record of *Gunniopsis divisa* (P3) on the database search occurs within the survey area and this was captured during the survey.

The Priority species *Hibiscus* sp. Perrinvale Station (P1) was identified in the second site visit and no record of this species was found within a 50 km radius of the survey area on the DBCA searches used for this survey (DBCA, 2021a). However, the databases were updated in March 2022, when this species was added. Two of the known DBCA records for *Hibiscus* sp. Perrinvale Station (P1) fall inside the Pleiades Survey area (PERTH 08583781 & PERTH 08583803), which were were not detected in the survey effort. Both records were collected in 2008, and the determinavit was not completed until March 2022. It is recommended that a follow up targeted search of this species be completed in August 2022, at the optimal time of previously recorded samples being in flower and fruiting (WAHERB, 2022).

#### 4.2.2.4 Other Species

The location of two species recorded in the survey area are considered to be range extensions to their already know distribution. The location of *Euploca inexplicita* is considered to be a range

extension of just over 200km southwest of already known locations on Florabase, whilst the location of *Lepidium pedicellosum* is considered to be a range extension of just over 100km to the southwest of its known range.

#### 4.2.2.5 Introduced species

Three introduced weed species were recorded in the Survey area. *Cuscuta planiflora* (Red Dodder) was recorded in Quadrats 14 and 23, *Mesembryanthemum nodiflorum* (Slender iceplant) was recorded in Quadrats 1 and 2 and *Spergula pentandra* (Five Anther Spurry) was recorded in Quadrat 1. These species are not listed as declared pests in the state of Western Australia by DPIRD (2022).

### 4.3 ASSESSMENT OF THE CLEARING PRINCIPLES

The DMIRS and DWER assess clearing permits against ten principles relating to the effect of clearing. NVS submits the following comments regarding the clearing principles specifically related to Native Vegetation.

#### **a). Native vegetation should not be cleared if it comprises a high level of biological diversity.**

One hundred and forty-two species were recorded within the survey area with 135 species recorded within quadrats. Thirty-one families and 63 genera were found. Species composition and vegetation types within the application area are typical of the local region and not considered to be unusually diverse. Based on the low level of disturbance, the lack of fragmentation of vegetation and vegetation condition generally rated as 'Good' to 'Very Good' on the Keighery scale (Keighery, 1994), the area proposed to be cleared is not considered to be remnant vegetation.

The PEC/TEC search (DBCA, 2021) revealed the area lies within the New Forest Priority 1 Ecological Community. The New Forest PEC is listed as threatened by mining (DBCA, 2017). This PEC directly correlates to the Mulga over BIF vegetation group identified in this report.

Six Priority Flora were recorded in the survey area, as well as a population range extension to two species not previously recorded in the general area.

No TECs were identified within the survey area (DBCA, 2021).

Three weed species were identified within the survey area and are not considered to be a significant threat to biodiversity in the area. Weeds have the potential to significantly change the dynamics of a natural ecosystem and lower the biodiversity of an area.

#### **b). Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia.**

Not addressed in this assessment.

#### **c). Native vegetation should not be cleared if it includes, or is necessary for, the continued existence of rare flora**

The DBCA database searches revealed a potential for 0 Threatened and 31 Priority Flora species to occur within a 50 km radius of the survey area (DBCA, 2021a). The searches revealed one record of these species, *Gunniopsis divisa* (P3) is present in the Pleiades survey area. No known locations of Threatened Flora occur within the survey area.

No Threatened Flora were recorded in the survey area.

There were six Priority flora recorded via fieldwork in the survey area. *Acacia* sp. Muggon Station (P2) found in one quadrat and at 12 other locations within the survey area, *Eremophila simulans* subsp. *megacalyx* (P3) found in two quadrats as well as at 24 locations within the survey area, and *Gunniopsis divisa* (P3) found at seven quadrats. *Hibiscus* sp. Perrinvale Station (P1), *Prostanthera petrophila* (P3), and *Ptilotus beardii* (P3) were each found in a separate quadrat.

Five of the Priority species identified in the survey were recorded on the DBCA databases, within a 50 km radius of the survey area. One DBCA record of *Gunniopsis divisa* (P3) occurs within the Survey area and this was captured during the survey.

The Priority species *Hibiscus* sp. Perrinvale Station (P1) was identified in the second site visit and no record of this species was found within a 50 km radius of the survey area on the DBCA searches used for this survey (DBCA, 2021a). However, the databases were updated in March 2022, when this species was added. Two of the known DBCA records for *Hibiscus* sp. Perrinvale Station (P1) fall inside the Pleiades Survey area (PERTH 08583781 & PERTH 08583803), which were not detected in the survey effort. Both records were collected in 2008, and the determination was not completed until March 2022. It is recommended that a follow up targeted search of this species be completed in August 2022, at the optimal time of previously recorded samples being in flower and fruiting (WAHERB, 2022).

**d). Native vegetation should not be cleared if it comprises the whole or part of, or is necessary for the maintenance of a threatened ecological community**

No TECs were identified within the survey area (DBCA, 2021).

The PEC/TEC search (DBCA, 2021) revealed the area lies within the New Forest Priority 1 Ecological Community. The New Forest PEC is listed as threatened by mining (DBCA, 2017). This PEC directly correlates to the Mulga over BIF vegetation group identified in this report.

**e). Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared**

As demonstrated in section 4.1.5, three beard vegetation associations fall within the survey area, each with less than 1% of the total association extent inside the survey area at all scales. All three vegetation associations are above the 30% threshold of their known spatial area remaining post European settlement at a state, bioregional and subregional level, and are not adversely affected by extensive clearing.

**f). Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland**

The survey area contains no watercourses or wetlands. The closest waterbody lies 22 km to the northeast of the survey area (DWER, 2021).

**g). Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation**

Not addressed in this assessment.

**h). Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area**

No conservation areas occur within the survey area.



**i). Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water**

Not addressed in this assessment.

## 5 DISCUSSION

The survey area is located within the Western Murchison subregion (CALM, 2002). Results of this survey indicate that the majority of the flora within the survey area is not unique and is in fact common throughout the Western Murchison subregion and adjoining regions.

One hundred and forty-two species were recorded within the survey area with 135 species recorded within quadrats. Thirty-one families and 63 genera were found. These are listed in Appendix E, per Quadrat as well as per vegetation group. Of the native species, Fabaceae had the highest representation, with 31 species from 4 genera. The next best represented family was Chenopodiaceae with 16 species, followed by Scrophulariaceae (12 species), and Asteraceae (11 species).

Of the 142 taxa recorded three were introduced weed species. *Cuscuta planiflora* (Red Dodder) recorded in Q14 and Q23, *Mesembryanthemum nodiflorum* (Slender iceplant) recorded in Q1 and Q2 and *Spergula pentandra* (Five Anther Spurry) recorded in Q1. These species are not listed as declared pests in the state of Western Australia by DPIRD (2022).

The most common and widespread species were *Acacia aneura* and *Solanum lasiophyllum* which were both recorded within 24 quadrats.

The DBCA database searches revealed a potential for 0 Threatened and 31 Priority Flora species to occur within a 50 km radius of the survey area (DBCA, 2021a). The searches revealed one record of these species, *Gunniopsis divisa* (P3) is present in the Pleiades survey area. No known locations of Threatened Flora occur within the survey area.

No Threatened Flora were recorded in the survey area.

There were six Priority flora recorded via fieldwork in the survey area. *Acacia* sp. Muggon Station (P2) found in one quadrat and at 12 other locations within the survey area, *Eremophila simulans* subsp. *megacalyx* (P3) found in two quadrats as well as at 24 locations within the survey area, and *Gunniopsis divisa* (P3) found at seven quadrats. *Hibiscus* sp. Perrinvale Station (P1), *Prostanthera petrophila* (P3), and *Ptilotus beardii* (P3) were each found in one quadrat.

Five of the Priority species identified in the survey were recorded on the DBCA databases, within a 50 km radius of the survey area. One DBCA record of *Gunniopsis divisa* (P3) occurs within the Survey area and this was captured during the survey.

The Priority species *Hibiscus* sp. Perrinvale Station (P1) was identified in the second site visit and no record of this species was found within a 50 km radius of the survey area on the DBCA searches used for this survey (DBCA, 2021a). However, the databases were updated in March 2022, when this species was added. Two of the known DBCA records for *Hibiscus* sp. Perrinvale Station (P1) fall inside the Pleiades Survey area (PERTH 08583781 & PERTH 08583803), which were not detected in the survey effort. Both records were collected in 2008, and the determination was not completed until March 2022. It is recommended that a follow up targeted search of this species be completed in August 2022, at the optimal time of previously recorded samples being in flower and fruiting (WAHERB, 2022).

The location of two species recorded in the survey area are considered to be range extensions to their already known distribution. The location of *Euploca inexplicita* is considered to be a range extension of just over 200km southwest of already known locations on Florabase, whilst the location of *Lepidium pedicellosum* is considered to be a range extension of just over 100km to the southwest of its known range.

The PEC/TEC search revealed no TECs within the survey area (DBCA, 2021).

The PEC/TEC search (DBCA, 2021) revealed the area lies within the New Forest Priority 1 Ecological Community. The New Forest PEC is listed as threatened by mining (DBCA, 2017). This PEC directly correlates to the Mulga over BIF vegetation group identified in this report.

Vegetation condition was generally 'Good' to 'Very Good', with some areas rated as 'Excellent' (Keighery 1994). Disturbance was present within the survey area mostly attributed to historic access tracks, exploration related activities, and grazing.

Given the above it is not expected that the proposed clearing will result in significant impacts such as vegetation fragmentation or the loss of vegetation associations or species that may be unique. This is partially due to the relevant size of the proposed clearing in comparison to similar abundant vegetation and habitat represented and retained outside of the survey area.



## 6 IMPACT ASSESSMENT

### 6.1 THREATENING PROCESSES

The processes that may impact the Flora within the survey area as a result of the proposed clearing include:

- Localised vegetation clearing resulting in a reduction in biodiversity in the immediate area, however it is adequately represented in the surrounding vegetation in the local area and region;
- Vehicle use damaging vegetation if existing tracks are not adhered to;
- The introduction and increased abundance of non-native species;
- Dust generated during clearing of native vegetation and associated activities may settle on adjacent native vegetation, causing possible stress and perhaps death, especially during drier months; and
- Accidental fire arising from clearing and associated activities, may affect vegetation in surrounding areas.

## 7 CONCLUSIONS

The survey established that the condition of the vegetation in the survey area is overall 'Good' to 'Very Good' condition, with some areas rated as 'Excellent'. No Threatened Flora were recorded in the area. The survey area lies within the New Forest Priority 1 Ecological Community. No TECs were recorded in the survey area.

There were six Priority Flora recorded via fieldwork in the survey area. *Acacia* sp. Muggon Station (P2) found in one quadrat and at 12 other locations within the survey area, *Eremophila simulans* subsp. *megacalyx* (P3) found in two quadrats as well as at 24 locations within the survey area, and *Gunniopsis divisa* (P3) found at seven quadrats. *Hibiscus* sp. Perrinvale Station (P1), *Prostanthera petrophila* (P3), and *Ptilotus beardii* (P3) were each found in one quadrat.

Five of the Priority species identified in the survey had records on the DBCA databases, within a 50 km radius of the survey area. One DBCA record of *Gunniopsis divisa* (P3) occurs within the survey area and this was captured during the survey.

The Priority species *Hibiscus* sp. Perrinvale Station (P1) was identified in the second site visit and no record of this species was found within a 50 km radius of the survey area on the DBCA searches used for this survey (DBCA, 2021a). However, the databases were updated in March 2022, when this species was added. Two of the known DBCA records for *Hibiscus* sp. Perrinvale Station (P1) fall inside the Pleiades Survey area (PERTH 08583781 & PERTH 08583803), which were not detected in the survey effort. Both records were collected in 2008, and the determination was not completed until March 2022. It is recommended that a follow up targeted search of this species be completed in August 2022, at the optimal time of previously recorded samples being in flower and fruiting (WAHERB, 2022).

The EPA objective for flora and vegetation is to maintain the abundance, species diversity and geographical distribution of flora and vegetation as well as protect Threatened flora consistent with the provisions of the *Biodiversity Conservation Act 2016*. The proposed clearing of vegetation will result in the loss of some individuals from the local area; however, the impact will not be great enough to remove whole communities or populations. Most of the species and communities recorded during this survey are widespread throughout the Western Murchison subregion and adjoining regions, and therefore the loss of a small proportion from this area will not be significant.

## 8 REFERENCES

Beard, J.S. (1990). *Plant life of Western Australia*. Kangaroo Press, NSW

Belbin, L. (1994). *PATN: pattern analysis package: Technical reference*, Division of Wildlife and Ecology, CSIRO

BOM, (2022), *Climate Data Online*, Bureau of Meteorology  
<http://www.bom.gov.au/climate/data/>  
Accessed: 4/05/2022

CALM, (2002), *A Biodiversity Audit of Western Australia's 53 Biogeographical Subregions in 2002 (Murchison 2 MUR02 –Western Murchison Subregion)*, Department of Conservation and Land Management

CALM, (2003), *Phytophthora cinnamomi and Diseases Caused by It, Volume 1-Management Guidelines*, Department of Conservation and Land Management  
<https://library.dbca.wa.gov.au/static/FullTextFiles/021873.pdf>  
Accessed: 23/09/2021

DAWE, (2021), *Interim Biogeographic Regionalisation for Australia (IBRA)*, Department of Agriculture, Water and the Environment, Australian Government  
<https://www.environment.gov.au/land/nrs/science/ibra>  
Accessed: 2/12/2021

DAWE, (2021a), *Protected Matters Search Tool*, Department of Agriculture, Water and the Environment  
<http://www.environment.gov.au/webgis-framework/apps/pmst/pmst-coordinate.jsf>  
Accessed: 2/12/2021

DBCA, (2017), *Priority Ecological Communities for Western Australia (version 27)*, Species and Communities Branch & WA Department of Biodiversity, Conservation and Attractions, Perth,  
[https://www.dpaw.wa.gov.au/images/documents/plants-animals/threatened-species/Listings/priority\\_ecological\\_communities\\_list.pdf](https://www.dpaw.wa.gov.au/images/documents/plants-animals/threatened-species/Listings/priority_ecological_communities_list.pdf)  
Accessed: 13/12/2021

DBCA, (2019), *2018 Statewide Vegetation Statistics incorporating the CAR Reserve Analysis (Full Report)- Current as of March 2019*, WA Department of Biodiversity, Conservation and Attractions, Perth,  
<https://catalogue.data.wa.gov.au/dataset/dbca-statewide-vegetation-statistics>  
Accessed: 2/12/2021

DBCA, (2019a) Conservation Codes for Western Australian Flora and Fauna. Department of Biodiversity, Conservation and Attractions, Western Australia, January 2019

DBCA, (2021), *TEC/PEC Database Results Ref: 06-1221EC*, Department of Biodiversity, Conservation and Attractions

DBCA, (2021a), *Threatened Flora Database Results Ref: 13-1221FL*, Department of Biodiversity, Conservation and Attractions

DPIRD, (2022), *Declared Plants Database*, Department of Primary Industries and Regional Development, Western Australia  
<https://www.agric.wa.gov.au/pests-weeds-diseases/weeds/declared-plants>  
Accessed: 24/02/2022

DPIRD, (2017), *NRInfo Digital Mapping*, Department of Primary Industries and Regional Development

<https://maps.agric.wa.gov.au/nrm-info/>

Accessed: 03/03/2022

DWER, (2022), *Clearing Permit System Map Viewer*, Department of Water and Environmental Regulation

<https://cps.der.wa.gov.au/main.html>

Accessed: 10/05/2022

EPA, (2016), *Environmental Factor Guideline: Flora and Vegetation*, Environmental Protection Authority, Western Australia

EPA (2016a), *Technical Guidance- Flora and Vegetation Surveys for Environmental Impact Assessment*, Environmental Protection Authority, Western Australia

Keighery, B.J., (1994), *Bushland Plant Survey; A guide to plant community survey for the Community*, Wildflower Society of Western Australia (Inc.) Nedlands

Muir, B.G. (1977), *Biological Survey of the Western Australian Wheatbelt. Pt. 2. Vegetation and habitat of the Bendering Reserve*. Records of the Western Australian Museum Supplement 3

Seaby R. M. & Henderson, P. A., (2006), *Species Diversity and Richness Version 4.1.2*, Pisces Conservation Ltd., Lymington, England.

Shepherd, D.P., Beeston, G.R., and A.J.M. Hopkins, (2002), *Land-Use and Vegetation in Western Australia- National Land and Water Resources Audit Report*, Technical Report 250, Department of Agriculture Western Australia

Smith, M.G., Jones, A., (2018) *Threatened and priority flora list for Western Australia*, Department of Biodiversity, Conservation and Attractions

WAHERB, (2021), *FloraBase- the Western Australian Flora*, Department of Parks and Wildlife

<http://florabase.dpaw.wa.gov.au/>

Accessed: 9/12/2021



## 9 GLOSSARY

### Acronyms:

<b>BAM Act</b>	<i>Biosecurity and Agriculture Management Act 2007</i> , Western Australia
<b>BC Act</b>	<i>Biodiversity Conservation Act 2016</i> (partly enacted), Western Australia
<b>BOM</b>	Bureau of Meteorology, Australian Government
<b>BSc</b>	Bachelor of Science
<b>CALM</b>	Department of Conservation and Land Management (now DBCA)
<b>CPS</b>	Clearing Permit System (DWER)
<b>DAWE</b>	Department of Agriculture, Water and the Environment, Australian Government
<b>DBCA</b>	Department of Biodiversity, Conservation and Attractions, Western Australia
<b>DMIRS</b>	Department of Mines, Industry Regulation and Safety, Western Australia
<b>DPAW</b>	Department of Parks and Wildlife, Western Australia (now DBCA)
<b>DPIRD</b>	Department of Primary Industries and Regional Development, Western Australia
<b>DRF</b>	Declared Rare Flora
<b>DWER</b>	Department of Water and Environmental Regulation, Western Australia
<b>EPA</b>	Environmental Protection Authority, Western Australia
<b>EP Act</b>	<i>Environmental Protection Act 1986</i> , Western Australia
<b>EPBC Act</b>	<i>Environment Protection and Biodiversity Conservation Act 1999</i> (Commonwealth Act)
<b>ESA</b>	Environmentally Sensitive Area
<b>GIS</b>	Geographical Information System
<b>ha</b>	Hectare (10,000 square metres)
<b>IBRA</b>	Interim Biogeographic Regionalisation for Australia, DAWE
<b>IUCN</b>	International Union for the Conservation of Nature and Natural Resources – commonly known as the World Conservation Union
<b>km</b>	Kilometres
<b>m</b>	Metres
<b>MUR</b>	Murchison Bioregion, IBRA
<b>MUR02</b>	Western Murchison Subregion, IBRA
<b>NVS</b>	Native Vegetation Solutions
<b>PEC</b>	Priority Ecological Community, Western Australia
<b>Ramsar</b>	A wetland site designated of international importance under the Ramsar Convention (UNESCO)
<b>TEC</b>	Threatened Ecological Community
<b>UNESCO</b>	United Nations Educational, Scientific and Cultural Organization
<b>WA</b>	Western Australia
<b>WAHERB</b>	Western Australian Herbarium, DBCA
<b>WAOL</b>	Western Australian Organism List
<b>WC Act</b>	<i>Wildlife Conservation Act 1950</i> , Western Australia

### Definitions:

{DBCA (2019a) Conservation Codes for Western Australian Flora and Fauna. Department of Biodiversity, Conservation and Attractions, Western Australia, January 2019}: -

#### 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.

**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.

**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.

**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.

**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.

## **Appendix A - EPBC and Other Government Database Search Results**





## 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: 14/12/21 18:34:00

[Summary](#)

[Details](#)

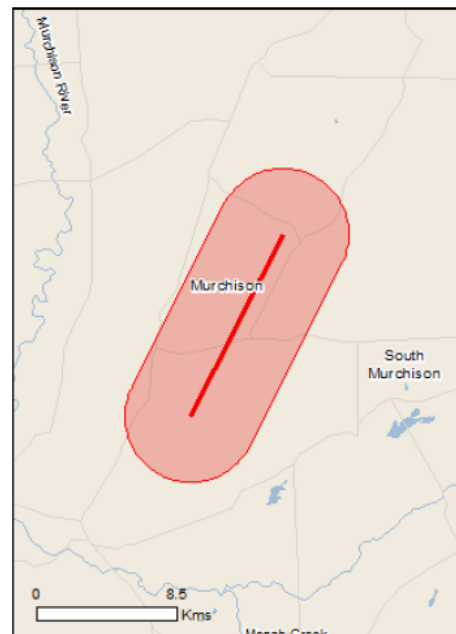
[Matters of NES](#)

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

[Extra Information](#)

[Caveat](#)

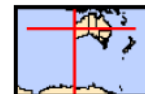
[Acknowledgements](#)



This map may contain data which are  
©Commonwealth of Australia  
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[Coordinates](#)

Buffer: 4.0Km



## 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>	None
<a href="#">Listed Threatened Species:</a>	4
<a href="#">Listed Migratory Species:</a>	6

### 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>	None
<a href="#">Commonwealth Heritage Places:</a>	None
<a href="#">Listed Marine Species:</a>	9
<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>	None
<a href="#">Regional Forest Agreements:</a>	None
<a href="#">Invasive Species:</a>	9
<a href="#">Nationally Important Wetlands:</a>	None
<a href="#">Key Ecological Features (Marine)</a>	None

## Details

### Matters of National Environmental Significance

Listed Threatened Species		[ Resource Information ]
Name	Status	Type of Presence
<b>Birds</b>		
<a href="#">Calidris ferruginea</a> Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
<a href="#">Rostratula australis</a> Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
<b>Other</b>		
<a href="#">Idiosoma nigrum</a> Shield-backed Trapdoor Spider, Black Rugose Trapdoor Spider [66798]	Vulnerable	Species or species habitat likely to occur within area
<b>Reptiles</b>		
<a href="#">Egernia stokesii badia</a> Western Spiny-tailed Skink, Baudin Island Spiny-tailed Skink [64483]	Endangered	Species or species habitat likely to occur within area
Listed Migratory Species		[ Resource Information ]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
<b>Migratory Marine Birds</b>		
<a href="#">Apus pacificus</a> Fork-tailed Swift [678]		Species or species habitat likely to occur within area
<b>Migratory Terrestrial Species</b>		
<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

## Other Matters Protected by the EPBC Act

### Listed Marine Species [ Resource Information ]

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

Name	Threatened	Type of Presence
<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="#">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="#">Chrysococcyx osculans</a> Black-eared Cuckoo [705]		Species or species habitat likely 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="#">Rostratula benghalensis (sensu lato)</a> Painted Snipe [889]	Endangered*	Species or species habitat may occur within area

## Extra Information

### 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>		
Streptopelia senegalensis Laughing Turtle-dove, Laughing Dove [781]		Species or species



Name	Status	Type of Presence
habitat likely to occur within area		
<b>Mammals</b>		
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Capra hircus Goat [2]		Species or species habitat likely to occur within area
Equus asinus Donkey, Ass [4]		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
Oryctolagus cuniculus Rabbit, European Rabbit [128]		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>		
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species habitat likely to occur within area
Prosopis spp. Mesquite, Algaroba [68407]		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

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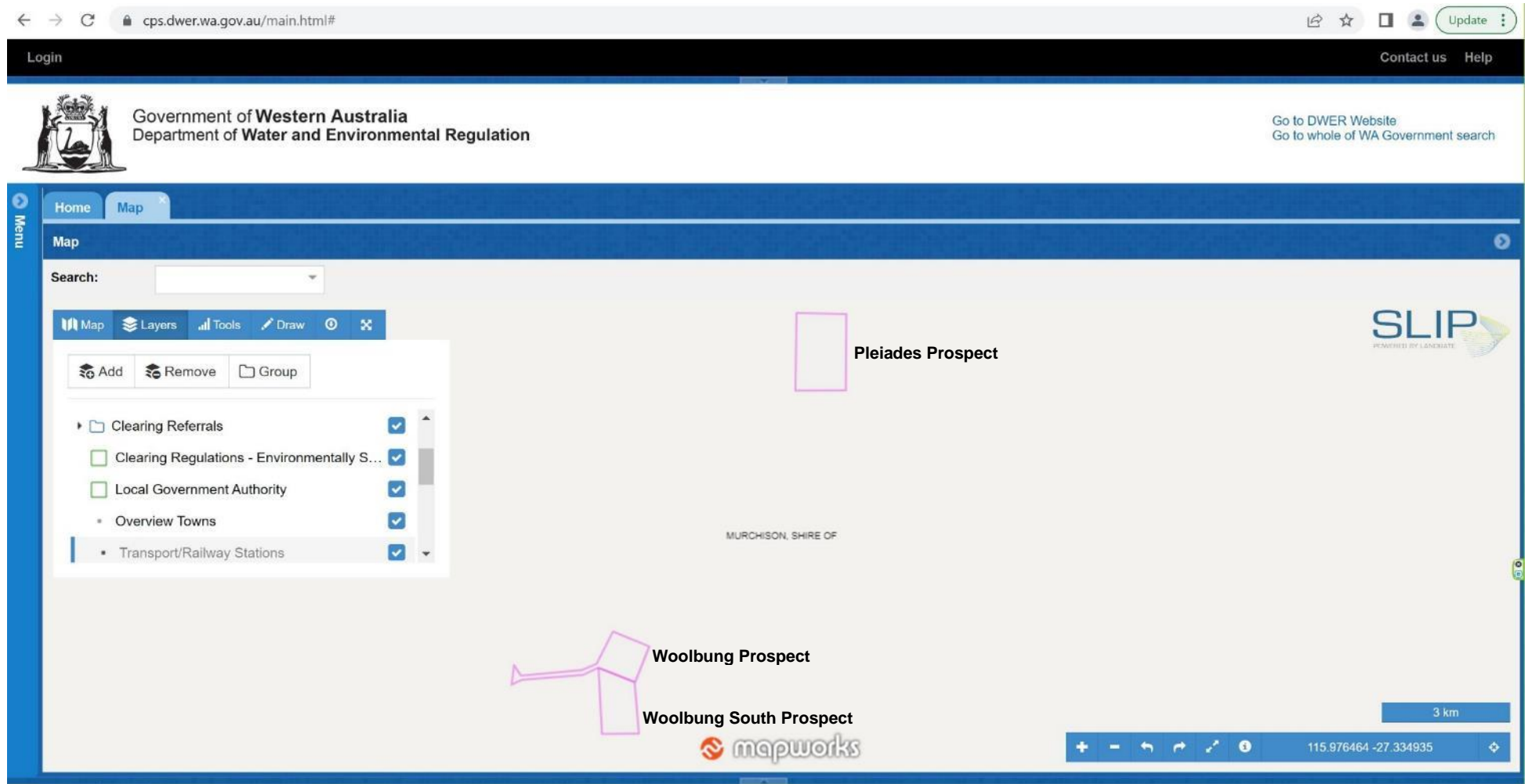
## Acknowledgements

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

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

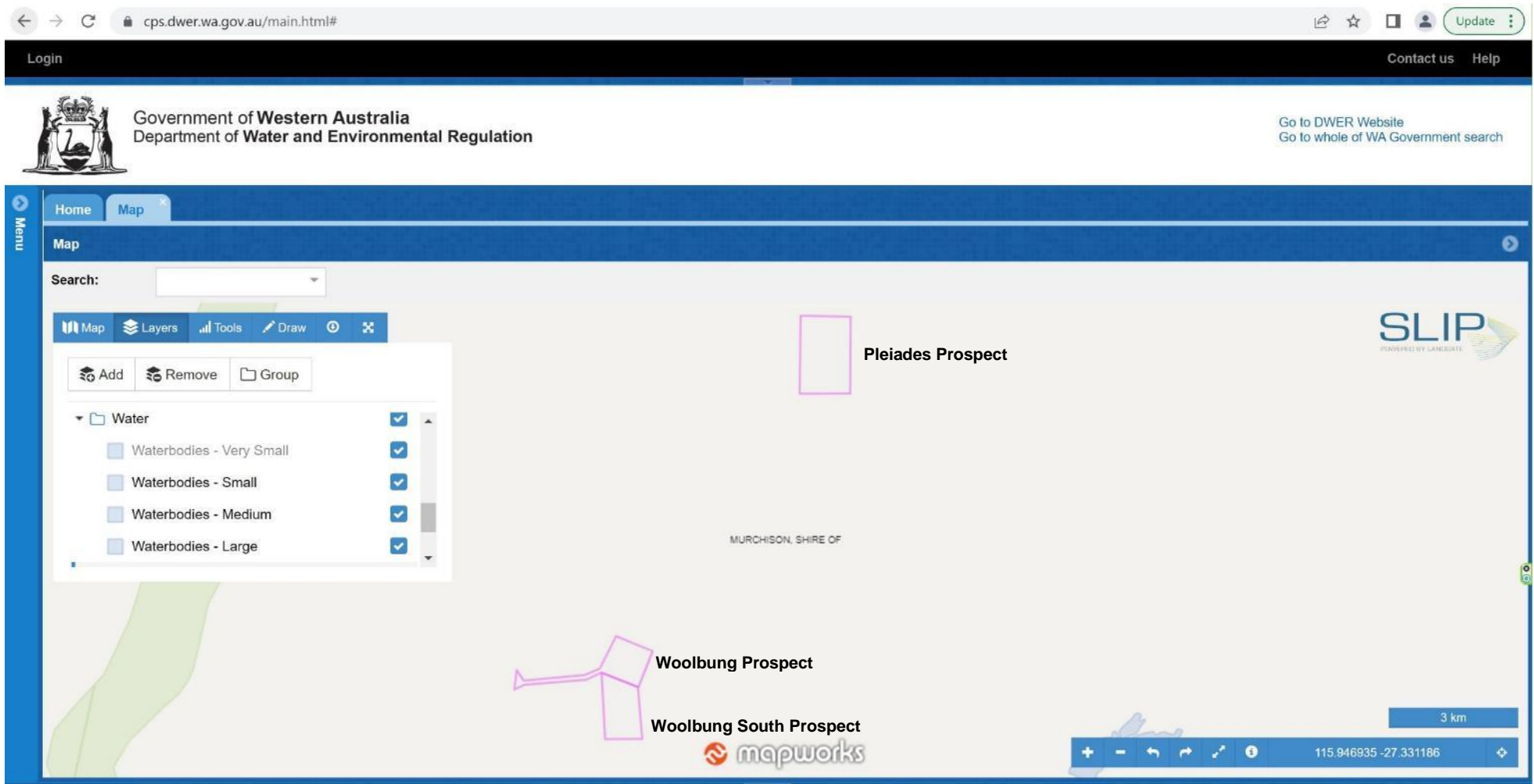
The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

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



DWER CPS Map Viewer - showing no ESA's (dark green shaded areas) within the survey areas (pink polygons) (DWER, 2022)





DWER CPS Map Viewer - showing no water bodies within the survey areas (pink polygons) (DWER, 2022)

## **Appendix B - Vegetation Definitions**

## Vegetation Condition Definitions (Keighery, 1994)

**Pristine (1).** Pristine or nearly so, no obvious signs of disturbance.

**Excellent (2).** Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species.

**Very Good (3).** Vegetation structure altered, obvious signs of disturbance.  
For example, disturbance to vegetation structure caused by repeating fires, the presence of some more aggressive weeds, dieback, logging and grazing.

**Good (4).** Vegetation structure significantly altered by very obvious signs of multiple disturbance.

Retains basic vegetation structure or ability to regenerate it.

For example, disturbance to vegetation structure caused by frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and grazing.

**Degraded (5).** Basic vegetation structure severely impacted by disturbance.

Scope for regeneration but not to a state approaching good condition without intensive management.

For example, disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.

**Completely Degraded (6).** 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 compromising weed or crop species with isolated trees or shrubs.

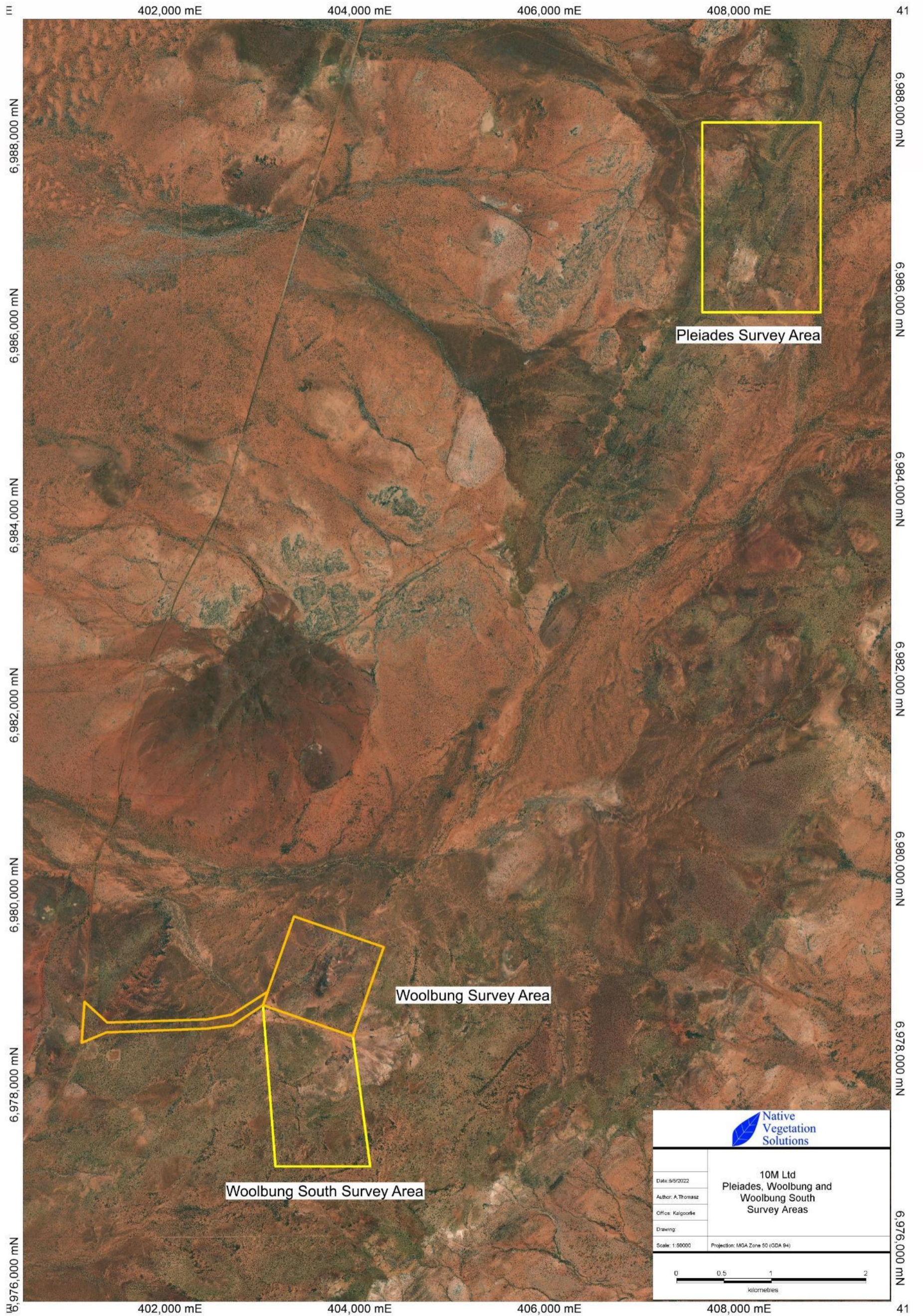
## Vegetation Structure Definitions (Muir, 1977)

Life Form/Height Class	Canopy Cover			
	Dense 70-100% d	Mid-Dense 30-70% c	Sparse 10-30% i	Very Sparse 2-10% r
T Trees>30m	Dense Tall Forest	Tall Forest	Tall Woodland	Open Tall Woodland
M Trees 15-30m	Dense Forest	Forest	Woodland	Open Woodland
LA Trees 5-15m	Dense Low Forest A	Low Forest A	Low Woodland A	Open Low Woodland A
LB Trees<5m	Dense Low Forest B	Low Forest B	Low Woodland B	Open Low Woodland B
KT Mallee tree form	Dense Tree Mallee	Tree Mallee	Open Tree Mallee	Very Open Tree Mallee
KS Mallee shrub form	Dense Shrub Mallee	Shrub Mallee	Open Shrub Mallee	Very Open Shrub Mallee
S Shrubs>2m	Dense Thicket	Thicket	Scrub	Open Scrub
SA Shrubs 1.5-2.0m	Dense Heath A	Heath A	Low Scrub A	Open Low Scrub A
SB Shrubs 1.0-1.5m	Dense Heath B	Heath B	Low Scrub B	Open Low Scrub B
SC Shrubs 0.5-1.0m	Dense Low Heath C	Low Heath C	Dwarf Scrub C	Open Dwarf Scrub C
SD Shrubs 0.0-0.5m	Dense Low Heath D	Low Heath D	Dwarf Scrub D	Open Dwarf Scrub D
P Mat plants	Dense Mat Plants	Mat Plants	Open Mat Plants	Very Open Mat Plants
H Hummock Grass	Dense Hummock Grass	Mid-Dense Hummock Grass	Hummock Grass	Open Hummock Grass
GT Bunch grass >0.5m	Dense Tall Grass	Tall Grass	Open Tall Grass	Very Open Tall Grass
GL Bunch grass <0.5m	Dense Low Grass	Low Grass	Open Low Grass	Very Open Low Grass
J Herbaceous spp.	Dense Herbs	Herbs	Open Herbs	Very Open Herbs
VT Sedges >0.5m	Dense Tall Sedges	Tall Sedges	Open Tall Sedges	Very Open Tall Sedges
VL Sedges <0.5m	Dense Low Sedges	Low Sedges	Open Low Sedges	Very Open Low Sedges
X Ferns	Dense Ferns	Ferns	Open Ferns	Very Open Ferns
Mosses, liverwort	Dense Mosses	Mosses	Open Mosses	Very Open Mosses



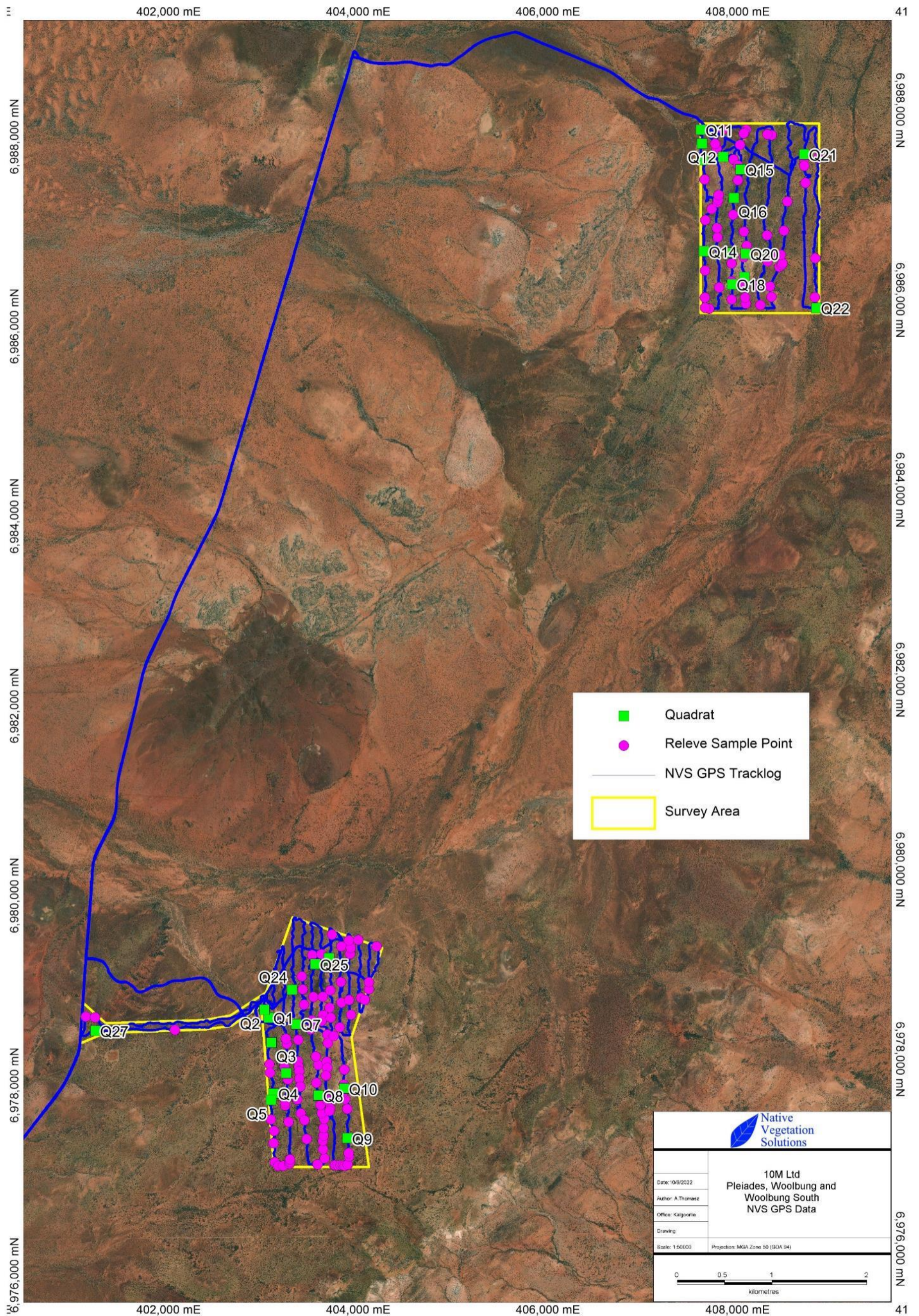
## **Appendix C - Mapping**





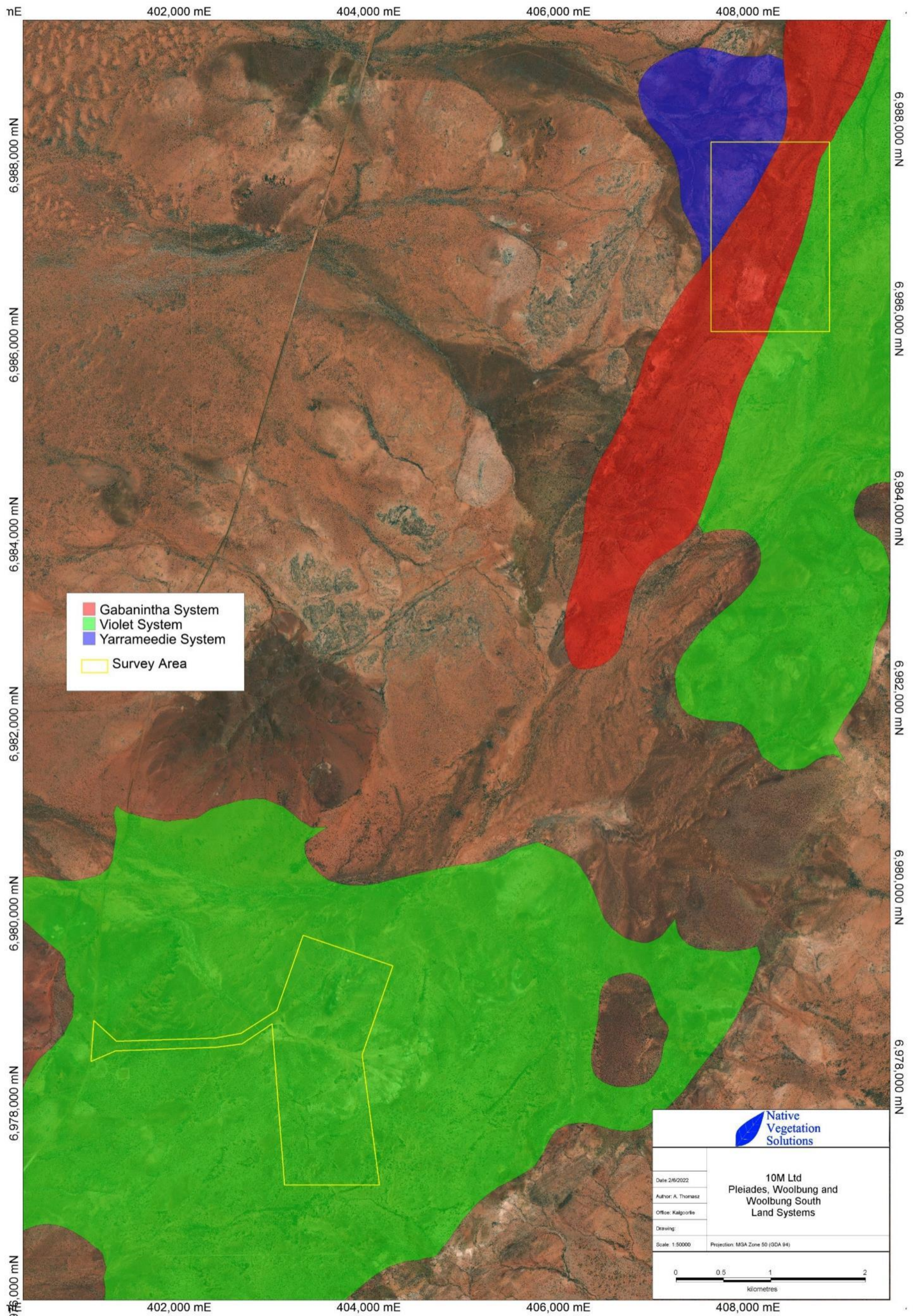
Map 1: Pleiades, Woolbung Peak and Woolbung South Prospects survey area





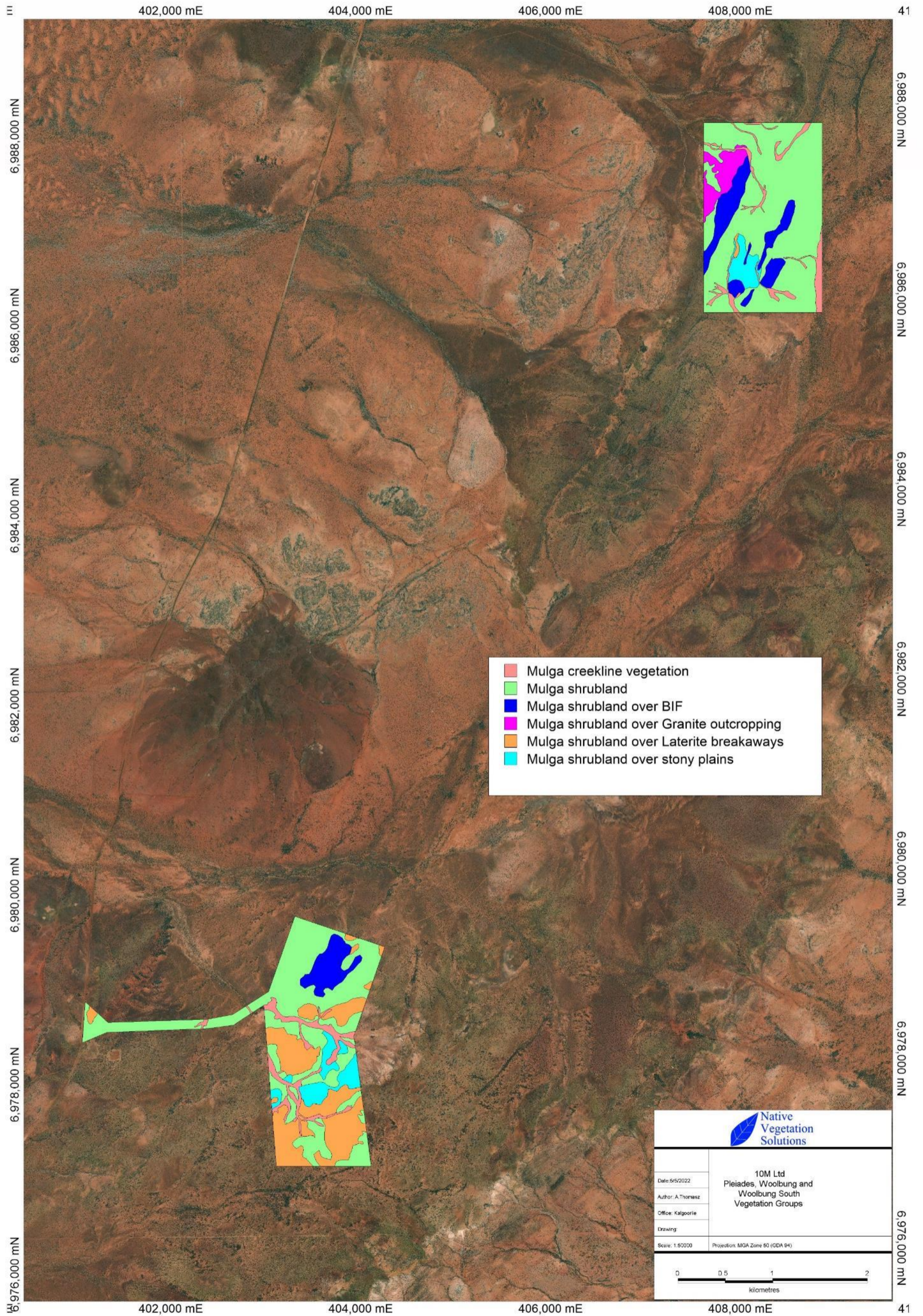
Map 2: NVS GPS Data for Pleiades, Woolbung Peak and Woolbung South Prospects





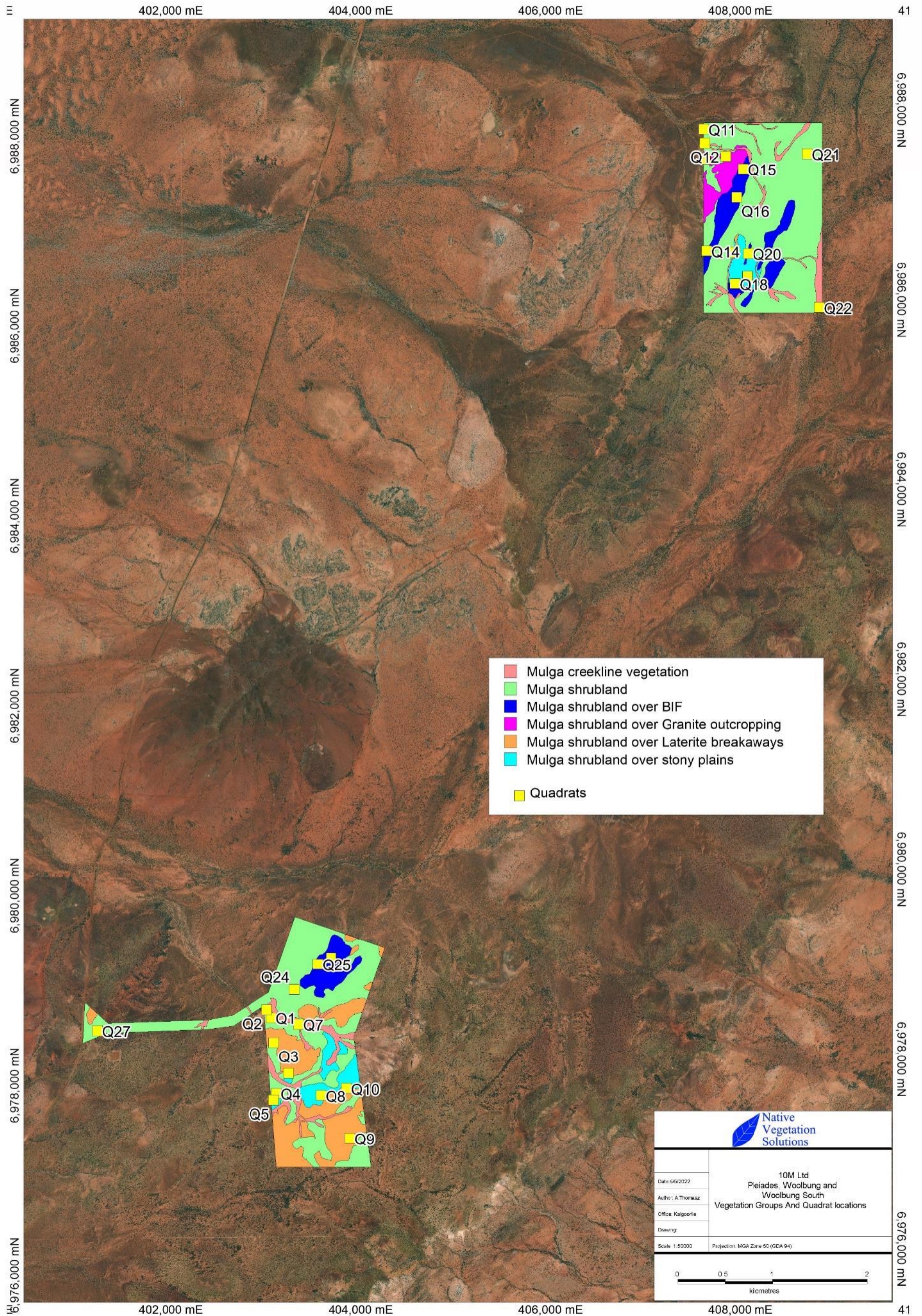
Map 3: Land Systems (DPIRD, 2017) for Pleiades, Woolbung Peak and Woolbung South Prospects





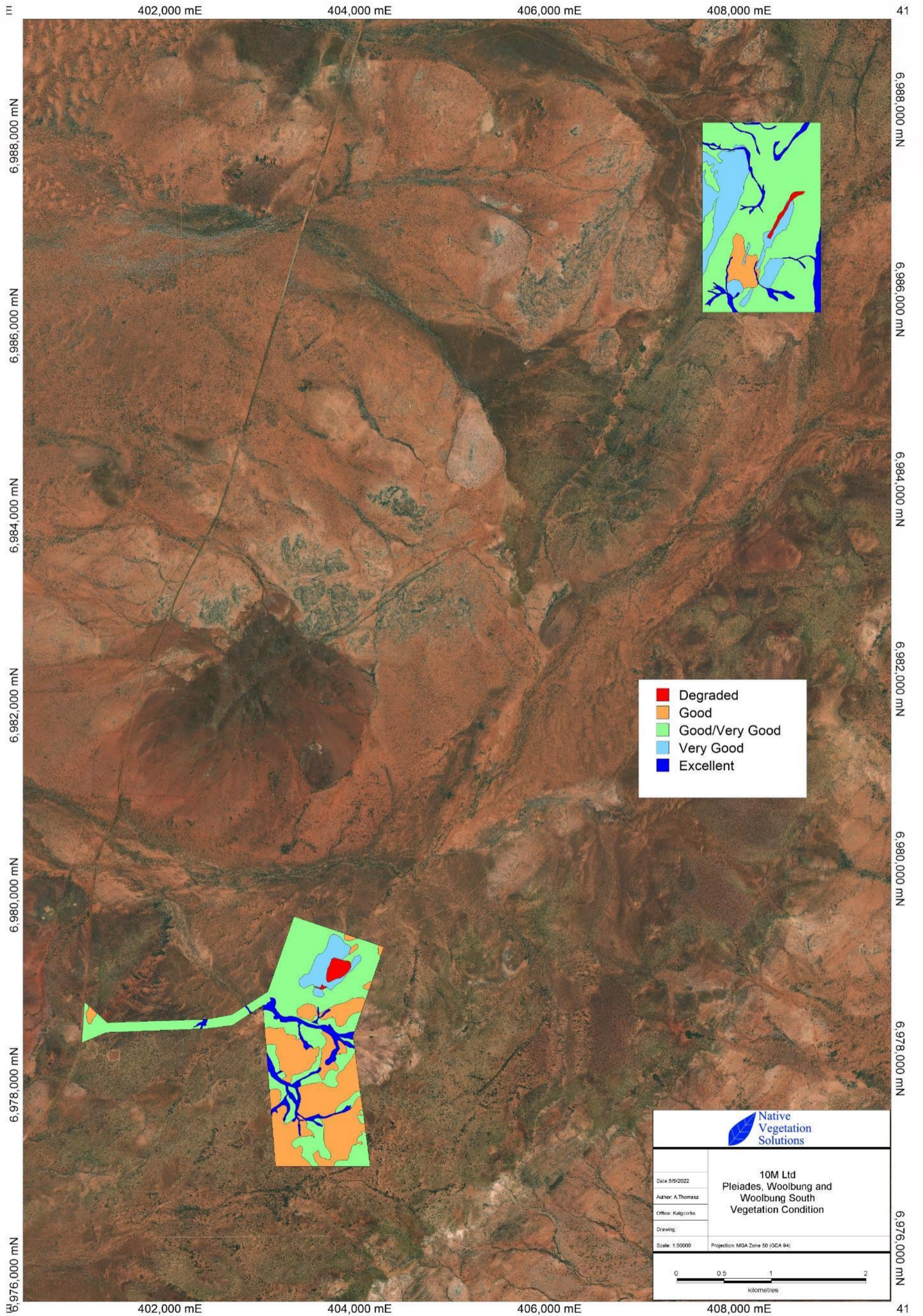
Map 4: Vegetation Groups for Pleiades, Woolbung Peak and Woolbung South Prospects





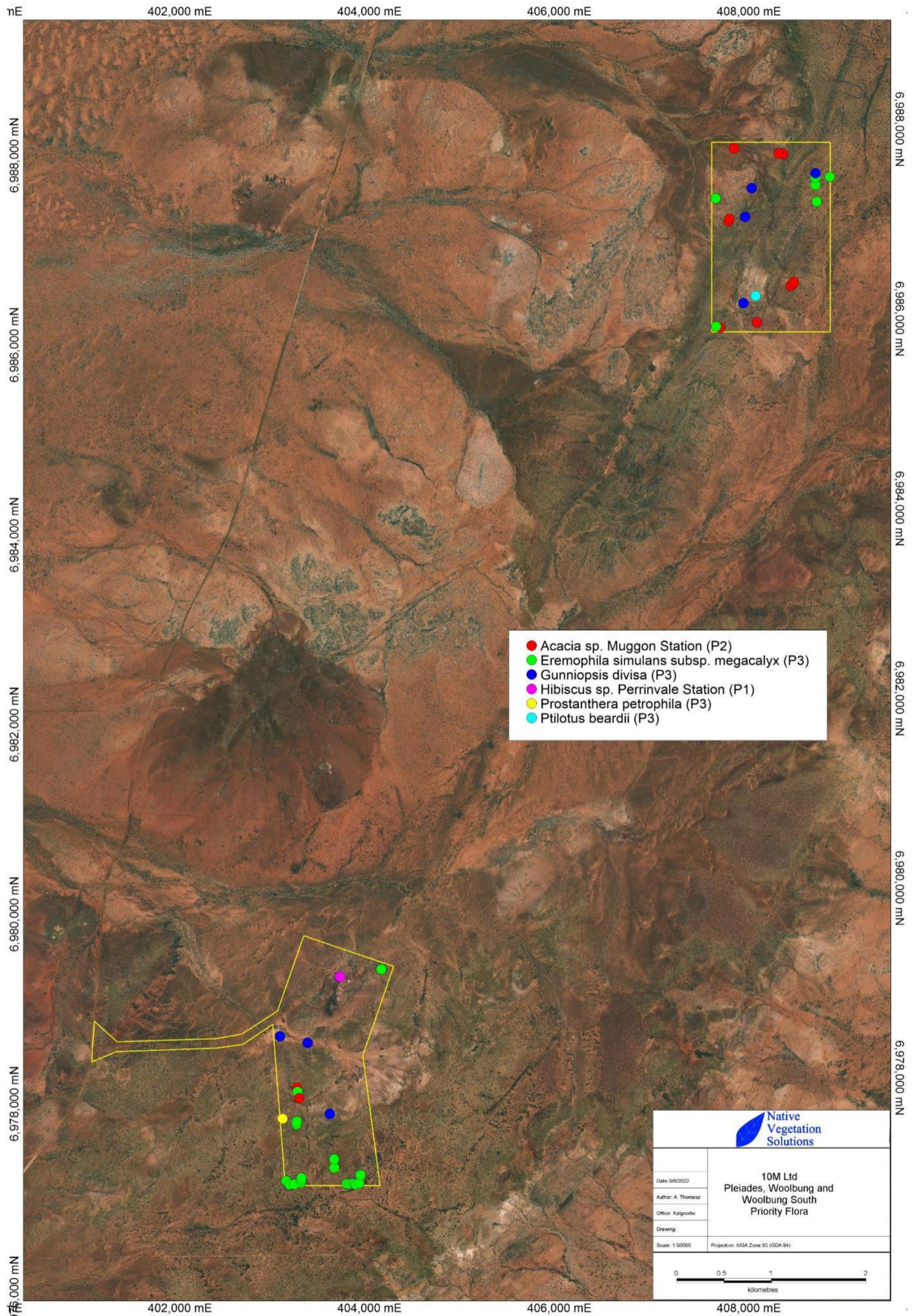
Map 5: Vegetation Groups and Quadrat locations for Pleiades, Woolbung Peak and Woolbung South Prospects





Map 6: Vegetation Condition for Pleiades, Woolbung Peak and Woolbung South Prospects





Map 7: Priority Flora locations for Pleiades, Woolbung Peak and Woolbung South Prospects



## **Appendix D - Threatened Flora Database Search Results**

TAXON	CONS_CODE	Likelihood of occurring in survey area- Comment post field work
<i>Acacia atopa</i>	P3	Not Likely- Main population is greater than 200km away, unsuitable habitat
<i>Acacia</i> sp. Muggon Station (S. Patrick & D. Edinger SP 3235)	P2	Likely - Occurs in Survey Area
<i>Acacia speckii</i>	P4	Possible- possible suitable habitat, known locations greater than 50km from survey area
<i>Baeckea</i> sp. Mount Barloweerie (J.Z. Weber 5079)	P1	Possible- possible suitable habitat, known locations less than 1.3km from survey area
<i>Balladonia aevroides</i>	P3	Not Likely- no suitable habitat
<i>Calandrinia butcherensis</i>	P1	Possible- possible suitable habitat, known location greater than 35km from survey area
<i>Calandrinia umbelliformis</i>	P1	Not Likely- no suitable habitat
<i>Dicrastylis linearifolia</i>	P3	Possible- possible suitable habitat, known locations greater than 35km from survey area
<i>Eremophila mirabilis</i>	P2	Possible- possible suitable habitat, known location greater than 45km from survey area
<i>Eremophila muelleriana</i>	P3	Possible- possible suitable habitat, known location greater than 30km from survey area
<i>Eremophila physocalyx</i>	P3	Possible- possible suitable habitat, known location less than 15km from survey area
<i>Eremophila simulans</i> subsp. <i>megacalyx</i>	P3	Likely - Occurs in Survey Area
<i>Frankenia confusa</i>	P4	Not Likely- no suitable habitat
<i>Goodenia neogoodenia</i>	P4	Not Likely- no suitable habitat
<i>Gunniopsis divisa</i>	P3	Likely - Occurs in Survey Area
<i>Hibiscus</i> sp. Perrinvale Station <sup>^</sup>	P1	Likely - Occurs in Survey Area
<i>Hemigenia tysonii</i>	P3	Possible- possible suitable habitat, known locations greater than 12km from survey area
<i>Indigofera eriophylla</i>	P1	Possible- possible suitable habitat, known locations less than 4km from survey area
<i>Isotropis petrensis</i>	P1	Possible- possible suitable habitat, known locations greater than 30km from survey area
<i>Lepidium scandens</i>	P3	Not Likely- no suitable habitat
<i>Lepidium xylodes</i>	P1	Not Likely- no suitable habitat
<i>Micromyrtus placoides</i>	P3	Possible- possible suitable habitat, known locations less than 25km from survey area
<i>Micromyrtus racemosa</i> var. <i>Jingemarra</i> (R.J. Cranfield 5253a)	P2	Possible- possible suitable habitat, known location less than 35km from survey area
<i>Petrophile pauciflora</i>	P3	Possible- possible suitable habitat, known location less than 50km from survey area
<i>Petrophile vana</i>	P1	Possible- possible suitable habitat, known location more than 45km from survey area
<i>Prostanthera petrophila</i>	P3	Likely -Occurs in Survey Area
<i>Psammomoya ephedroides</i>	P3	Possible- possible suitable habitat, known location less than 10km from survey area
<i>Ptilotus beardii</i>	P3	Likely -Occurs in Survey Area
<i>Sauropus</i> sp. Woolgorong (M. Officer s.n. 10/8/94)	P3	Possible- possible suitable habitat, known location less than 20km from survey area
<i>Solanum pycnotrichum</i>	P2	Possible- possible suitable habitat, known location less than 25km from survey area
<i>Stackhousia clementii</i>	P3	Not Likely- no suitable habitat
<i>Verticordia jamiesonii</i>	P3	Possible- possible suitable habitat, known location more than 42km from survey area

<sup>^</sup> Species added to DBCA Priority and Threatened Flora Database in March 2022 after original record search in December 2021



## **Appendix E - Species Recorded During the November 2021 and April 2022 Surveys**

### Species List per Quadrat

Family	Genus	Taxon	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24	Q25	Q26	Q27
Agaricaceae	<i>Mycenastrum</i>	<i>Mycenastrum corium</i>							*													*							
Aizoaceae	<i>Gunniopsis</i>	<i>Gunniopsis divisa</i> (P3)	*						*	*							*	*		*			*						
Aizoaceae	<i>Gunniopsis</i>	<i>Gunniopsis propinqua</i>																	*										
Aizoaceae	<i>Gunniopsis</i>	<i>Gunniopsis septifraga</i>																				*							
Aizoaceae	<i>Mesembryanthemum</i>	<i>Mesembryanthemum nodiflorum</i> *	*	*																									
Amaranthaceae	<i>Ptilotus</i>	<i>Ptilotus beardii</i> (P3)																				*							
Amaranthaceae	<i>Ptilotus</i>	<i>Ptilotus exaltatus</i>	*	*	*				*															*					
Amaranthaceae	<i>Ptilotus</i>	<i>Ptilotus gaudichaudii</i>												*															
Amaranthaceae	<i>Ptilotus</i>	<i>Ptilotus obovatus</i>	*	*	*			*		*		*		*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Amaranthaceae	<i>Ptilotus</i>	<i>Ptilotus polystachyus</i>	*										*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Amaranthaceae	<i>Ptilotus</i>	<i>Ptilotus schwartzii</i>			*			*	*	*		*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Apocynaceae	<i>Cynanchum</i>	<i>Cynanchum viminale</i> subsp. <i>australe</i>					*																						
Apocynaceae	<i>Leichhardtia</i>	<i>Leichhardtia australis</i>														*			*								*		*
Asparagaceae	<i>Thysanotus</i>	<i>Thysanotus manglesianus</i>			*																								
Asteraceae	<i>Calocephalus</i>	<i>Calocephalus multiflorus</i>			*		*	*			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Asteraceae	<i>Cephalopterum</i>	<i>Cephalopterum drummondii</i>	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Asteraceae	<i>Chthonocephalus</i>	<i>Chthonocephalus pseudevax</i>																							*				
Asteraceae	<i>Panaetia</i>	<i>Panaetia lessonii</i>	*	*																				*					
Asteraceae	<i>Pogonolepis</i>	<i>Pogonolepis muelleriana</i>											*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Asteraceae	<i>Rhodanthe</i>	<i>Rhodanthe battii</i>																					*		*				
Asteraceae	<i>Rhodanthe</i>	<i>Rhodanthe chlorocephala</i>																						*					
Asteraceae	<i>Rhodanthe</i>	<i>Rhodanthe floribunda</i>	*		*																								
Asteraceae	<i>Rhodanthe</i>	<i>Rhodanthe maryonii</i>															*									*			
Asteraceae	<i>Rhodanthe</i>	<i>Rhodanthe</i> sp.	*	*																									
Asteraceae	<i>Siemssenia</i>	<i>Siemssenia capillaris</i>		*																				*					
Boraginaceae	<i>Euploca</i>	<i>Euploca inexplicita</i> (Range Extension)												*															
Boraginaceae	<i>Trichodesma</i>	<i>Trichodesma zeylanicum</i> var. <i>grandiflorum</i>												*															
Brassicaceae	<i>Lepidium</i>	<i>Lepidium oxytrichum</i>	*																				*						
Brassicaceae	<i>Lepidium</i>	<i>Lepidium pedicellosum</i> (Range Extension)																	*			*							
Caryophyllaceae	<i>Spergula</i>	<i>Spergula pentandra</i> *	*																										
Chenopodiaceae	<i>Enchylaena</i>	<i>Enchylaena tomentosa</i> var. <i>tomentosa</i>	*	*		*													*			*	*	*	*				
Chenopodiaceae	<i>Maireana</i>	<i>Maireana appressa</i>																	*										
Chenopodiaceae	<i>Maireana</i>	<i>Maireana convexa</i>															*				*	*	*	*					
Chenopodiaceae	<i>Maireana</i>	<i>Maireana georgei</i>	*			*																					*		
Chenopodiaceae	<i>Maireana</i>	<i>Maireana planifolia</i>													*							*	*	*	*				*
Chenopodiaceae	<i>Maireana</i>	<i>Maireana thesioides</i>														*					*	*	*	*	*				
Chenopodiaceae	<i>Maireana</i>	<i>Maireana tomentosa</i>	*	*																		*							
Chenopodiaceae	<i>Maireana</i>	<i>Maireana triptera</i>	*	*		*				*							*				*	*							
Chenopodiaceae	<i>Rhagodia</i>	<i>Rhagodia drummondii</i>	*	*	*																								
Chenopodiaceae	<i>Rhagodia</i>	<i>Rhagodia eremaea</i>												*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Chenopodiaceae	<i>Sclerolaena</i>	<i>Sclerolaena burbidgeae</i>	*	*					*	*			*	*	*														*
Chenopodiaceae	<i>Sclerolaena</i>	<i>Sclerolaena densiflora</i>	*	*		*																*							
Chenopodiaceae	<i>Sclerolaena</i>	<i>Sclerolaena diacantha</i>	*	*		*			*	*		*					*		*	*	*	*	*	*	*	*	*	*	*
Chenopodiaceae	<i>Sclerolaena</i>	<i>Sclerolaena ericantha</i>		*		*				*												*							
Chenopodiaceae	<i>Sclerolaena</i>	<i>Sclerolaena euratioides</i>															*		*	*	*	*	*	*	*	*	*	*	*
Convolvulaceae	<i>Cuscuta</i>	<i>Cuscuta planiflora</i> *														*						*	*	*	*	*	*	*	*
Euphorbiaceae	<i>Euphorbia</i>	<i>Euphorbia boophthona</i>	*	*			*		*					*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Euphorbiaceae	<i>Euphorbia</i>	<i>Euphorbia drummondii</i>																					*						
Euphorbiaceae	<i>Euphorbia</i>	<i>Euphorbia tannensis</i> subsp. <i>eremophila</i>					*																			*	*	*	*
Fabaceae	<i>Acacia</i>	<i>Acacia ?eremaea</i>								*											*								
Fabaceae	<i>Acacia</i>	<i>Acacia aneura</i>	*	*		*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Fabaceae	<i>Acacia</i>	<i>Acacia aptaneura</i>																						*					
Fabaceae	<i>Acacia</i>	<i>Acacia aulacophylla</i>				*						*																	
Fabaceae	<i>Acacia</i>	<i>Acacia citrinoviridis</i>													*							*							
Fabaceae	<i>Acacia</i>	<i>Acacia craspedocarpa</i>											*										*						*
Fabaceae	<i>Acacia</i>	<i>Acacia cuthbertsonii</i> subsp. <i>cuthbertsonii</i>	*	*		*	*							*			*	*	*	*	*	*	*	*	*	*	*	*	*

Family	Genus	Taxon	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24	Q25	Q26	Q27		
Fabaceae	Acacia	Acacia effusifolia																	*												
Fabaceae	Acacia	Acacia grasbyi										*												*							
Fabaceae	Acacia	Acacia incurvaneura																							*						
Fabaceae	Acacia	Acacia kempeana								*							*		*		*										
Fabaceae	Acacia	Acacia mulganeura										*																			
Fabaceae	Acacia	Acacia palustris										*												*							
Fabaceae	Acacia	Acacia pruinocarpa			*	*		*								*		*				*	*		*	*	*	*	*	*	
Fabaceae	Acacia	Acacia pteraneura	*	*		*			*	*	*	*	*											*		*					
Fabaceae	Acacia	Acacia quadrimarginea			*						*													*							
Fabaceae	Acacia	Acacia ramulosa var. linophylla	*	*	*		*	*	*			*	*					*		*		*	*	*	*	*	*	*	*	*	
Fabaceae	Acacia	Acacia rhodophloia													*										*						
Fabaceae	Acacia	Acacia scleroclada						*				*	*	*			*		*	*	*			*							
Fabaceae	Acacia	Acacia sp. Muggon Station (P2)											*	*	*		*		*	*	*			*							
Fabaceae	Acacia	Acacia tetragonophylla	*	*	*	*				*		*	*			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Fabaceae	Acacia	Acacia umbraculiformis																	*			*									
Fabaceae	Acacia	Acacia victoriae																			*		*								
Fabaceae	Indigofera	Indigofera chamaeclada subsp. chamaeclada													*																
Fabaceae	Mirbelia	Mirbelia rhagodioides										*																			
Fabaceae	Senna	Senna artemisioides subsp. helmsii							*				*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Fabaceae	Senna	Senna glutinosa subsp. chatelainiana			*							*					*	*				*								*	
Fabaceae	Senna	Senna sp. Austin				*			*	*																					
Fabaceae	Senna	Senna sp. Meekatharra							*							*			*			*									
Geraniaceae	Erodium	Erodium cygnorum		*										*	*									*	*	*	*	*	*	*	
Goodeniaceae	Goodenia	Goodenia berardiana	*				*					*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Goodeniaceae	Goodenia	Goodenia sp. (sterile)									*																				
Goodeniaceae	Scaevola	Scaevola spinescens		*		*											*		*		*										
Lamiaceae	Hemigenia	Hemigenia botryphylla									*															*					
Lamiaceae	Prostanthera	Prostanthera petrophila (P3)					*																								
Lamiaceae	Teucrium	Teucrium teucriiflorum		*																											
Malvaceae	Abutilon	Abutilon cryptopetalum		*																											
Malvaceae	Abutilon	Abutilon otocarpum																						*							
Malvaceae	Abutilon	Abutilon oxycarpum		*								*												*							
Malvaceae	Hibiscus	Hibiscus sp. Gardneri										*																			
Malvaceae	Hibiscus	Hibiscus sp. Perrinvale Station (P1)																											*		
Malvaceae	Sida	Sida calyxhymenia			*			*		*	*	*			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Malvaceae	Sida	Sida ectogama		*		*					*						*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Malvaceae	Sida	Sida sp. dark green fruits														*															
Malvaceae	Sida	Sida sp. Golden calyces glabrous		*		*								*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Montiaceae	Calandrinia	Calandrinia translucens			*								*	*									*	*							
Myrtaceae	Aluta	Aluta aspera subsp. hesperia									*																*	*			
Myrtaceae	Calytrix	Calytrix desolata									*						*														
Myrtaceae	Calytrix	Calytrix tetragona																											*		
Myrtaceae	Micromyrtus	Micromyrtus sulphurea										*																			
Myrtaceae	Thryptomene	Thryptomene decussata			*		*	*	*		*					*				*					*						
Phyllanthaceae	Phyllanthus	Phyllanthus erwinii											*													*					
Poaceae	Aristida	Aristida contorta	*		*		*			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Poaceae	Austrostipa	Austrostipa elegantissima		*		*												*													
Poaceae	Austrostipa	Austrostipa nitida				*						*							*												
Poaceae	Enneapogon	Enneapogon caeruleus																	*												
Poaceae	Eragrostis	Eragrostis eriopoda										*												*							
Poaceae	Eragrostis	Eragrostis setifolia			*		*					*			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Poaceae	Eriachne	Eriachne helmsii														*															
Poaceae	Eriachne	Eriachne pulchella subsp. pulchella			*					*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Poaceae	Monachather	Monachather paradoxus					*					*		*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Proteaceae	Grevillea	Grevillea berryana																		*			*								
Proteaceae	Hakea	Hakea recurva subsp. arida											*																		
Pteridaceae	Cheilanthes	Cheilanthes sieberi subsp. sieberi																									*	*			



Family	Genus	Taxon	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24	Q25	Q26	Q27	
Rubiaceae	<i>Psyrax</i>	<i>Psyrax rigidula</i>					*																							
Rubiaceae	<i>Psyrax</i>	<i>Psyrax suaveolens</i>											*																	
Rutaceae	<i>Philotheca</i>	<i>Philotheca brucei</i> subsp. <i>brucei</i>										*																	*	
Rutaceae	<i>Philotheca</i>	<i>Philotheca sericea</i>					*	*			*	*														*				
Santalaceae	<i>Santalum</i>	<i>Santalum lanceolatum</i>		*																										
Sapindaceae	<i>Dodonaea</i>	<i>Dodonaea rigida</i>			*																									
Sapindaceae	<i>Dodonaea</i>	<i>Dodonaea viscosa</i> subsp. <i>spatulata</i>										*				*														
Scrophulariaceae	<i>Eremophila</i>	<i>Eremophila forrestii</i> subsp. <i>forrestii</i>	*	*	*	*											*			*	*		*	*						*
Scrophulariaceae	<i>Eremophila</i>	<i>Eremophila galeata</i>	*	*									*											*		*				
Scrophulariaceae	<i>Eremophila</i>	<i>Eremophila glutinosa</i>									*																			*
Scrophulariaceae	<i>Eremophila</i>	<i>Eremophila granitica</i>				*																								
Scrophulariaceae	<i>Eremophila</i>	<i>Eremophila latrobei</i> subsp. <i>latrobei</i>		*	*		*	*		*	*	*	*		*	*				*					*	*	*	*	*	*
Scrophulariaceae	<i>Eremophila</i>	<i>Eremophila macmillaniana</i>														*	*													
Scrophulariaceae	<i>Eremophila</i>	<i>Eremophila oldfieldii</i> subsp. <i>oldfieldii</i>																	*											
Scrophulariaceae	<i>Eremophila</i>	<i>Eremophila oppositifolia</i> subsp. <i>angustifolia</i>								*																				
Scrophulariaceae	<i>Eremophila</i>	<i>Eremophila platycalyx</i> subsp. <i>Granites</i>		*																										
Scrophulariaceae	<i>Eremophila</i>	<i>Eremophila platycalyx</i> subsp. <i>Woolgorong</i>												*																
Scrophulariaceae	<i>Eremophila</i>	<i>Eremophila pterocarpa</i> subsp. <i>pterocarpa</i>																						*						
Scrophulariaceae	<i>Eremophila</i>	<i>Eremophila simulans</i> subsp. <i>megacalyx</i> (P3)						*															*							
Solanaceae	<i>Solanum</i>	<i>Solanum lasiophyllum</i>	*	*	*	*	*	*	*		*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Solanaceae	<i>Solanum</i>	<i>Solanum plicatile</i>													*			*							*					
Stylidiaceae	<i>Stylidium</i>	<i>Stylidium longibracteatum</i>										*																		

Species List per Vegetation Group (Quadrat data including opportunistic sampling- Identified in Bold type)

Family	Genus	Taxon	a	b	c	d	e	f
Agaricaceae	<i>Mycenastrum</i>	<i>Mycenastrum corium</i>	*					
Aizoaceae	<i>Gunniopsis</i>	<i>Gunniopsis divisa</i> (P3)	*			*	*	
Aizoaceae	<i>Gunniopsis</i>	<i>Gunniopsis propinqua</i>			*			
Aizoaceae	<i>Gunniopsis</i>	<i>Gunniopsis septifraga</i>	*	*		*		
Aizoaceae	<i>Mesembryanthemum</i>	<i>Mesembryanthemum nodiflorum</i> *	*	*				
Amaranthaceae	<i>Ptilotus</i>	<i>Ptilotus beardii</i> (P3)				*		
Amaranthaceae	<i>Ptilotus</i>	<i>Ptilotus exaltatus</i>	*	*	*			
Amaranthaceae	<i>Ptilotus</i>	<i>Ptilotus gaudichaudii</i>		*				
Amaranthaceae	<i>Ptilotus</i>	<i>Ptilotus obovatus</i>	*	*	*	*	*	*
Amaranthaceae	<i>Ptilotus</i>	<i>Ptilotus polystachyus</i>	*	*			*	*
Amaranthaceae	<i>Ptilotus</i>	<i>Ptilotus schwartzii</i>	*	*	*		*	*
Apocynaceae	<i>Cynanchum</i>	<i>Cynanchum viminale</i> subsp. <i>australe</i>				*		
Apocynaceae	<i>Leichhardtia</i>	<i>Leichhardtia australis</i>	*				*	
Asparagaceae	<i>Thysanotus</i>	<i>Thysanotus manglesianus</i>			*			
Asteraceae	<i>Calocephalus</i>	<i>Calocephalus multiflorus</i>	*	*	*		*	
Asteraceae	<i>Cephalopterum</i>	<i>Cephalopterum drummondii</i>	*	*	*	*	*	*
Asteraceae	<i>Chthonocephalus</i>	<i>Chthonocephalus pseudevax</i>						*
Asteraceae	<i>Panaetia</i>	<i>Panaetia lessonii</i>	*	*				
Asteraceae	<i>Pogonolepis</i>	<i>Pogonolepis muelleriana</i>		*			*	*
Asteraceae	<i>Rhodanthe</i>	<i>Rhodanthe battii</i>	*					*
Asteraceae	<i>Rhodanthe</i>	<i>Rhodanthe chlorocephala</i>		*				
Asteraceae	<i>Rhodanthe</i>	<i>Rhodanthe floribunda</i>	*		*			
Asteraceae	<i>Rhodanthe</i>	<i>Rhodanthe maryonii</i>					*	*
Asteraceae	<i>Rhodanthe</i>	<i>Rhodanthe</i> sp.	*	*				
Asteraceae	<i>Siemssenia</i>	<i>Siemssenia capillaris</i>		*				
Boraginaceae	<i>Euploca</i>	<i>Euploca inexplicita</i> (Range Extension)		*				
Boraginaceae	<i>Trichodesma</i>	<i>Trichodesma zeylanicum</i> var. <i>grandiflorum</i>		*				
Brassicaceae	<i>Lepidium</i>	<i>Lepidium oxytrichum</i>	*	*				
Brassicaceae	<i>Lepidium</i>	<i>Lepidium pedicellosum</i> (Range Extension)			*	*		
Caryophyllaceae	<i>Spergula</i>	<i>Spergula pentandra</i> *	*					
<b>Chenopodiaceae</b>	<b>Atriplex</b>	<b>Atriplex codonocarpa</b>		*				
Chenopodiaceae	<i>Enchylaena</i>	<i>Enchylaena tomentosa</i> var. <i>tomentosa</i>	*	*	*	*		
Chenopodiaceae	<i>Maireana</i>	<i>Maireana appressa</i>			*			
Chenopodiaceae	<i>Maireana</i>	<i>Maireana convexa</i>	*	*		*	*	
Chenopodiaceae	<i>Maireana</i>	<i>Maireana georgei</i>	*			*	*	
Chenopodiaceae	<i>Maireana</i>	<i>Maireana planifolia</i>	*			*		*
Chenopodiaceae	<i>Maireana</i>	<i>Maireana thesioides</i>	*	*		*	*	
Chenopodiaceae	<i>Maireana</i>	<i>Maireana tomentosa</i>	*	*				
Chenopodiaceae	<i>Maireana</i>	<i>Maireana triptera</i>	*	*		*	*	
Chenopodiaceae	<i>Rhagodia</i>	<i>Rhagodia drummondii</i>	*	*	*			
Chenopodiaceae	<i>Rhagodia</i>	<i>Rhagodia eremaea</i>	*	*	*	*	*	*
Chenopodiaceae	<i>Sclerolaena</i>	<i>Sclerolaena burbridgeae</i>	*	*		*	*	*

Family	Genus	Taxon	a	b	c	d	e	f
Chenopodiaceae	<i>Sclerolaena</i>	<i>Sclerolaena densiflora</i>	*	*		*		
Chenopodiaceae	<i>Sclerolaena</i>	<i>Sclerolaena diacantha</i>	*	*	*	*	*	*
Chenopodiaceae	<i>Sclerolaena</i>	<i>Sclerolaena eriacantha</i>		*		*		
Chenopodiaceae	<i>Sclerolaena</i>	<i>Sclerolaena eurotioides</i>	*	*	*	*	*	*
Convolvulaceae	<i>Cuscuta</i>	<i>Cuscuta planiflora</i> *					*	*
Euphorbiaceae	<i>Euphorbia</i>	<i>Euphorbia boophthona</i>	*	*	*		*	*
Euphorbiaceae	<i>Euphorbia</i>	<i>Euphorbia drummondii</i>	*					
Euphorbiaceae	<i>Euphorbia</i>	<i>Euphorbia tannensis</i> subsp. <i>eremophila</i>	*		*		*	
Fabaceae	<i>Acacia</i>	<i>Acacia ?eremaea</i>				*		
Fabaceae	<i>Acacia</i>	<i>Acacia aneura</i>	*	*	*	*	*	*
Fabaceae	<i>Acacia</i>	<i>Acacia aptaneura</i>		*				
Fabaceae	<i>Acacia</i>	<i>Acacia aulacophylla</i>			*	*		
Fabaceae	<i>Acacia</i>	<i>Acacia citrinoviridis</i>	*				*	
Fabaceae	<i>Acacia</i>	<i>Acacia craspedocarpa</i>	*	*				
Fabaceae	<i>Acacia</i>	<i>Acacia cuthbertsonii</i> subsp. <i>cuthbertsonii</i>	*	*	*	*	*	
Fabaceae	<i>Acacia</i>	<i>Acacia effusifolia</i>			*			
Fabaceae	<i>Acacia</i>	<i>Acacia grasbyi</i>		*	*			
Fabaceae	<i>Acacia</i>	<i>Acacia incurvaneura</i>	*	*				
Fabaceae	<i>Acacia</i>	<i>Acacia kempeana</i>			*	*	*	
Fabaceae	<i>Acacia</i>	<i>Acacia mulganeura</i>	*					
<b>Fabaceae</b>	<b>Acacia</b>	<b>Acacia oswaldii</b>	*					
Fabaceae	<i>Acacia</i>	<i>Acacia palustris</i>		*				
Fabaceae	<i>Acacia</i>	<i>Acacia pruinocarpa</i>	*		*	*	*	
Fabaceae	<i>Acacia</i>	<i>Acacia pteraneura</i>	*	*	*	*		
Fabaceae	<i>Acacia</i>	<i>Acacia quadrimarginea</i>			*			
Fabaceae	<i>Acacia</i>	<i>Acacia ramulosa</i> var. <i>linophylla</i>	*	*	*		*	
Fabaceae	<i>Acacia</i>	<i>Acacia rhodophloia</i>						*
Fabaceae	<i>Acacia</i>	<i>Acacia scleroclada</i>	*	*	*	*	*	*
Fabaceae	<i>Acacia</i>	<i>Acacia</i> sp. <i>Muggon Station (P2)</i>					*	
Fabaceae	<i>Acacia</i>	<i>Acacia tetragonophylla</i>	*	*	*	*	*	
Fabaceae	<i>Acacia</i>	<i>Acacia umbraculiformis</i>			*			
Fabaceae	<i>Acacia</i>	<i>Acacia victoriae</i>				*		
Fabaceae	<i>Indigofera</i>	<i>Indigofera chamaeclada</i> subsp. <i>chamaeclada</i>		*				
Fabaceae	<i>Mirbelia</i>	<i>Mirbelia rhagodioides</i>			*			
<b>Fabaceae</b>	<b>Senna</b>	<b>Senna artemisioides</b> subsp. <b>artemisioides</b>	*					
Fabaceae	<i>Senna</i>	<i>Senna artemisioides</i> subsp. <i>helmsii</i>	*	*	*		*	*
Fabaceae	<i>Senna</i>	<i>Senna glutinosa</i> subsp. <i>chatelainiana</i>	*		*		*	
Fabaceae	<i>Senna</i>	<i>Senna</i> sp. <i>Austin</i>	*			*		
Fabaceae	<i>Senna</i>	<i>Senna</i> sp. <i>Meekatharra</i>	*		*		*	
<b>Frankeniaceae</b>	<b>Frankenia</b>	<b>Frankenia setosa</b>		*				
Geraniaceae	<i>Erodium</i>	<i>Erodium cygnorum</i>	*	*			*	*
Goodeniaceae	<i>Goodenia</i>	<i>Goodenia berardiana</i>	*	*	*	*	*	*
Goodeniaceae	<i>Goodenia</i>	<i>Goodenia</i> sp. (sterile)			*			



Family	Genus	Taxon	a	b	c	d	e	f
Goodeniaceae	<i>Scaevola</i>	<i>Scaevola spinescens</i>		*	*	*	*	
Lamiaceae	<i>Hemigenia</i>	<i>Hemigenia botryphylla</i>	*		*			
Lamiaceae	<i>Prostanthera</i>	<i>Prostanthera petrophila</i> (P3)			*			
Lamiaceae	<i>Teucrium</i>	<i>Teucrium teucriiflorum</i>		*				
Malvaceae	<i>Abutilon</i>	<i>Abutilon cryptopetalum</i>		*				
Malvaceae	<i>Abutilon</i>	<i>Abutilon otocarpum</i>		*				
Malvaceae	<i>Abutilon</i>	<i>Abutilon oxycarpum</i>	*	*				
Malvaceae	<i>Hibiscus</i>	<i>Hibiscus</i> sp. Gardneri		*				
Malvaceae	<i>Hibiscus</i>	<i>Hibiscus</i> sp. Perrinvale Station (P1)					*	
Malvaceae	<i>Sida</i>	<i>Sida calyxhymenia</i>	*		*		*	
Malvaceae	<i>Sida</i>	<i>Sida ectogama</i>	*	*	*	*	*	
Malvaceae	<i>Sida</i>	<i>Sida</i> sp. dark green fruits					*	
Malvaceae	<i>Sida</i>	<i>Sida</i> sp. Golden calyces glabrous	*	*		*	*	
Montiaceae	<i>Calandrinia</i>	<i>Calandrinia translucens</i>		*	*			*
Myrtaceae	<i>Aluta</i>	<i>Aluta aspera</i> subsp. <i>hesperia</i>			*		*	
Myrtaceae	<i>Calytrix</i>	<i>Calytrix desolata</i>			*		*	
Myrtaceae	<i>Calytrix</i>	<i>Calytrix tetragona</i>					*	
Myrtaceae	<i>Micromyrtus</i>	<i>Micromyrtus sulphurea</i>			*			
Myrtaceae	<i>Thryptomene</i>	<i>Thryptomene decussata</i>	*		*		*	
Phyllanthaceae	<i>Phyllanthus</i>	<i>Phyllanthus erwinii</i>		*				
<b>Phyllanthaceae</b>	<b><i>Synostemon</i></b>	<b><i>Synostemon crassifolius</i></b>			*			
Poaceae	<i>Aristida</i>	<i>Aristida contorta</i>	*	*	*	*	*	*
Poaceae	<i>Austrostipa</i>	<i>Austrostipa elegantissima</i>		*	*	*		
Poaceae	<i>Austrostipa</i>	<i>Austrostipa nitida</i>			*	*		
Poaceae	<i>Enneapogon</i>	<i>Enneapogon caerulescens</i>			*			
Poaceae	<i>Eragrostis</i>	<i>Eragrostis eriopoda</i>	*					
Poaceae	<i>Eragrostis</i>	<i>Eragrostis setifolia</i>	*		*		*	*
Poaceae	<i>Eriachne</i>	<i>Eriachne helmsii</i>					*	
Poaceae	<i>Eriachne</i>	<i>Eriachne pulchella</i> subsp. <i>pulchella</i>	*	*	*	*	*	*
Poaceae	<i>Monachather</i>	<i>Monachather paradoxus</i>	*		*		*	*
Proteaceae	<i>Grevillea</i>	<i>Grevillea berryana</i>	*				*	
<b>Proteaceae</b>	<b><i>Grevillea</i></b>	<b><i>Grevillea deflexa</i></b>						*
Proteaceae	<i>Hakea</i>	<i>Hakea recurva</i> subsp. <i>arida</i>		*				
Pteridaceae	<i>Cheilanthes</i>	<i>Cheilanthes sieberi</i> subsp. <i>sieberi</i>					*	
<b>Rubiaceae</b>	<b><i>Psydrax</i></b>	<b><i>Psydrax latifolia</i></b>	*					
Rubiaceae	<i>Psydrax</i>	<i>Psydrax rigidula</i>			*			
Rubiaceae	<i>Psydrax</i>	<i>Psydrax suaveolens</i>	*					
Rutaceae	<i>Philotheca</i>	<i>Philotheca brucei</i> subsp. <i>brucei</i>			*		*	
Rutaceae	<i>Philotheca</i>	<i>Philotheca sericea</i>	*		*			
Santalaceae	<i>Santalum</i>	<i>Santalum lanceolatum</i>		*				
Sapindaceae	<i>Dodonaea</i>	<i>Dodonaea rigida</i>			*			
Sapindaceae	<i>Dodonaea</i>	<i>Dodonaea viscosa</i> subsp. <i>spatulata</i>			*		*	
Scrophulariaceae	<i>Eremophila</i>	<i>Eremophila forrestii</i> subsp. <i>forrestii</i>	*	*	*	*	*	

Family	Genus	Taxon	a	b	c	d	e	f
Scrophulariaceae	<i>Eremophila</i>	<i>Eremophila galeata</i>	*	*				
Scrophulariaceae	<i>Eremophila</i>	<i>Eremophila glutinosa</i>	*		*			
Scrophulariaceae	<i>Eremophila</i>	<i>Eremophila granitica</i>				*		
Scrophulariaceae	<i>Eremophila</i>	<i>Eremophila latrobei</i> subsp. <i>latrobei</i>	*	*	*	*	*	*
Scrophulariaceae	<i>Eremophila</i>	<i>Eremophila macmillaniana</i>					*	
Scrophulariaceae	<i>Eremophila</i>	<i>Eremophila oldfieldii</i> subsp. <i>oldfieldii</i>			*			
Scrophulariaceae	<i>Eremophila</i>	<i>Eremophila oppositifolia</i> subsp. <i>angustifolia</i>				*		
Scrophulariaceae	<i>Eremophila</i>	<i>Eremophila platycalyx</i> subsp. <i>Granites</i>		*				
Scrophulariaceae	<i>Eremophila</i>	<i>Eremophila platycalyx</i> subsp. <i>Woolgorong</i>		*				
Scrophulariaceae	<i>Eremophila</i>	<i>Eremophila pterocarpa</i> subsp. <i>pterocarpa</i>				*		
Scrophulariaceae	<i>Eremophila</i>	<i>Eremophila simulans</i> subsp. <i>megacalyx</i> (P3)	*		*			
Solanaceae	<i>Solanum</i>	<i>Solanum lasiophyllum</i>	*	*	*	*	*	*
Solanaceae	<i>Solanum</i>	<i>Solanum plicatile</i>					*	*
Stylidiaceae	<i>Stylidium</i>	<i>Stylidium longibracteatum</i>			*			



## **Appendix F - Site Descriptions**



Project Name: Pleiades, Woolbung Peak and Woolbung South prospects					
Date:	14/11/2021		Botanist:	Eren Reid	
Location (Longitude/Latitude GDA2020):	116.019067	-27.312452	Quadrat:	Q1	
Quadrat size:	20x20 m				
Quadrat marking method:	Fence dropper at each corner. TwoNav Aventura GPS waypoint @ NE corner (±4 m accuracy). Using GDA2020 datum				
Vegetation group:	Mulga shrubland				
Vegetation condition	Good/Very Good				
WP:	1				
Photo number:	1				
Landform:	Flat/Plain				
Land surface/disturbance:	No effective disturbance				
Fire history:	>15 years				
Coarse fragments on the surface (abundance/size/shape):	No coarse fragments				
Rock outcrop (abundance/runoff):	No bedrock exposed/No runoff				
Soil (profile/field texture/soil surface):	Uniform/Sandy clay loam/Cracking				
% Cover leaf litter:	5				
% Cover bare ground:	70				
Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	S Shrub	Growth form:	S Shrub	Growth form:	S Shrub
Height:	3-6m	Height:	1-3m	Height:	0.5-1m
Crown cover %:	S 10-30	Crown cover %:	S 10-30	Crown cover %:	S 10-30
Dominant taxa:	Acacia ramulosa var. linophylla		Eremophila forrestii subsp. forrestii		
Acacia aneura	Eremophila galeata		Solanum lasiophyllum		
	Acacia cuthbertsonii subsp. cuthbertsonii		Ptilotus obovatus		
ALL SPECIES					
Acacia aneura					
Acacia ramulosa var. linophylla					
Eremophila galeata					
Acacia cuthbertsonii subsp. cuthbertsonii					
Eremophila forrestii subsp. forrestii					
Solanum lasiophyllum					
Ptilotus obovatus					
Enchylaena tomentosa var. tomentosa					
Ptilotus polystachyus					
Rhagodia drummondii					
Sclerolaena diacantha					
Ptilotus exaltatus					
Cephalopterum drummondii					
Maireana georgei					
Maireana triptera					
Goodenia berardiana					
Acacia tetragonophylla					
Aristida contorta					
Acacia pteraneura					
Gunnipopsis divisa (P3)					
Mesembryanthemum nodiflorum*					
Rhodanthe floribunda					
Panaetia lessonii					
Rhodanthe sp.					
Sclerolaena densiflora					
Spergula pentandra*					
Maireana tomentosa					
Euphorbia boophithona					
Lepidium oxytrichum					
Sclerolaena burbridgeae					
Outside					
Acacia pruinoarpa					
Senna glutinosa subsp. chatelainiana					



Project Name: Pleiades, Woolbung Peak and Woolbung South prospects					
Date:	14/11/2021	Botanist:	Eren Reid		
Location (Longitude/Latitude GDA2020):	116.018619	-27.311700	Quadrat:	Q2	
Quadrat size:	20x20 m				
Quadrat marking method:	Fence dropper at each corner. TwoNav Aventura GPS waypoint @ NE corner (±4 m accuracy). Using GDA2020 datum				
Vegetation group:	Creekline				
Vegetation condition:	Excellent				
WP:	2				
Photo number:	21				
Landform:	Open depression (vale)/Drainage depression				
Land surface/disturbance:	No effective disturbance				
Fire history:	>15 years				
Coarse fragments on the surface (abundance/size/shape):	No coarse fragments				
Rock outcrop (abundance/runoff):	No bedrock exposed/Slow				
Soil (profile/field texture/soil surface):	Uniform/Sandy clay loam/Cracking				
% Cover leaf litter:	10				
% Cover bare ground:	40				
Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	S Shrub	Growth form:	S Shrub	Growth form:	S Shrub
Height:	6-12m	Height:	1-3m	Height:	0.5-1m
Crown cover %:	M 30-70	Crown cover %:	S 10-30	Crown cover %:	S 10-30
Dominant taxa:		Dominant taxa:		Dominant taxa:	
Acacia aneura		Acacia ramulosa var. linophylla		Eremophila platycalyx subsp. Granites	
Acacia pteraneura		Eremophila forrestii subsp. forrestii		Ptilotus obovatus	
		Eremophila galeata		Solanum lasiophyllum	
ALL SPECIES					
Acacia aneura					
Acacia pteraneura					
Acacia ramulosa var. linophylla					
Eremophila forrestii subsp. forrestii					
Eremophila galeata					
Eremophila platycalyx subsp. Granites					
Ptilotus obovatus					
Solanum lasiophyllum					
Acacia tetragonophylla					
Ptilotus exaltatus					
Sida sp. Golden calyces glabrous					
Sida ectogama					
Eremophila latrobei subsp. latrobei					
Abutilon cryptopetalum					
Abutilon oxycarpum					
Euphorbia boophthona					
Enchylaena tomentosa var. tomentosa					
Maireana tomentosa					
Gunnipopsis septifraga					
Scaevola spinescens					
Teucrium teucriiflorum					
Santalum lanceolatum					
Rhagodia drummondii					
Maireana triptera					
Austrostipa elegantissima					
Rhodanthe sp.					
Mesembryanthemum nodiflorum*					
Panaetia lessonii					
Sclerolaena eriacantha					
Sclerolaena densiflora					
Sclerolaena burbidgeae					
Siemssenia capillaris					
Acacia cuthbertsonii subsp. cuthbertsonii					
Sclerolaena diacantha					
Cephalopterum drummondii					
Erodium cygnorum					
Outside					





Project Name: Pleiades, Woolbung Peak and Woolbung South prospects					
Date:	14/11/2021	Botanist:	Eren Reid		
Location (Longitude/Latitude GDA2020):	116.019354	-27.314832	Quadrat:	Q3	
Quadrat size:	20x20 m				
Quadrat marking method:	Fence dropper at each corner. TwoNav Aventura GPS waypoint @ NE corner (±4 m accuracy). Using GDA2020 datum				
Vegetation group:	Acacia pruinocarpa over Acacia quadrimarginea and Acacia ramulosa over Myrtaceae sp and Eremophila forrestii				
Vegetation condition:	Good				
WP:	3				
Photo number:	22				
Landform:	Flat/Plain				
Land surface/disturbance:	No effective disturbance				
Fire history:	>15 years				
Coarse fragments on the surface (abundance/size/shape):	Moderately; many/Coarse gravelly; large pebbles/Rounded				
Rock outcrop (abundance/runoff):	No bedrock exposed/Slow				
Soil (profile/field texture/soil surface):	Uniform/Sandy clay loam/Firm				
% Cover leaf litter:	10				
% Cover bare ground:	60				
Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	T Tree	Growth form:	S Shrub	Growth form:	S Shrub
Height:	6-12m	Height:	1-3m	Height:	0.5-1m
Crown cover %:	V <10	Crown cover %:	M 30-70	Crown cover %:	S 10-30
Dominant taxa:		Dominant taxa:		Dominant taxa:	
Acacia pruinocarpa		Acacia quadrimarginea		Eremophila forrestii subsp. forrestii	
		Thryptomene decussata		Eremophila latrobei subsp. latrobei	
		Acacia ramulosa var. linophylla		Ptilotus schwartzii	
ALL SPECIES					
Acacia pruinocarpa					
Acacia quadrimarginea					
Thryptomene decussata					
Acacia ramulosa var. linophylla					
Eremophila forrestii subsp. forrestii					
Eremophila latrobei subsp. latrobei					
Ptilotus schwartzii					
Senna glutinosa subsp. chatelainiana					
Ptilotus exaltatus					
Ptilotus obovatus					
Rhodanthe floribunda					
Solanum lasiophyllum					
Thysanotus manglesianus					
Dodonaea rigida					
Rhagodia drummondii					
Acacia tetragonophylla					
Sida calyxymenia					
Aristida contorta					
Calandrinia translucens					
Calocephalus multiflorus					
Eriachne pulchella subsp. pulchella					
Eragrostis setifolia					
Cephalopterum drummondii					
Outside					
Acacia aneura					
Grevillea berryana					
Eremophila granitica					







Project Name: Pleiades, Woolbung Peak and Woolbung South prospects					
Date:	14/11/2021		Botanist:	Eren Reid	
Location (Longitude/Latitude GDA2020):	116.019277	-27.320292	Quadrat:	Q5	
Quadrat size:	20x20 m				
Quadrat marking method:	Fence dropper at each corner. TwoNav Aventura GPS waypoint @ NE corner (±4 m accuracy). Using GDA2020 datum				
Vegetation group:	Small rocky outcrop BIF				
Vegetation condition:	Good				
WP:	7				
Photo number:	25				
Landform:	Hillock/Mound				
Land surface/disturbance:	No effective disturbance				
Fire history:	>15 years				
Coarse fragments on the surface (abundance/size/shape):	Extremely; very abundant/Bouldery; or boulders/Angular platy				
Rock outcrop (abundance/runoff):	Rockland/Rapid				
Soil (profile/field texture/soil surface):	Uniform/Sandy clay loam/Firm				
% Cover leaf litter:	<5				
% Cover bare ground:	70				
Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	S Shrub	Growth form:	S Shrub	Growth form:	S Shrub
Height:	1-3m	Height:	0.5-1m	Height:	0.25-0.5m
Crown cover %:	V <10	Crown cover %:	S 10-30	Crown cover %:	V <10
Dominant taxa:	Thryptomene decussata		Philothea sericea		Eremophila latrobei subsp. latrobei
Acacia aneura	Philothea sericea		Acacia ramulosa var. linophylla		
	Acacia ramulosa var. linophylla				
ALL SPECIES					
Acacia aneura					
Thryptomene decussata					
Philothea sericea					
Acacia ramulosa var. linophylla					
Eremophila latrobei subsp. latrobei					
Monachather paradoxus					
Calocephalus multiflorus					
Cephalopterum drummondii					
Acacia cuthbertsonii subsp. cuthbertsonii					
Psychrax rigidula					
Euphorbia boophthona					
Aristida contorta					
Goodenia berardiana					
Eragrostis setifolia					
Solanum lasiophyllum					
Prostanthera petrophila (P3)					
Euphorbia tannensis subsp. eremophila					
Outside					





Project Name: Pleiades, Woolbung Peak and Woolbung South prospects					
Date:	14/11/2021	Botanist:	Eren Reid		
Location (Longitude/Latitude GDA2020):	116.020872	-27.317749	Quadrat:	Q6	
Quadrat size:	20x20 m				
Quadrat marking method:	Fence dropper at each corner. TwoNav Aventura GPS waypoint @ NE corner (±4 m accuracy). Using GDA2020 datum				
Vegetation group:	Same as q3				
Vegetation condition:	Good				
WP:	22				
Photo number:	31				
Landform:	Upper slope/Hillslope				
Land surface/disturbance:	No effective disturbance				
Fire history:	>15 years				
Coarse fragments on the surface (abundance/size/shape):	Extremely; very abundant/Coarse gravelly; large pebbles/Subrounded				
Rock outcrop (abundance/runoff):	Rocky/Slow				
Soil (profile/field texture/soil surface):	Uniform/Sandy clay loam/Firm				
% Cover leaf litter:	5				
% Cover bare ground:	70				
Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	T Tree	Growth form:	S Shrub	Growth form:	S Shrub
Height:	3-6m	Height:	1-3m	Height:	0.5-1m
Crown cover %:	I <1	Crown cover %:	S 10-30	Crown cover %:	S 10-30
Dominant taxa:		Dominant taxa:		Dominant taxa:	
Acacia pruinocarpa		Acacia aneura		Solanum lasiophyllum	
		Acacia ramulosa var. linophylla		Philothea sericea	
		Thryptomene decussata			
ALL SPECIES					
Acacia pruinocarpa					
Acacia aneura					
Acacia ramulosa var. linophylla					
Thryptomene decussata					
Solanum lasiophyllum					
Philothea sericea					
Acacia scleroclada					
Cephalopterum drummondii					
Calocephalus multiflorus					
Ptilotus schwartzii					
Ptilotus obovatus					
Eremophila latrobei subsp. latrobei					
Sida calyxymenia					
Eremophila simulans subsp. meqacalyx (P3)					
Outside					





Project Name: Pleiades, Woolbung Peak and Woolbung South prospects					
Date:	14/11/2021	Botanist:	Eren Reid		
Location (Longitude/Latitude GDA2020):	116.021998	-27.313092	Quadrat:	Q7	
Quadrat size:	20x20 m				
Quadrat marking method:	Fence dropper at each corner. TwoNav Aventura GPS waypoint @ NE corner (±4 m accuracy). Using GDA2020 datum				
Vegetation group:	Q1				
Vegetation condition:	Excellent				
WP:	29				
Photo number:	40				
Landform:	Flat/Plain				
Land surface/disturbance:	No effective disturbance				
Fire history:	>15 years				
Coarse fragments on the surface (abundance/size/shape):	No coarse fragments				
Rock outcrop (abundance/runoff):	No bedrock exposed/Slow				
Soil (profile/field texture/soil surface):	Uniform/Sandy clay loam/Firm				
% Cover leaf litter:	5				
% Cover bare ground:	75				
Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	S Shrub	Growth form:		Growth form:	
Height:	1-3m	Height:	0.5-1m	Height:	0.25-0.5m
Crown cover %:	S 10-30	Crown cover %:		Crown cover %:	
Dominant taxa:		Dominant taxa:		Dominant taxa:	
Acacia aneura		Senna sp. Meekatharra		Senna sp. Austin	
Acacia ramulosa var. linophylla					
Acacia pteraneura					
ALL SPECIES					
Acacia aneura					
Acacia ramulosa var. linophylla					
Acacia pteraneura					
Senna sp. Meekatharra					
Senna sp. Austin					
Sclerolaena diacantha					
Ptilotus exaltatus					
Senna artemisioides subsp. helmsii					
Ptilotus schwartzii					
Solanum lasiophyllum					
Thryptomene decussata					
Mycenastrum corium					
Euphorbia boophthona					
Cephalopterum drummondii					
Gunnipopsis divisa (P3)					
Sclerolaena burbridgeae					
Outside					



Project Name: Pleiades, Woolbung Peak and Woolbung South prospects					
Date:	14/11/2021		Botanist:	Eren Reid	
Location (Longitude/Latitude GDA2020):	116.024318	-27.319890	Quadrat:	Q8	
Quadrat size:	20x20 m				
Quadrat marking method:	Fence dropper at each corner. TwoNav Aventura GPS waypoint @ NE corner (±4 m accuracy). Using GDA2020 datum				
Vegetation group:	Q4				
Vegetation condition:	Good				
WP:	49				
Photo number:	41				
Landform:	Flat/Plain				
Land surface/disturbance:	No effective disturbance				
Fire history:	>15 years				
Coarse fragments on the surface (abundance/size/shape):	Very; abundant/Coarse gravelly; large pebbles/Subrounded platy				
Rock outcrop (abundance/runoff):	Slightly rocky/Slow				
Soil (profile/field texture/soil surface):	Uniform/Sandy clay loam/Firm				
% Cover leaf litter:	<5				
% Cover bare ground:	75				
Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	S Shrub	Growth form:	S Shrub	Growth form:	S Shrub
Height:	1-3m	Height:	0.5-1m	Height:	0.25-0.5m
Crown cover %:		Crown cover %:	S 10-30	Crown cover %:	S 10-30
Dominant taxa:		Dominant taxa:		Dominant taxa:	
Acacia ?eremaea		Eremophila oppositifolia subsp. angustifolia		Senna sp. Austin	
Acacia aneura		Acacia kempeana			
ALL SPECIES					
Acacia ?eremaea					
Acacia aneura					
Eremophila oppositifolia subsp. angustifolia					
Acacia kempeana					
Senna sp. Austin					
Maireana triptera					
Sclerolaena diacantha					
Sclerolaena eriantha					
Sclerolaena burbidgeae					
Cephalopterum drummondii					
Gunnipopsis divisa (P3)					
Aristida contorta					
Ptilotus obovatus					
Acacia tetragonophylla					
Eremophila latrobei subsp. latrobei					
Acacia pteraneura					
Outside					
Acacia grasbyi					





Project Name: Pleiades, Woolbung Peak and Woolbung South prospects					
Date:	14/11/2021	Botanist:	Eren Reid		
Location (Longitude/Latitude GDA2020):	116.027368	-27.323985	Quadrat:	Q9	
Quadrat size:	20x20 m				
Quadrat marking method:	Fence dropper at each corner. TwoNav Aventura GPS waypoint @ NE corner (±4 m accuracy). Using GDA2020 datum				
Vegetation group:	Q3				
Vegetation condition:	Good				
WP:	72				
Photo number:	42				
Landform:	Flat/Plain				
Land surface/disturbance:	No effective disturbance				
Fire history:	>15 years				
Coarse fragments on the surface (abundance/size/shape):	Moderately; many/Medium gravelly; medium pebbles/Rounded				
Rock outcrop (abundance/runoff):	No bedrock exposed/Slow				
Soil (profile/field texture/soil surface):	Uniform/Sandy clay loam/Firm				
% Cover leaf litter:	5				
% Cover bare ground:	75				
Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	S Shrub	Growth form:	S Shrub	Growth form:	S Shrub
Height:	3-6m	Height:	1-3m	Height:	0.5-1m
Crown cover %:	V <10	Crown cover %:	S 10-30	Crown cover %:	S 10-30
Dominant taxa:		Dominant taxa:		Dominant taxa:	
Acacia aneura		Thryptomene decussata		Philothea sericea	
Acacia quadrimarginea				Eremophila latrobei subsp. latrobei	
				Hemigenia botryphylla	
ALL SPECIES					
Acacia aneura					
Acacia quadrimarginea					
Thryptomene decussata					
Philothea sericea					
Eremophila latrobei subsp. latrobei					
Hemigenia botryphylla					
Solanum lasiophyllum					
Calocephalus multiflorus					
Acacia pteraneura					
Eremophila glutinosa					
Ptilotus schwartzii					
Aluta aspera subsp. hesperia					
Calytrix desolata					
Sida calyxhymenia					
Goodenia sp. (sterile)					
Aristida contorta					
Eriachne pulchella subsp. pulchella					
Outside					
Acacia pruinocarpa					





Project Name: Pleiades, Woolbung Peak and Woolbung South prospects					
Date:	14/11/2021		Botanist:	Eren Reid	
Location (Longitude/Latitude GDA2020):	116.027057	-27.319247	Quadrat:	Q10	
Quadrat size:	20x20 m				
Quadrat marking method:	Fence dropper at each corner. TwoNav Aventura GPS waypoint @ NE corner (±4 m accuracy). Using GDA2020 datum				
Vegetation group:	Q3				
Vegetation condition:	Good				
WP:	76				
Photo number:	43				
Landform:	Simple slope/Breakaway				
Land surface/disturbance:	No effective disturbance				
Fire history:	>15 years				
Coarse fragments on the surface (abundance/size/shape):	Moderately; many/Medium gravelly; medium pebbles/Angular tabular				
Rock outcrop (abundance/runoff):	Rockland/Rapid				
Soil (profile/field texture/soil surface):	Uniform/Sandy clay loam/Firm				
% Cover leaf litter:	<5				
% Cover bare ground:	80				
Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	S Shrub	Growth form:	S Shrub	Growth form:	S Shrub
Height:	1-3m	Height:	0.5-1m	Height:	0.25-0.5m
Crown cover %:	V <10	Crown cover %:	S 10-30	Crown cover %:	V <10
Dominant taxa:		Dominant taxa:		Dominant taxa:	
Acacia grasbyi		Acacia aulacophylla		Stylidium longibracteatum	
Acacia aneura		Philothea sericea		Micromyrtus sulphurea	
		Eremophila latrobei subsp. latrobei			
		<b>ALL SPECIES</b>			
		Acacia grasbyi			
		Acacia aneura			
		Acacia aulacophylla			
		Philothea sericea			
		Eremophila latrobei subsp. latrobei			
		Stylidium longibracteatum			
		Micromyrtus sulphurea			
		Dodonaea viscosa subsp. spatulata			
		Philothea brucei subsp. brucei			
		Acacia pteraneura			
		Solanum lasiophyllum			
		Calocephalus multiflorus			
		Eriachne pulchella subsp. pulchella			
		Sclerolaena diacantha			
		Aristida contorta			
		Sida calyxymenia			
		Ptilotus obovatus			
		Sida ectogama			
		Austrostipa nitida			
		Mirbelia rhaqodioides			
		Outside			





Project Name: Pleiades, Woolbung Peak and Woolbung South prospects					
Date:	15/11/2021		Botanist:	Eren Reid	
Location (Longitude/Latitude GDA2020):	116.065839	-27.228291	Quadrat:	Q11	
Quadrat size:	20x20 m				
Quadrat marking method:	Fence dropper at each corner. TwoNav Aventura GPS waypoint @ NE corner (±4 m accuracy). Using GDA2020 datum				
Vegetation group:	Q1				
Vegetation condition:	Good/Very Good				
WP:	83				
Photo number:	44				
Landform:	Flat/Plain				
Land surface/disturbance:	No effective disturbance				
Fire history:	>15 years				
Coarse fragments on the surface (abundance/size/shape):	Moderately, many/Medium gravelly; medium pebbles/Subrounded				
Rock outcrop (abundance/runoff):	No bedrock exposed/Slow				
Soil (profile/field texture/soil surface):	Uniform/Sandy clay loam/Firm				
% Cover leaf litter:	5				
% Cover bare ground:	70				
Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	S Shrub	Growth form:	S Shrub	Growth form:	S Shrub
Height:	3-6m	Height:	1-3m	Height:	0.5-1m
Crown cover %:	S 10-30	Crown cover %:	S 10-30	Crown cover %:	V <10
Dominant taxa:		Dominant taxa:		Dominant taxa:	
Acacia aneura		Eremophila galeata		Ptilotus schwartzii	
Acacia ramulosa var. linophylla		Eremophila latrobei subsp. latrobei		Aristida contorta	
ALL SPECIES					
Acacia aneura					
Acacia ramulosa var. linophylla					
Eremophila galeata					
Eremophila latrobei subsp. latrobei					
Ptilotus schwartzii					
Aristida contorta					
Acacia scleroclada					
Psudras suaveolens					
Solanum lasiophyllum					
Acacia craspedocarpa					
Eragrostis eriopoda					
Acacia mulganeura					
Abutilon oxycarpum					
Sida calyxymenia					
Calocephalus multiflorus					
Scleroaena burbidqae					
Eragrostis setifolia					
Ptilotus polystachyus					
Acacia tetragonophylla					
Senna glutinosa subsp. chatelainiana					
Cephalopterum drummondii					
Acacia pteraneura					
Goodenia berardiana					
Outside					





Project Name: Pleiades, Woolbung Peak and Woolbung South prospects					
Date:	15/11/2021	Botanist:	Eren Reid		
Location (Longitude/Latitude GDA2020):	116.065935	-27.229618	Quadrat:	Q12	
Quadrat size:	20x20 m				
Quadrat marking method:	Fence dropper at each corner. TwoNav Aventura GPS waypoint @ NE corner (±4 m accuracy). Using GDA2020 datum				
Vegetation group:	Q2				
Vegetation condition:	Excellent				
WP:	84				
Photo number:	45				
Landform:	Open depression (vale)/Drainage depression				
Land surface/disturbance:	No effective disturbance				
Fire history:	>15 years				
Coarse fragments on the surface (abundance/size/shape):	Slightly; few/Bouldery; or boulders/Subrounded				
Rock outcrop (abundance/runoff):	Slightly rocky/Slow				
Soil (profile/field texture/soil surface):	Uniform/Sandy clay loam/Firm				
% Cover leaf litter:	5				
% Cover bare ground:	70				
Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	S Shrub	Growth form:	S Shrub	Growth form:	S Shrub
Height:	3-6m	Height:	1-3m	Height:	0.5-1m
Crown cover %:	S 10-30	Crown cover %:	S 10-30	Crown cover %:	S 10-30
Dominant taxa:		Dominant taxa:		Dominant taxa:	
Acacia aneura		Acacia tetragonophylla		Sida sp. Golden calyces glabrous	
Acacia cuthbertsonii subsp. cuthbertsonii		Senna artemisioides subsp. helmsii		Indigofera chamaeclada subsp. chamaeclada	
		Acacia ramulosa var. linophylla		Ptilotus schwartzii	
ALL SPECIES					
Acacia aneura					
Acacia cuthbertsonii subsp. cuthbertsonii					
Acacia tetragonophylla					
Senna artemisioides subsp. helmsii					
Acacia ramulosa var. linophylla					
Sida sp. Golden calyces glabrous					
Indigofera chamaeclada subsp. chamaeclada					
Ptilotus schwartzii					
Aristida contorta					
Hakea recurva subsp. arida					
Calandrinia translucens					
Acacia palustris					
Solanum lasiophyllum					
Eriachne pulchella subsp. pulchella					
Sclerolaena burbidgeae					
Ptilotus polystachyus					
Euphorbia boophthona					
Trichodesma zeylanicum var. grandiflorum					
Cephalopterum drummondii					
Pogonolepis muelleriana					
Hibiscus sp. Gardneri					
Heliotropium inexplicitum (Range Extension)					
Phyllanthus erwinii					
Goodenia berardiana					
Acacia scleroclada					
Eremophila platycalyx subsp. Woolgorong					
Ptilotus gaudichaudii					
Erodium cygnorum					
Outside					









Project Name: Pleiades, Woolbung Peak and Woolbung South prospects					
Date:	15/11/2021	Botanist:	Eren Reid		
Location (Longitude/Latitude GDA2020):	116.066069	-27.239859	Quadrat:	Q14	
Quadrat size:	20x20 m				
Quadrat marking method:	Fence dropper at each corner. TwoNav Aventura GPS waypoint @ NE corner (±4 m accuracy). Using GDA2020 datum				
Vegetation group:	Mulga over bit				
Vegetation condition:	Very Good				
WP:	93				
Photo number:	48				
Landform:	Crest/Hill Crest				
Land surface/disturbance:	No effective disturbance				
Fire history:	>15 years				
Coarse fragments on the surface (abundance/size/shape):	Very: abundant/Stony; stones/Subangular tabular				
Rock outcrop (abundance/runoff):	Rockland/Rapid				
Soil (profile/field texture/soil surface):	Uniform/Sandy clay loam/Firm				
% Cover leaf litter:	10				
% Cover bare ground:	70				
Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	S Shrub	Growth form:	S Shrub	Growth form:	S Shrub
Height:	3-6m	Height:	1-3m	Height:	0.5-1m
Crown cover %:	S 10-30	Crown cover %:	S 10-30	Crown cover %:	S 10-30
Dominant taxa:		Dominant taxa:		Dominant taxa:	
Acacia citrinoviridis		Eremophila macmillaniana		Dodonaea viscosa subsp. spatulata	
Acacia pruinocarpa		Thryptomene decussata		Ptilotus obovatus	
		Senna sp. Meekatharra		Eremophila latrobei subsp. latrobei	
ALL SPECIES					
Acacia citrinoviridis					
Acacia pruinocarpa					
Eremophila macmillaniana					
Thryptomene decussata					
Senna sp. Meekatharra					
Dodonaea viscosa subsp. spatulata					
Ptilotus obovatus					
Eremophila latrobei subsp. latrobei					
Aristida contorta					
Eriachne pulchella subsp. pulchella					
Sida sp. Golden calyces glabrous					
Sida sp. dark green fruits					
Sida calyxhymenia					
Solanum lasiophyllum					
Ptilotus polystachyus					
Goodenia berardiana					
Eragrostis setifolia					
Eriachne helmsii					
Acacia tetragonophylla					
Ptilotus schwartzii					
Senna artemisioides subsp. helmsii					
Rhagodia eremaea					
Leichhardtia australis					
Cuscuta planiflora*					
Pogonolepis muelleriana					
Cephalopterum drummondii					
Outside					





Project Name: Pleiades, Woolbung Peak and Woolbung South prospects					
Date:	17/11/2021	Botanist:	Eren Reid		
Location (Longitude/Latitude GDA2020):	116.070009      -27.232090	Quadrat:	Q15		
Quadrat size:	20x20 m				
Quadrat marking method:	Fence dropper at each corner. TwoNav Aventura GPS waypoint @ NE corner (±4 m accuracy). Using GDA2020 datum				
Vegetation group:	Mulga on BIF				
Vegetation condition:	Very Good				
WP:	110				
Photo number:			42		
Landform:			Hillock/Mound		
Land surface/disturbance:			No effective disturbance		
Fire history:			>15 years		
Coarse fragments on the surface (abundance/size/shape):			Extremely; very abundant/Bouldery; or boulders/Subangular		
Rock outcrop (abundance/runoff):			Rockland/Moderately rapid		
Soil (profile/field texture/soil surface):			Uniform/Sandy clay loam/Firm		
% Cover leaf litter:			20		
% Cover bare ground:			70		
Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	S Shrub	Growth form:	S Shrub	Growth form:	S Shrub
Height:	1-3m	Height:	0.5-1m	Height:	0.25-0.5m
Crown cover %:	S 10-30	Crown cover %:	S 10-30	Crown cover %:	S 10-30
Dominant taxa:		Dominant taxa:		Dominant taxa:	
Acacia aneura		Acacia scleroclada		Calytrix desolata	
Acacia cuthbertsonii subsp. cuthbertsonii		Scaevola spinescens		Ptilotus obovatus	
Acacia tetragonophylla		Eremophila macmillianiana		Sida ectogama	
ALL SPECIES					
Acacia aneura					
Acacia cuthbertsonii subsp. cuthbertsonii					
Acacia tetragonophylla					
Acacia scleroclada					
Scaevola spinescens					
Eremophila macmillianiana					
Calytrix desolata					
Ptilotus obovatus					
Sida ectogama					
Goodenia berardiana					
Aristida contorta					
Ptilotus schwartzii					
Eragrostis setifolia					
Ptilotus polystachyus					
Gunnipopsis divisa (P3)					
Sclerolaena eurotioides					
Sclerolaena diacantha					
Acacia kempeana					
Eremophila forrestii subsp. forrestii					
Eriachne pulchella subsp. pulchella					
Monachather paradoxus					
Rhodanthe maryonii					
Solanum lasiophyllum					
Sida calythymeria					
Euphorbia boeghthona					
Cephalopterum drummondii					
Maireana convexa					
Rhagodia eremaea					
Maireana triptera					
Pogonolepis muelleriana					
Maireana thesioides					
Senna glutinosa subsp. chatelainiana					
Outside					





Project Name: Pleiades, Woolbung Peak and Woolbung South prospects					
Date:	17/11/2021	Botanist:	Eren Reid		
Location (Longitude/Latitude GDA2020):	116.069277	-27.234804	Quadrat:	Q16	
Quadrat size:	20x20 m				
Quadrat marking method:	Fence dropper at each corner. TwoNav Aventura GPS waypoint @ NE corner (±4 m accuracy). Using GDA2020 datum				
Vegetation group:	Mulga on BIF				
Vegetation condition:	Very Good				
WP:	112				
Photo number:	53+54				
Landform:	Crest/Hill Crest				
Land surface/disturbance:	No effective disturbance				
Fire history:	>15 years				
Coarse fragments on the surface (abundance/size/shape):	Very; abundant/Cobbly; or cobbles/Subangular				
Rock outcrop (abundance/runoff):	No bedrock exposed/Moderately rapid				
Soil (profile/field texture/soil surface):	Uniform/Sandy clay loam/Firm				
% Cover leaf litter:	10				
% Cover bare ground:	70				
Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	T Tree	Growth form:	S Shrub	Growth form:	S Shrub
Height:	6-12m	Height:	1-3m	Height:	0.5-1m
Crown cover %:	V <10	Crown cover %:	S 10-30	Crown cover %:	S 10-30
Dominant taxa:		Dominant taxa:		Dominant taxa:	
Acacia pruinocarpa		Acacia ramulosa var. linophylla		Solanum lasiophyllum	
		Senna artemisioides subsp. helmsii		Ptilotus obovatus	
				Ptilotus polystachyus	
ALL SPECIES					
Acacia pruinocarpa					
Acacia ramulosa var. linophylla					
Senna artemisioides subsp. helmsii					
Solanum lasiophyllum					
Ptilotus obovatus					
Ptilotus polystachyus					
Goodenia berardiana					
Acacia cuthbertsonii subsp. cuthbertsonii					
Rhagodia eremaea					
Euphorbia boophthona					
Aristida contorta					
Senna glutinosa subsp. chatelainiana					
Sida calyxymenia					
Eriachne pulchella subsp. pulchella					
Gunnipopsis divisa (P3)					
Monachather paradoxus					
Solanum plicatile					
Acacia tetragonophylla					
Outside					
Eremophila macmillaniana					
Acacia quadrimarginea					
Eremophila galeata					
Acacia citrinoviridis					





Project Name: Pleiades, Woolbung Peak and Woolbung South prospects					
Date:	17/11/2021		Botanist:	Eren Reid	
Location (Longitude/Latitude GDA2020):	116.069056	-27.240003	Quadrat:	Q17	
Quadrat size:	20x20 m				
Quadrat marking method:	Fence dropper at each corner. TwoNav Aventura GPS waypoint @ NE corner (±4 m accuracy). Using GDA2020 datum				
Vegetation group:	Mulga over laterite breakaway drainage				
Vegetation condition:	Good				
WP:	114				
Photo number:	55				
Landform:	Open depression (vale)/Drainage depression				
Land surface/disturbance:	No effective disturbance				
Fire history:	>15 years				
Coarse fragments on the surface (abundance/size/shape):	Moderately; many/Coarse gravelly; large pebbles/Subrounded				
Rock outcrop (abundance/runoff):	Slightly rocky/Very rapid				
Soil (profile/field texture/soil surface):	Uniform/Sandy loam/Firm				
% Cover leaf litter:	5				
% Cover bare ground:	75				
Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	S Shrub	Growth form:	S Shrub	Growth form:	S Shrub
Height:	3-6m	Height:	1-3m	Height:	0.5-1m
Crown cover %:	S 10-30	Crown cover %:	S 10-30	Crown cover %:	S 10-30
Dominant taxa:	Eremophila oldfieldii subsp. oldfieldii		Scaevola spinescens		
Acacia aneura	Acacia tetragonophylla		Lepidium pedicellosum (Significant Range Extension)		
Acacia effusifolia			Solanum lasiophyllum		
ALL SPECIES					
Acacia aneura					
Acacia effusifolia					
Eremophila oldfieldii subsp. oldfieldii					
Acacia tetragonophylla					
Scaevola spinescens					
Lepidium pedicellosum (Significant Range Extension)					
Solanum lasiophyllum					
Sclerolaena diacantha					
Goodenia berardiana					
Maireana appressa					
Sclerolaena eurotioides					
Ptilotus obovatus					
Enchylaena tomentosa var. tomentosa					
Austrostipa elegantissima					
Senna artemisioides subsp. helmsii					
Rhagodia eremaea					
Senna sp. Meekatharra					
Acacia kempeana					
Gunnopsis propinqua					
Eriachne pulchella subsp. pulchella					
Aristida contorta					
Enneapogon caeruleascens					
Austrostipa nitida					
Sida ectogama					
Sida calyxymenia					
Acacia umbraculiformis					
Outside					









Project Name: Pleiades, Woolbung Peak and Woolbung South prospects					
Date:	17/11/2021	Botanist:	Eren Reid		
Location (Longitude/Latitude GDA2020):	116.070354	-27.242336	Quadrat:	Q19	
Quadrat size:	20x20 m				
Quadrat marking method:	Fence dropper at each corner. TwoNav Aventura GPS waypoint @ NE corner (±4 m accuracy). Using GDA2020 datum				
Vegetation group:	Mulga on stony plains				
Vegetation condition:	Good				
WP:	122				
Photo number:	58				
Landform:	Flat/Plain				
Land surface/disturbance:	No effective disturbance				
Fire history:	>15 years				
Coarse fragments on the surface (abundance/size/shape):	Very; abundant/Cobbly; or cobbles/Subangular				
Rock outcrop (abundance/runoff):	Very slightly rocky/Slow				
Soil (profile/field texture/soil surface):	Uniform/Sandy clay loam/Firm				
% Cover leaf litter:	5				
% Cover bare ground:	75				
Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	S Shrub	Growth form:	S Shrub	Growth form:	S Shrub
Height:	3-6m	Height:	0.5-1m	Height:	0.25-0.5m
Crown cover %:	V <10	Crown cover %:	V <10	Crown cover %:	S 10-30
Dominant taxa:		Dominant taxa:		Dominant taxa:	
Acacia ?eremaea		Eremophila pterocarpa subsp. pterocarpa		Acacia kempeana	
Acacia victoriae				Acacia scleroclada	
Acacia aneura				Ptilotus obovatus	
ALL SPECIES					
Acacia ?eremaea					
Acacia victoriae					
Acacia aneura					
Eremophila pterocarpa subsp. pterocarpa					
Acacia kempeana					
Acacia scleroclada					
Ptilotus obovatus					
Ptilotus beardii (P3)					
Sclerolaena diacantha					
Acacia tetragonophylla					
Sclerolaena euroides					
Sclerolaena eriacantha					
Scaevola spinescens					
Aristida contorta					
Maireana triptera					
Lepidium pedicellusum (Significant Range Extension)					
Maireana convexa					
Rhagodia eremaea					
Maireana thesioides					
Eriachne pulchella subsp. pulchella					
Eremophila forrestii subsp. forrestii					
Goodenia berardiana					
Maireana planifolia					
Outside					





Project Name: Pleiades, Woolbung Peak and Woolbung South prospects					
Date:	17/11/2021	Botanist:	Eren Reid		
Location (Longitude/Latitude GDA2020):	116.070480	-27.240125	Quadrat:	Q20	
Quadrat size:	20x20 m				
Quadrat marking method:	Fence dropper at each corner. TwoNav Aventura GPS waypoint @ NE corner (±4 m accuracy). Using GDA2020 datum				
Vegetation group:	Q1				
Vegetation condition:	Very Good				
WP:	124				
Photo number:	62				
Landform:	Flat/Plain				
Land surface/disturbance:	No effective disturbance				
Fire history:	>15 years				
Coarse fragments on the surface (abundance/size/shape):	Slightly; few/Stony; stones/Rounded				
Rock outcrop (abundance/runoff):	No bedrock exposed/Slow				
Soil (profile/field texture/soil surface):	Uniform/Sandy clay loam/Firm				
% Cover leaf litter:	15				
% Cover bare ground:	70				
Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	T Tree	Growth form:	S Shrub	Growth form:	S Shrub
Height:	6-12m	Height:	1-3m	Height:	0.5-1m
Crown cover %:	V <10	Crown cover %:	S 10-30	Crown cover %:	S 10-30
Dominant taxa:		Dominant taxa:		Dominant taxa:	
Acacia pruinocarpa		Acacia ramulosa var. linophylla		Senna glutinosa subsp. chatelainiana	
		Acacia aneura		Ptilotus obovatus	
				Sida ectogama	
ALL SPECIES					
Acacia pruinocarpa					
Acacia ramulosa var. linophylla					
Acacia aneura					
Senna glutinosa subsp. chatelainiana					
Ptilotus obovatus					
Sida ectogama					
Goodenia berardiana					
Aristida contorta					
Eriachne pulchella subsp. pulchella					
Ptilotus polystachyus					
Cephalopterum drummondii					
Solanum lasiophyllum					
Sclerolaena eurotioides					
Maireana thesioides					
Sclerolaena densiflora					
Acacia tetragonophylla					
Acacia citrinoviridis					
Maireana convexa					
Sclerolaena diacantha					
Maireana tomentosa					
Rhagodia eremaea					
Maireana triptera					
Enchylaena tomentosa var. tomentosa					
Outside					









Project Name: Pleiades, Woolbung Peak and Woolbung South prospects					
Date:	17/11/2021		Botanist:	Eren Reid	
Location (Longitude/Latitude GDA2020):	116.077966	-27.245330	Quadrat:	Q22	
Quadrat size:	20x20 m				
Quadrat marking method:	Fence dropper at each corner. TwoNav Aventura GPS waypoint @ NE corner (±4 m accuracy). Using GDA2020 datum				
Vegetation group:	Creekline				
Vegetation condition:	Excellent				
WP:	146				
Photo number:	68				
Landform:	Open depression (vale)/Drainage depression				
Land surface/disturbance:	No effective disturbance				
Fire history:	>15 years				
Coarse fragments on the surface (abundance/size/shape):	Moderately; many/Stony; stones/Rounded				
Rock outcrop (abundance/runoff):	No bedrock exposed/Slow				
Soil (profile/field texture/soil surface):	Uniform/Sandy clay loam/Firm				
% Cover leaf litter:	10				
% Cover bare ground:	60				
Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	S Shrub	Growth form:	S Shrub	Growth form:	S Shrub
Height:	3-6m	Height:	1-3m	Height:	0.5-1m
Crown cover %:	S 10-30	Crown cover %:	S 10-30	Crown cover %:	V <10
Dominant taxa:	Eremophila forrestii subsp. forrestii		Dominant taxa:		
Acacia aptaneura	Acacia tetragonophylla		Solanum lasiophyllum		
Acacia aneura	Eremophila galeata		Ptilotus obovatus		
Acacia craspedocarpa	Eremophila galeata				
ALL SPECIES					
Acacia aptaneura					
Acacia aneura					
Acacia craspedocarpa					
Eremophila forrestii subsp. forrestii					
Acacia tetragonophylla					
Eremophila galeata					
Solanum lasiophyllum					
Ptilotus obovatus					
Acacia cuthbertsonii subsp. cuthbertsonii					
Sclerolaena eurotioides					
Siemssenia capillaris					
Panaetia lessonii					
Cephalopterum drummondii					
Ptilotus polystachyus					
Ptilotus exaltatus					
Rhagodia eremaea					
Enchylaena tomentosa var. tomentosa					
Acacia grasbyi					
Goodenia berardiana					
Aristida contorta					
Calandrinia translucens					
Acacia incurvaneura					
Maireana convexa					
Calocephalus multiflorus					
Lepidium oxytrichum					
Erodium cygnorum					
Abutilon otocarpum					
Acacia palustris					
Acacia pteraneura					
Rhodanthe chlorocephala					
Sclerolaena diacantha					
Maireana thesioides					
Acacia ramulosa var. linophylla					
Abutilon oxycarpum					
Outside					







Project Name: Pleiades, Woolbung Peak and Woolbung South prospects					
Date:	29/04/2022		Botanist:	Eren Reid	
Location (Longitude/Latitude GDA2020):	116.02157	-27.309802	Quadrat:	Q24	
Quadrat size:	20x20 m				
Quadrat marking method:	Fence dropper at each corner. TwoNav Aventura GPS waypoint @ NE corner (±4 m accuracy). Using GDA2020 datum				
Vegetation group:	A				
Vegetation condition:	Good/Very Good				
WP:	1				
Photo number:			1		
Landform:	Lower slope/Hillslope				
Land surface/disturbance:	No effective disturbance				
Fire history:	>15 years				
Coarse fragments on the surface (abundance/size/shape):	Moderately; many/Coarse gravelly; large pebbles/Subangular platy				
Rock outcrop (abundance/runoff):	No bedrock exposed/Moderately rapid				
Soil (profile/field texture/soil surface):	Uniform/Sandy clay loam/Firm				
% Cover leaf litter:	15				
% Cover bare ground:	70				
Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	T Tree	Growth form:	S Shrub	Growth form:	S Shrub
Height:	6-12m	Height:	3-6m	Height:	0.25-0.5m
Crown cover %:	V <10	Crown cover %:	S 10-30	Crown cover %:	S 10-30
Dominant taxa:			Dominant taxa:		
Acacia pruinocarpa	Acacia aneura		Hemigenia botryphylla		
	Acacia pteraneura		Thryptomene decussata		
	Acacia ramulosa var. linophylla		Ptilotus schwartzii		
ALL SPECIES					
Acacia pruinocarpa					
Acacia aneura					
Acacia pteraneura					
Acacia ramulosa var. linophylla					
Hemigenia botryphylla					
Thryptomene decussata					
Ptilotus schwartzii					
Eremophila latrobei subsp. latrobei					
Goodenia berardiana					
Eremophila galeata					
Solanum lasiophyllum					
Philotheca sericea					
Acacia tetragonophylla					
Erodium cygnorum					
Sida calyxhymenia					
Euphorbia boophthona					
Euphorbia tannensis subsp. eremophila					
Outside					





Project Name: Pleiades, Woolbung Peak and Woolbung South prospects					
Date:	29/04/2022		Botanist:	Eren Reid	
Location (Longitude/Latitude GDA2020):	116.024098	-27.307402	Quadrat:	Q25	
Quadrat size:	20x20 m				
Quadrat marking method:	Fence dropper at each corner. TwoNav Aventura GPS waypoint @ NE corner (±4 m accuracy). Using GDA2020 datum				
Vegetation group:	Mulga over BIF				
Vegetation condition:	Very Good				
WP:	8				
Photo number:			23, 20		
Landform:	Mid slope/Bench				
Land surface/disturbance:	No effective disturbance				
Fire history:	>15 years				
Coarse fragments on the surface (abundance/size/shape):	Extremely; very abundant/Stony; stones/Subrounded platy				
Rock outcrop (abundance/runoff):	Very rocky/Very rapid				
Soil (profile/field texture/soil surface):	Uniform/Sandy clay loam/Firm				
% Cover leaf litter:	20				
% Cover bare ground:	65				
Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	T Tree	Growth form:	S Shrub	Growth form:	S Shrub
Height:	3-6m	Height:	1-3m	Height:	0.5-1m
Crown cover %:	V <10	Crown cover %:	S 10-30	Crown cover %:	S 10-30
Dominant taxa:		Dominant taxa:		Dominant taxa:	
Acacia pruinocarpa		Acacia ramulosa var. linophylla		Sida sp. Golden calyces glabrous	
Acacia aneura		Acacia tetragonophylla		Eremophila latrobei subsp. latrobei	
		Aluta aspera subsp. hesperia		Ptilotus schwartzii	
ALL SPECIES					
Acacia pruinocarpa					
Acacia aneura					
Acacia ramulosa var. linophylla					
Acacia tetragonophylla					
Aluta aspera subsp. hesperia					
Sida sp. Golden calyces glabrous					
Eremophila latrobei subsp. latrobei					
Ptilotus schwartzii					
Ptilotus obovatus					
Maireana georgei					
Leichhardtia australis					
Erodium cygnorum					
Solanum lasiophyllum					
Cheilanthes sieberi subsp. sieberi					
Euphorbia tannensis subsp. eremophila					
Euphorbia boophthona					
Goodenia berardiana					
Maireana georgei					
Monachather paradoxus					
Outside					





Project Name: Pleiades, Woolbung Peak and Woolbung South prospects					
Date:	29/04/2022		Botanist:	Eren Reid	
Location (Longitude/Latitude GDA2020):	116.02552	-27.306827	Quadrat:	Q26	
Quadrat size:	20x20 m				
Quadrat marking method:	Fence dropper at each corner. TwoNav Aventura GPS waypoint @ NE corner (±4 m accuracy). Using GDA2020 datum				
Mulga over BIF	Mulga over BIF				
Vegetation condition:	Very Good				
WP:	17				
Photo number:			24		
Landform:	Hillock/Mound				
Land surface/disturbance:	No effective disturbance				
Fire history:	>15 years				
Coarse fragments on the surface (abundance/size/shape):	Extremely; very abundant/Stony; stones/Subangular				
Rock outcrop (abundance/runoff):	Very rocky/Rapid				
Soil (profile/field texture/soil surface):	Uniform/Sandy clay loam/Firm				
% Cover leaf litter:	20				
% Cover bare ground:	70				
Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	T Tree	Growth form:	S Shrub	Growth form:	S Shrub
Height:	3-6m	Height:	1-3m	Height:	0.25-0.5m
Crown cover %:	S 10-30	Crown cover %:	S 10-30	Crown cover %:	S 10-30
Dominant taxa:		Dominant taxa:		Dominant taxa:	
Acacia pruinocarpa		Aluta aspera subsp. hesperia		Eremophila latrobei subsp. latrobei	
Acacia aneura				Ptilotus schwartzii	
ALL SPECIES					
Acacia pruinocarpa					
Acacia aneura					
Aluta aspera subsp. hesperia					
Eremophila latrobei subsp. latrobei					
Ptilotus schwartzii					
Euphorbia boophthona					
Euphorbia tannensis subsp. eremophila					
Goodenia berardiana					
Sida calyxhymenia					
Sclerolaena burbridgeae					
Monachather paradoxus					
Cheilanthes sieberi subsp. sieberi					
Calytrix tetragona					
Hibiscus sp. Perrinvale Station (P1)					
Philotheca brucei subsp. brucei					
Outside					



Project Name: Pleiades, Woolbung Peak and Woolbung South prospects					
Date:	29/04/2022		Botanist:	Eren Reid	
Location (Longitude/Latitude GDA2020):	116.0006	-27.313565	Quadrat:	Q27	
Quadrat size:	20x20 m				
Quadrat marking method:	Fence dropper at each corner. TwoNav Aventura GPS waypoint @ NE corner (±4 m accuracy). Using GDA2020 datum				
Vegetation group:	Veg a				
Vegetation condition:	Good/Very Good				
WP:	35				
Photo number:			27		
Landform:	Flat/Plain				
Land surface/disturbance:	No effective disturbance				
Fire history:	>15 years				
Coarse fragments on the surface (abundance/size/shape):	Very; abundant/Medium gravelly; medium pebbles/Rounded				
Rock outcrop (abundance/runoff):	No bedrock exposed/Slow				
Soil (profile/field texture/soil surface):	Uniform/Sandy clay loam/Surface crust				
% Cover leaf litter:	15				
% Cover bare ground:	70				
Tallest stratum		Mid-stratum		Lower stratum	
Growth form:	T Tree	Growth form:	S Shrub	Growth form:	S Shrub
Height:	3-6m	Height:	1-3m	Height:	0.25-0.5m
Crown cover %:	S 10-30	Crown cover %:	S 10-30	Crown cover %:	V <10
Dominant taxa:		Dominant taxa:		Dominant taxa:	
Acacia pruinocarpa		Acacia ramulosa var. linophylla		Ptilotus schwartzii	
Acacia aneura		Senna artemisioides subsp. helmsii		Senna glutinosa subsp. chatelainiana	
		Eremophila glutinosa		Sida ectogama	
ALL SPECIES					
Acacia pruinocarpa					
Acacia aneura					
Acacia ramulosa var. linophylla					
Senna artemisioides subsp. helmsii					
Eremophila glutinosa					
Ptilotus schwartzii					
Senna glutinosa subsp. chatelainiana					
Sida ectogama					
Acacia craspedocarpa					
Sida calyxhymenia					
Solanum lasiophyllum					
Eragrostis eriopoda					
Acacia tetragonophylla					
Leichhardtia australis					
Eremophila forrestii subsp. forrestii					
Acacia incurvaneura					
Eremophila latrobei subsp. latrobei					
Ptilotus obovatus					
Maireana planifolia					
Sida sp. Golden calyces glabrous					
Outside					





**APPENDIX 4: TARGETED PRIORITY FLORA SURVEY REPORT (NVS  
2022B)**



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13<sup>th</sup> October 2022

Dear Belinda,

On the 20<sup>th</sup> of August 2022, Native Vegetation Solutions (NVS) was commissioned by 10M Ltd (10M) to complete a Targeted Threatened Flora survey at their Twin Peaks Project. The purpose of the survey was to target locations of *Hibiscus* sp. Perrinvale Station (P1).

In November 2021 and April 2022, NVS was originally commissioned by 10M to complete a detailed flora and vegetation survey of the Pleiades, Woolbung Peak and Woolbung South prospect (NVS, 2022). The results of the survey revealed *Hibiscus* sp. Perrinvale Station (P1) within the survey area. Unfortunately at the time of the DBCA Database search request (December 2021) this species was not listed in the DBCA Database results, as some of the location records of this species were not incorporated into the database until March 2022.

As a result the detailed survey, several locations of a number of Priority Flora were identified (NVS, 2022), however only a single location of *Hibiscus* sp. Perrinvale Station (P1) was recorded. As this species was not revealed in the DBCA database results, it was not targeted, and the need to complete a target search for this species across the survey areas was acknowledged.

August was determined to be the best time of survey as this was when many of the known records on Florabase stated the time of flowering and seeding. *Hibiscus* sp. Perrinvale Station (P1) is considered a cleistogamous species, meaning the flowers form but never open.



Based on the known Florabase records and observations within the survey area, the preferred habitat of *Hibiscus* sp. Perrinvale Station (P1) appears to be within the rocky Banded Ironstone Formation (BIF) outcrops and the gently inclined footslopes below the BIF. For this reason the Woolbung South Survey area was not targeted during this survey due to the lack of preferred habitat.

Therefore preferred habitats were focused within the Woolbung Peak prospect and Pleiades prospect survey areas, as well as the known Florabase locations, namely the below listed Sheet Numbers:

- PERTH 08583773;
- PERTH 08583781;
- PERTH 08583803; and
- PERTH 08583811

Results of the targeted survey in August 2022 revealed 15 locations of *Hibiscus* sp. Perrinvale Station (P1) within the survey area totalling 48 plants. An additional 11 locations of *Hibiscus* sp. Perrinvale Station (P1) were recorded outside of the survey area totalling 74 plants.

In addition to the above, NVS also recorded one population of *Acacia* sp. Muggon Station (P2) outside of the survey area, totalling 21 plants.

In April 2022, one location of one plant of *Hibiscus* sp. Perrinvale Station (P1) was recorded in the Woolbung Peak Prospect, however when this location was re-visited in August 2022, the site had been disturbed by exploration activities and rehabilitation efforts. The remainder of the preferred habitat within the Woolbung Peak prospect was surveyed in August 2022, however no other locations of *Hibiscus* sp. Perrinvale Station (P1) were recorded in the Woolbung Peak Prospect survey area.

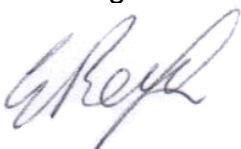
GPS locations and abundance of Priority Flora recorded during this survey are included below in Appendix 2.

The final disturbance footprint is not yet finalised; hence an impact assessment of clearing has not been completed at this stage.

It is recommended that any future clearing be planned to avoid the locations of Priority Flora identified in this survey where possible to minimise the impact to each species.

If you have any queries regarding this work completed, please do not hesitate to contact me on the above-mentioned contact details.

Kind Regards



**Eren Reid**  
Director/Botanist

**References:**

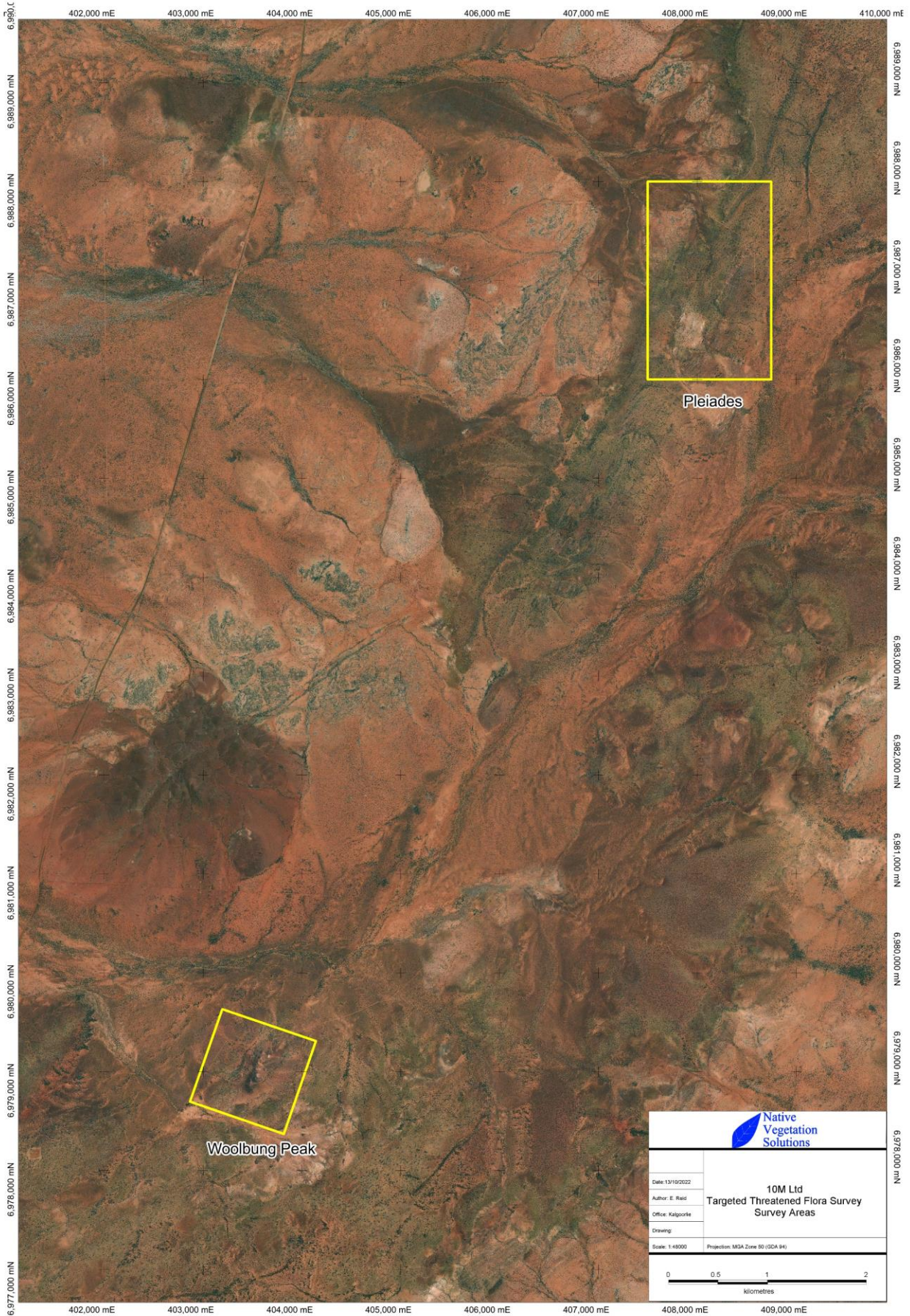
NVS, (2022), Detailed Flora and Vegetation Survey of the Pleiades, Woolbung Peak and Woolbung South Prospects- April 2022, Unpublished Report Prepared for 10M Pty Ltd

## Appendix 1: Maps

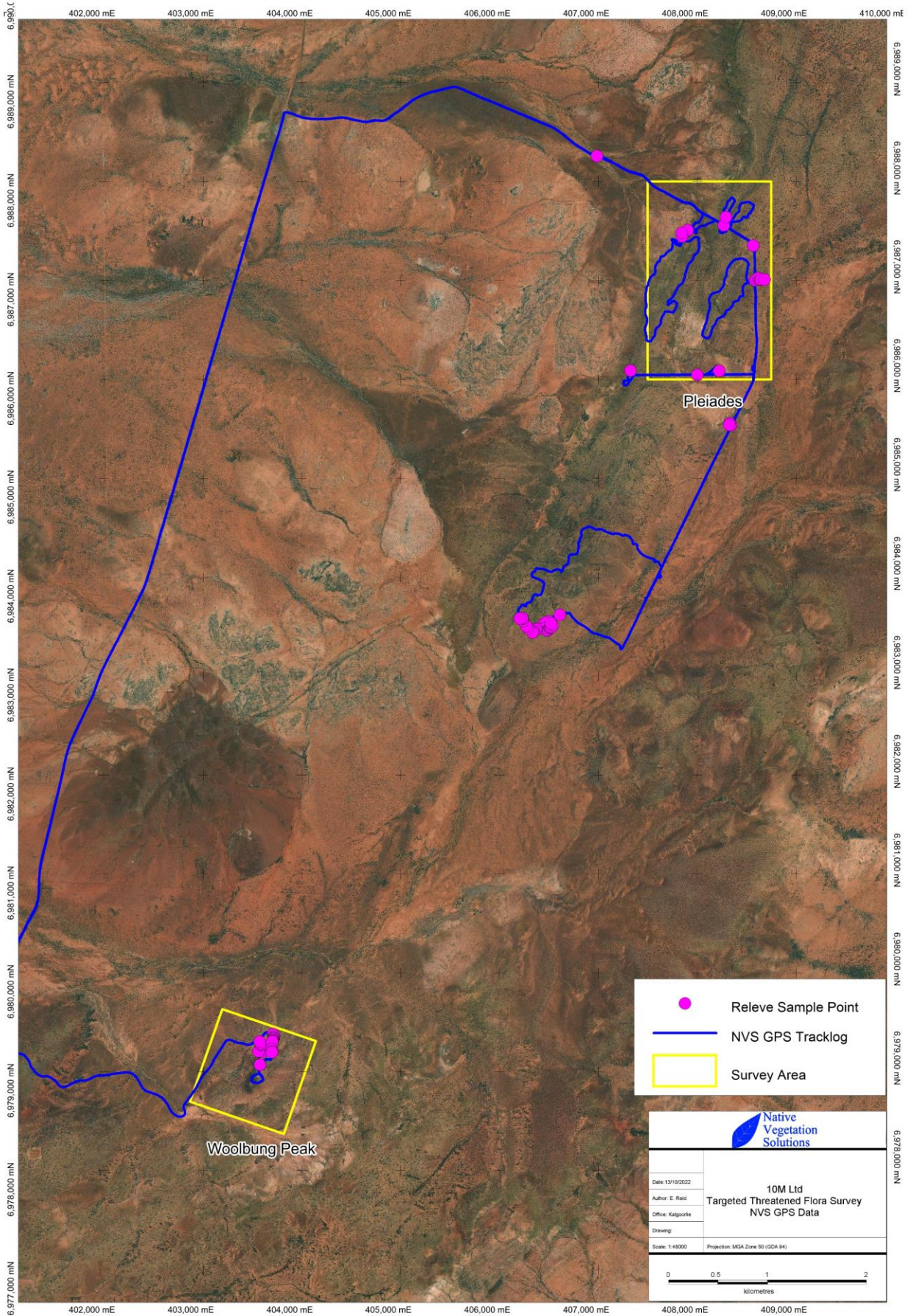




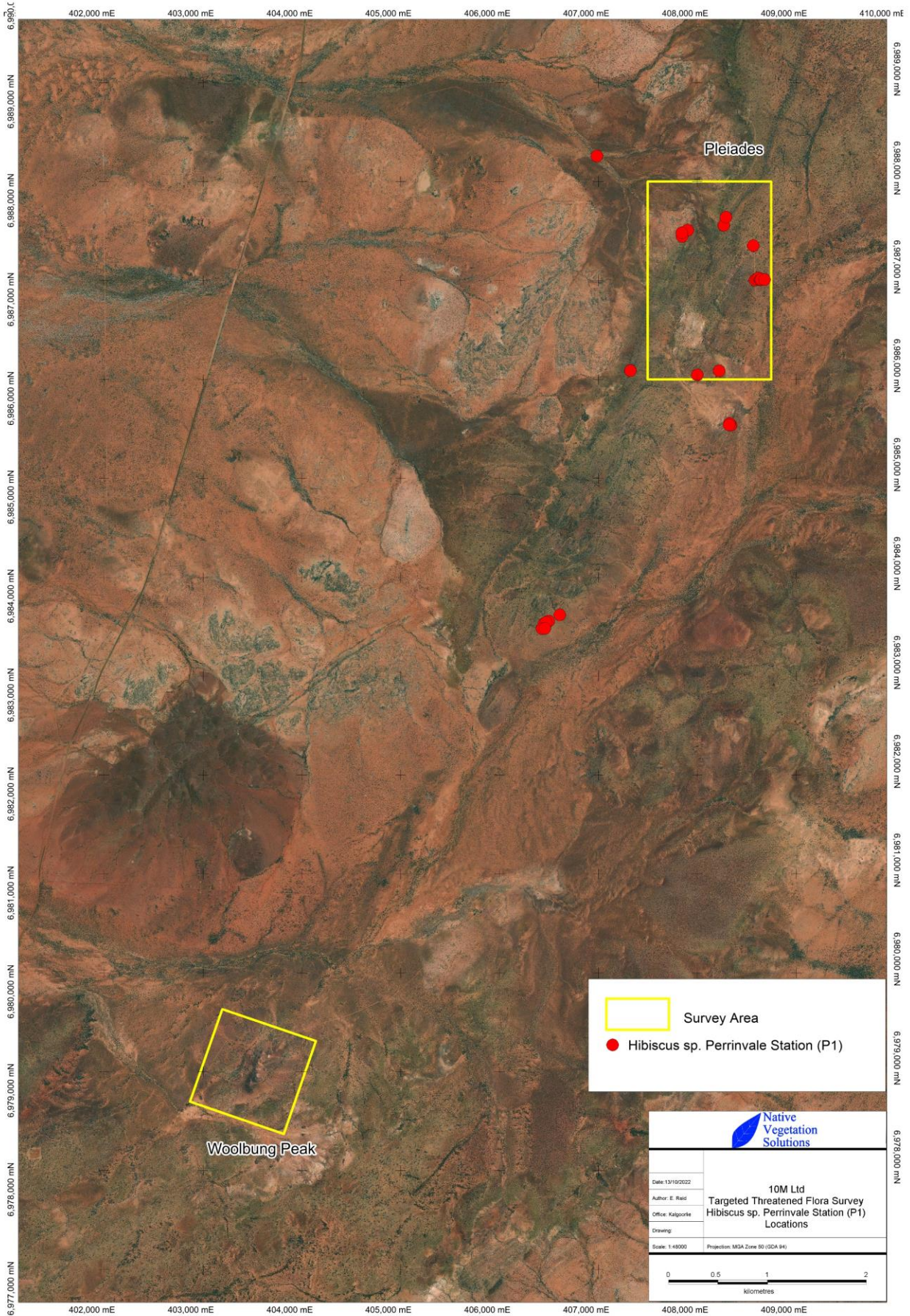














Survey Area  
● Hibiscus sp. Perrinvale Station (P1)

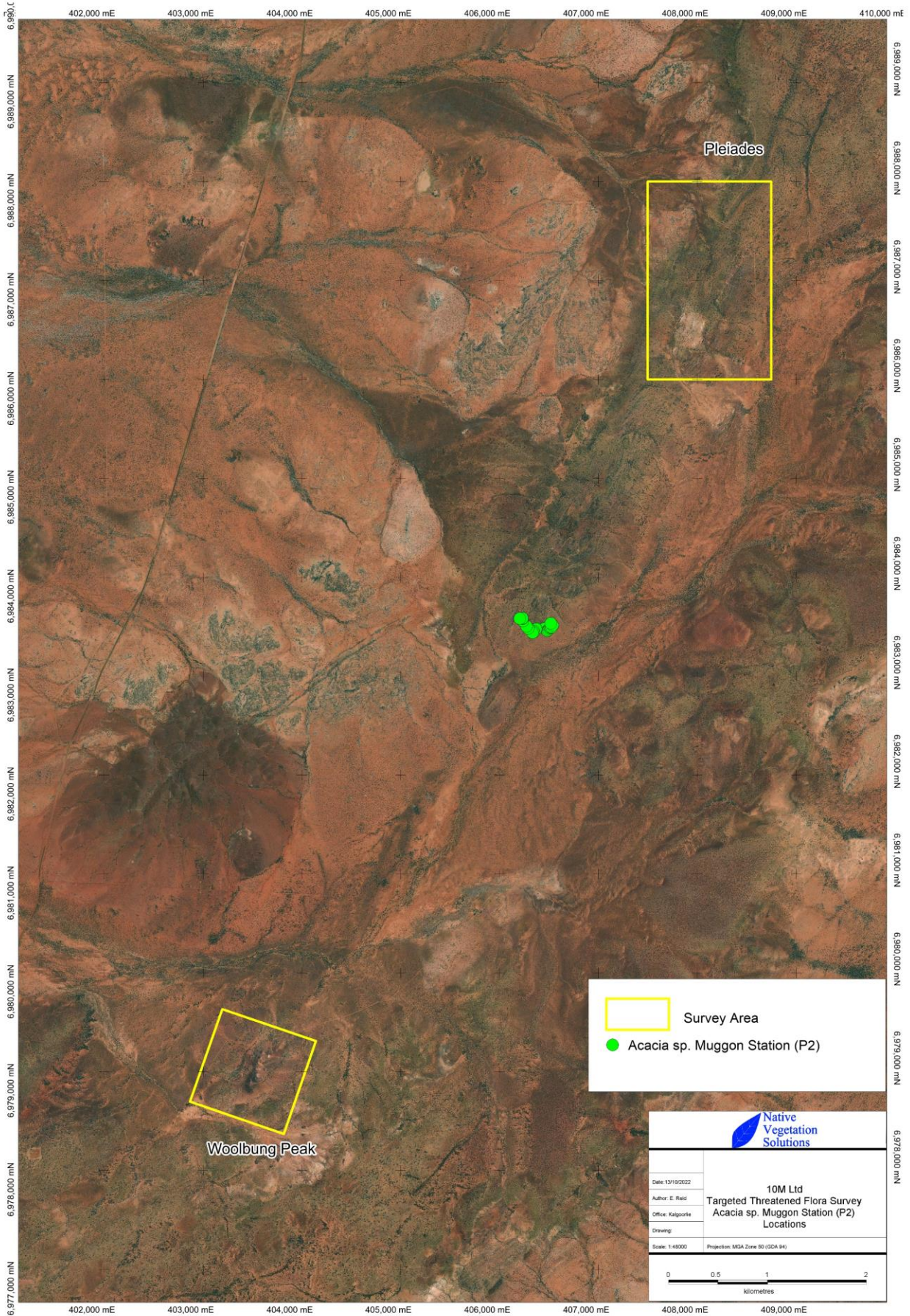
  
**Native  
Vegetation  
Solutions**

Date: 13/10/2022	<b>10M Ltd Targeted Threatened Flora Survey Hibiscus sp. Perrinvale Station (P1) Locations</b>
Author: E. Reid	
Office: Kalgoorlie	
Drawing:	
Scale: 1:40000	Projection: MGA Zone 50 (GDA 94)



0    0.5    1    2  
kilometres





## **Appendix 2: Priority Flora Locations**



TAXONNAME	SITENAME	ABUNDANCE	HERBREF	WACONSTAT	DATEOBS	LONGITUDE	LATITUDE	Observed within survey area	Observed outside survey area
<i>Hibiscus</i> sp. Perrinvale Station	wpt025	3	PERTH 08583781	P1	20/08/2022	116.072984	-27.244994	*	
<i>Hibiscus</i> sp. Perrinvale Station	wpt027	2	PERTH 08583781	P1	20/08/2022	116.070737	-27.245342	*	
<i>Hibiscus</i> sp. Perrinvale Station	wpt057	10		P1	20/08/2022	116.076698	-27.236734	*	
<i>Hibiscus</i> sp. Perrinvale Station	wpt058	1		P1	20/08/2022	116.076880	-27.236619	*	
<i>Hibiscus</i> sp. Perrinvale Station	wpt059	1		P1	20/08/2022	116.077075	-27.236540	*	
<i>Hibiscus</i> sp. Perrinvale Station	wpt060	1		P1	20/08/2022	116.077217	-27.236707	*	
<i>Hibiscus</i> sp. Perrinvale Station	wpt061	10		P1	20/08/2022	116.077268	-27.236720	*	
<i>Hibiscus</i> sp. Perrinvale Station	wpt062	3		P1	20/08/2022	116.077335	-27.236640	*	
<i>Hibiscus</i> sp. Perrinvale Station	wpt063	1		P1	20/08/2022	116.077673	-27.236705	*	
<i>Hibiscus</i> sp. Perrinvale Station	wpt064	5		P1	20/08/2022	116.076542	-27.233580	*	
<i>Hibiscus</i> sp. Perrinvale Station	wpt065	3		P1	20/08/2022	116.073553	-27.231700	*	
<i>Hibiscus</i> sp. Perrinvale Station	wpt066	2	PERTH 08583803	P1	20/08/2022	116.069847	-27.232135	*	
<i>Hibiscus</i> sp. Perrinvale Station	wpt067	3	PERTH 08583803	P1	20/08/2022	116.069280	-27.232685	*	
<i>Hibiscus</i> sp. Perrinvale Station	wpt068	2	PERTH 08583803	P1	20/08/2022	116.069258	-27.232370	*	
<i>Hibiscus</i> sp. Perrinvale Station	wpt069	1		P1	20/08/2022	116.073775	-27.230964	*	
<i>Hibiscus</i> sp. Perrinvale Station	wpt026	12	PERTH 08583773	P1	20/08/2022	116.063922	-27.244907		*
<i>Hibiscus</i> sp. Perrinvale Station	wpt028	20		P1	20/08/2022	116.074157	-27.249960		*
<i>Hibiscus</i> sp. Perrinvale Station	wpt029	10		P1	20/08/2022	116.074012	-27.249804		*
<i>Hibiscus</i> sp. Perrinvale Station	wpt030	10		P1	20/08/2022	116.073947	-27.249925		*
<i>Hibiscus</i> sp. Perrinvale Station	wpt031	10		P1	20/08/2022	116.056492	-27.267144		*
<i>Hibiscus</i> sp. Perrinvale Station	wpt032	1		P1	20/08/2022	116.055372	-27.267720		*
<i>Hibiscus</i> sp. Perrinvale Station	wpt033	1		P1	20/08/2022	116.054900	-27.267939		*
<i>Hibiscus</i> sp. Perrinvale Station	wpt034	1		P1	20/08/2022	116.055123	-27.267812		*
<i>Hibiscus</i> sp. Perrinvale Station	wpt035	1		P1	20/08/2022	116.054672	-27.268392		*
<i>Hibiscus</i> sp. Perrinvale Station	wpt036	3		P1	20/08/2022	116.054975	-27.268377		*
<i>Acacia</i> sp. Muggon Station	wpt036	1		P2	20/08/2022	116.054975	-27.268377		*
<i>Acacia</i> sp. Muggon Station	wpt037	1		P2	20/08/2022	116.055233	-27.268595		*
<i>Acacia</i> sp. Muggon Station	wpt038	1		P2	20/08/2022	116.055330	-27.268510		*
<i>Acacia</i> sp. Muggon Station	wpt039	1		P2	20/08/2022	116.055443	-27.268372		*
<i>Acacia</i> sp. Muggon Station	wpt040	1		P2	20/08/2022	116.055502	-27.268319		*
<i>Acacia</i> sp. Muggon Station	wpt041	1		P2	20/08/2022	116.055557	-27.268295		*
<i>Acacia</i> sp. Muggon Station	wpt042	1		P2	20/08/2022	116.055655	-27.268269		*
<i>Acacia</i> sp. Muggon Station	wpt043	1		P2	20/08/2022	116.055662	-27.268274		*
<i>Acacia</i> sp. Muggon Station	wpt044	1		P2	20/08/2022	116.055765	-27.268099		*
<i>Acacia</i> sp. Muggon Station	wpt045	1		P2	20/08/2022	116.055572	-27.267920		*
<i>Acacia</i> sp. Muggon Station	wpt046	1		P2	20/08/2022	116.054088	-27.268387		*
<i>Acacia</i> sp. Muggon Station	wpt047	1		P2	20/08/2022	116.054052	-27.268430		*
<i>Acacia</i> sp. Muggon Station	wpt048	1		P2	20/08/2022	116.053837	-27.268602		*
<i>Acacia</i> sp. Muggon Station	wpt049	1		P2	20/08/2022	116.053805	-27.268717		*
<i>Acacia</i> sp. Muggon Station	wpt050	1		P2	20/08/2022	116.053708	-27.268755		*
<i>Acacia</i> sp. Muggon Station	wpt051	1		P2	20/08/2022	116.053270	-27.268365		*
<i>Acacia</i> sp. Muggon Station	wpt052	1		P2	20/08/2022	116.053095	-27.268155		*
<i>Acacia</i> sp. Muggon Station	wpt053	1		P2	20/08/2022	116.052717	-27.267674		*
<i>Acacia</i> sp. Muggon Station	wpt054	1		P2	20/08/2022	116.052703	-27.267457		*
<i>Acacia</i> sp. Muggon Station	wpt055	1		P2	20/08/2022	116.052680	-27.267442		*
<i>Acacia</i> sp. Muggon Station	wpt056	1		P2	20/08/2022	116.052407	-27.267447		*
<i>Hibiscus</i> sp. Perrinvale Station	wpt070	5		P1	20/08/2022	116.060660	-27.225304		*

## **APPENDIX 5: MALLEEFOWL ASSESSMENT – WOOLBUNG PEAK**



04 October 2021

## **Malleefowl Assessment – Woolbung Peak**

To: Belinda Clark – Director & Manager – Approvals (on behalf of 10M Pty Ltd)

Company: Clark Lindbeck & Associates

Email: [belinda@clarklindbeck.com.au](mailto:belinda@clarklindbeck.com.au)

Western Ecological Reference: Clark Lindbeck & Associates 05

# **1. Introduction**

## **1.1 Background**

Western Ecological (WE) was commissioned by 10M Pty Ltd (10M) to undertake a Malleefowl (*Leipoa ocellata*) assessment at Woolbung Peak. The area to be assessed is approximately 12 ha (survey area) and about 215 km north east of Geraldton (Figure 1). The Malleefowl assessment will be used to support a programme of works (PoW) and excess tonnage submission to remove ore. The Malleefowl is a threatened species that is listed as Vulnerable under the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the *Western Australian Biodiversity Conservation Act 2016* (BC Act).

## **1.2 Objectives and Scope**

The scope of work (SoW) to be undertaken was as follows:

- Targeted searches and a habitat assessment for the Malleefowl in the survey area
- Document the above in a short letter report.

## **1.3 Legislative context**

Fauna in Western Australia is protected formally and informally by various legislative and non-legislative measures, which are as follows:

- *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) – Commonwealth Government*
- *Environmental Protection Act 1986 (EP Act) – WA State Government*
- *Biodiversity Conservation Act 2016 (BC Act) – WA State Government.*

Non-legislative measures:

- WA Department of Biodiversity, Conservation and Attractions (DBCA) Priority lists for flora, ecological communities and fauna.

A short description of each is given below. Other definitions, including species conservation categories, are provided in Appendix 1.

### **EPBC Act**

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) aims to protect matters of national environmental significance, which are detailed in Appendix 1. Under the EPBC Act, the Commonwealth Department of Agriculture, Water and the Environment (DAWE) lists protected species and Threatened Ecological Communities (TECs) by criteria set out in the Act. Species are conservation significant if they are listed as Threatened (i.e., Critically Endangered, Endangered and Vulnerable) or Migratory.





Bird species protected as Migratory under the EPBC Act include those listed under international migratory bird agreements relating to the protection of birds, which migrate between Australia and other countries, for which Australia has agreed. This includes the Japan-Australia Migratory Bird Agreement (JAMBA), the China-Australia Migratory Bird Agreement (CAMBA), the Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA) and the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention).

Some marine fauna or terrestrial fauna that use marine habitats are listed as Marine under the EPBC Act. These species are only considered conservation significant when a proposed development occurs in a Commonwealth marine area (i.e., any Commonwealth Waters or Commonwealth Marine Protected Area). Outside of such areas, the EPBC Act does not consider these species to be matters of national environmental significance, so are not protected under the Act.

### **BC Act**

The *Biodiversity Conservation Act 2016* (BC Act) replaced both the *Wildlife Conservation Act 1950* and the *Sandalwood Act 1929* and came into effect on 1 January 2019. The aim of the new Act is to conserve and protect biodiversity and to promote the ecologically sustainable use of biodiversity components in the State, and will bring more activities within the scope of biodiversity laws.

Taxa listed as Threatened in the category of critically endangered, endangered or vulnerable under section 19(1a, 1b, and 1c), or is a rediscovered species to be regarded as threatened species under section 26(2) of the BC Act. Other categories include extinct or extinct in the wild and they are listed under section 23 (1) of the BC Act (Appendix 1).

If species meet 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, they are covered under section 13(1) of the BC Act and are called specially protected species. Species that are listed as threatened species (critically endangered, endangered or vulnerable) or extinct species under the BC Act can't also be listed as Specially Protected species (see Appendix 1 for a more detailed description of each threat category).

Threatened Ecological Communities (TECs) are also covered under the BC Act and are placed into three categories of critically endangered, endangered or vulnerable under section 27(1a, 1b, and 1c) of the BC Act depending on their threat status.

### **DBCA Priority Species and Communities**

DBCA lists species that are possibly threatened but that do not meet criteria for listing under the BC Act, or are otherwise data deficient, and adds them 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. Consideration 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 (see Appendix 1 for more detail of the priority codes).

The DBCA also has a list of Priority Ecological Communities (PECs) that have scant information available to be considered a TEC, or which are rare but not currently threatened. Ecological communities that do not meet survey criteria or that are not sufficiently defined are added to the PEC list 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 a TEC. 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.



### Informal Recognition of Threatened Fauna

Certain populations or communities of fauna may be of local significance or interest because of their patterns of distribution and abundance. For example, fauna may be locally significant because they are range extensions to the previously known distribution or are newly discovered species (and have the potential to be of conservation significance). In addition, many species are in decline as a result of threatening processes (land clearing, grazing, and changed fire regimes) and relict populations of such species assume local importance for DBCA. It is not uncommon for DBCA to make comment on these species of interest.

## 2. Methods

### 2.1 Survey Guidance

The Malleefowl assessment was completed in accordance with the following EPA and DAWE requirements for the environmental surveying and reporting of fauna surveys in WA, where relevant and practical, and as documented in:

- EPA Technical Guidance: Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment (EPA 2020)
- Survey Guidelines for Australia's Threatened Birds. EPBC Act survey guidelines 6.2(2010) (DSEWPaC)
- National Recovery Plan for Malleefowl *Leipoa ocellata* Department for Environment and Heritage (J. Benshemesh 2007).

### 2.2 Database Search

Searches of the DBCA threatened fauna database, NatureMap, and the EPBC Protected Matters Search Tool (PMST) were undertaken to identify if there were records of the Malleefowl (and other species for potential future assessments) in and or near the survey area in the past (DBCA 2021a, DBCA 2021b, DAWE 2021) (Appendix 2). The DBCA threatened fauna search was centred on coordinates 27° 18' 32" S and 116° 01' 30" E. Originally a radial search area of 40 km was submitted to DBCA for the threatened fauna database, however, a larger buffer of 80 km was applied by DBCA in order to select a greater number of records that adequately demonstrate the potential for this species and others to occur in the search area. NatureMap and PMST database searches were centred on the same (or very similar coordinates) but with a 40 km radial search area for NatureMap (maximum search area) and 80 km for the PMST so that it aligned with the DBCA search.

### 2.3 Field Assessment

The field assessment was undertaken on the 24<sup>th</sup> September 2021 by two qualified and experienced Zoologists (Dr Ron Firth and Laura Stevens).

#### Malleefowl Assessment

Prior to the field assessment, the original intent was to walk a series of systematic transects across the survey area looking for Malleefowl and their signs (i.e., nesting mounds and or tracks) if suitable Malleefowl habitat was deemed present. However, when the survey area was visited it was considered unsuitable for Malleefowl (see Results and Discussion sections below). As a consequence, a number of photo points were taken in the survey area and just outside of it (approximately 100 m from the survey area boundary) to broadly illustrate the habitats present (these areas were visited on foot).



## 3. Results

### 3.1 Database Results

The DBCA threatened fauna database search returned two records of the Malleefowl (Figure 2). The earliest record was from 1927 (approximately 75 km south west of the survey area), with the locality given as Nerramyne along the Rabbit Proof Fence, halfway between Yalgoo and Anjana (Figure 2 and Appendix 2). The certainty of the record is described as moderately certain and its accuracy is given as 50 km (50,000 m). The second record and closest to the survey area (approximately 12.5 km north west of the survey area) comes from 2015, with the locality given as the Shire of Mullewa, 80 km north of Pindar in a native pine area (Figure 2 and Appendix 2). The certainty of this record is described as very certain and its accuracy is given as 1 km (1,000 m).

There were no records of the Malleefowl in the NatureMap search despite the second record above being well within the 40 km radial search area that was undertaken of this database (Appendix 2). The Malleefowl was present in the PMST (Appendix 2). It is important to note that the PMST is not entirely based on point records, but also on broader information, including bioclimatic distribution models, whereas the DBCA threatened fauna database and NatureMap are based on point records. Consequently, the results of the PMST are in some cases less accurate, particularly at a local scale. As a result, the PMST can include species that do not occur in the survey area because, for example, there is no habitat available or they are now known to be locally extinct. In addition, fauna is not distributed evenly across the landscape, are more abundant in some places than others, and consequently more detectable (Currie 2007).

### 3.2 Field Assessment

#### Malleefowl Assessment

As already mentioned in the methods section above the habitats in the survey area were unsuitable for Malleefowl. This was further confirmed by the absence of Malleefowl and their signs such as nesting mounds and tracks.

While traversing the survey area on foot we documented the habitat and its lack of suitability for the Malleefowl within the survey area, and directly adjacent to the survey area by taking a number of photos at eight points (Figure 3). The survey area consisted broadly of very open Mulga Shrubland on a very rocky (outcrops) to a rocky substrate on relatively gentle slopes (see plates one to eight below).



Plate 1. Photo Point 1.



Plate 2. Photo Point 2.



Plate 3. Photo Point 3.



Plate 4. Photo Point 4.





Plate 5. Photo Point 5.



Plate 6. Photo Point 6.





Plate 7. Photo Point 7.



Plate 8. Photo Point 8.



## 4. Discussion

During the assessment of the survey area no Malleefowl were sighted, nor were their mounds or tracks. The DBCA threatened fauna database search returned just two records of the Malleefowl within an 80 km radial search area and the closest record to the survey area was approximately 12.5 km north west.

The habitats present in the survey area are unsuitable because they are too rocky and open and have very little to no vegetation cover in the upper storey for Malleefowl to build their mounds. Malleefowl prefer habitat with a dense canopy and an open ground layer in which they can construct their mounds (Benshemesh 2007). Benshemesh (1992) also found that dense canopy cover was the most important feature associated with high breeding densities at sites in Victoria. There are also very few to no shrub species in the midstorey habitats of the survey area which might provide a food source. Studies have also shown that a wide range of food shrubs, rather than an abundance of any one species is probably important for Malleefowl during for example droughts (Harlen & Priddel 1996). This is supported by studies showing that Malleefowl are more abundant in areas where shrubs are more diverse (Woinarski 1989). These birds also have a relatively large home range that can be up to 4 km<sup>2</sup> in low rainfall areas (Booth 1987).

This current assessment has demonstrated that there is an absence of suitable habitat in the survey area and close by for Malleefowl to construct their mounds, or to forage in, therefore the likelihood of Malleefowl occurring in the survey area is considered highly unlikely.





## 5. References

- Benshemesh, J. (1992). The conservation ecology of Malleefowl, with particular regard to fire. Pages 1-224. Monash University, Clayton.
- Benshemesh, J. (2007). National Recovery Plan for Malleefowl. Department for Environment and Heritage, South Australia.
- Booth, D. T. (1987). Home range and hatching success of Malleefowl, *Leipoa ocellata* Gould (Megapodiidae), in Murray mallee near Renmark, S.A. Australian Wildlife Research 14, 95-104.
- Currie, D. J. (2007). Disentangling the roles of environment and space in ecology. Journal of Biogeography 34, 2009-2011.
- Department of Biodiversity, Conservation and Attractions (DBCA) (2021a). Threatened and Priority Fauna Information (custom search).
- Department of Biodiversity, Conservation and Attractions (DBCA) (2021b). NatureMap: Mapping Western Australia's Biodiversity. Retrieved from <https://naturemap.dbca.wa.gov.au>
- Department of Agriculture, Water and the Environment (DAWE) (2021). Protected Matters Search Tool, Accessed from <http://www.environment.gov.au/epbc/pmst/index.html> Commonwealth of Australia.
- Harlen, R., & D. Priddel. (1996). Potential food resources available to malleefowl *Leipoa ocellata* in marginal mallee lands during drought. Australian Journal of Ecology 21, 418-428.
- Woinarski, J. C. Z. (1989). The vertebrate fauna of Broombush *Melaleuca uncinata* vegetation in north-western Victoria, with reference to effects of broombush harvesting. Australian Wildlife Research 16, 217-238.

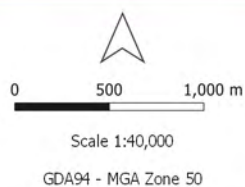


## Figures





Figure 1: Project Location



Legend  
 Survey Area





350000

420000

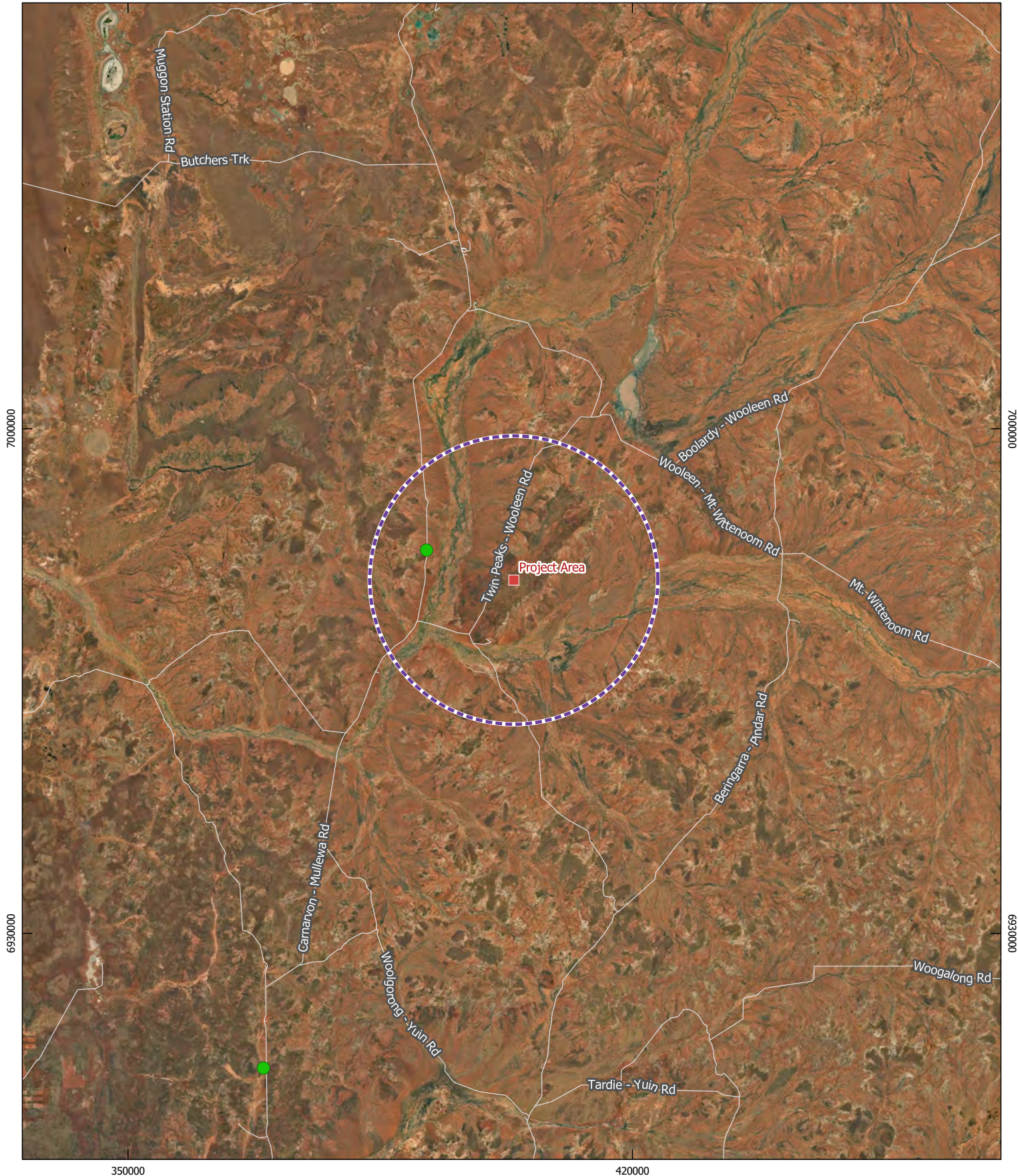
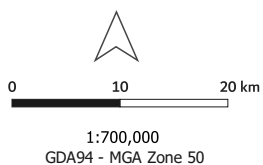


Figure 2: Malleefowl Database Records



Legend

- DBCA Malleefowl Record
- Project Area
- 20km Buffer



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403500

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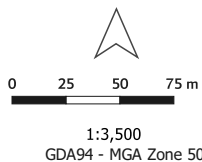
6978900

403500




403800



Figure 3: Photo Points and Tracks



Legend

-  Photo Points
-  Tracks
-  Survey Area



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## ***Appendix 1: Conservation Categories***





# 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).



### Categories of Threatened Fauna Species under the EPBC Act

Conservation Code	Description
Ex	Extinct Taxa which at a particular time if, at the time, there is no reasonable doubt that the last member of the species has died.
ExW	Extinct in the Wild Taxa which are known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or it has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.
CE	Critically Endangered Taxa which at a particular time, it is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.
En	Endangered Taxa which is not critically endangered and it is facing a very high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.
Vu	Vulnerable Taxa which is not critically endangered or endangered and is facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.

Source: Environment Protection and Biodiversity Conservation Act 1999.





## ***Appendix 2: Database Search Results***

SCI_NAME	COM_NAME	CLASS	WA_LISTING	WA_status	EPBStatus	Date	DAY	MONTH	YEAR	SOURCE_ID	SOURCE	CERTAINTY	OBS_METHOD	OBS_TYPE	COUNT	LOCALITY	SITE	ACCURACY_M	LONG_GDA	LAT_GDA	NAME_ID	FAMILY	GENUS	SPECIES	SUBSPECIES	KINGDOM
Tringa stagnatilis	Marsh sandpiper, little greenshank	BIRD	Specially Protected - m MI	MI		29/09/2012	29	9	2012	1265918 159	BIRDATA				0	Billabalong Station-f	Billabalong Station-f	0	115.823100000000	-27.470800000000	24809	Scolopacidae	Tringa	stagnatilis		Animalia
Falco peregrinus	Peregrine falcon	BIRD	Specially Protected - ot OS	MI		7/10/2012	7	10	2012	1280914 237	BIRDATA				0	Muggon Stn-Bungar	Muggon Stn-Bungar	0	115.774700000000	-27.525800000000	25624	Falconidae	Falco	peregrinus		Animalia
Tringa nebularia	Common greenshank, greenshank	BIRD	Specially Protected - m MI	MI		9/07/2012	9	7	2012	1300194 158	BIRDATA				100	Mungawalagudi Cla	Mungawalagudi Cla	100	115.447800000000	-26.830000000000	24808	Scolopacidae	Tringa	nebularia		Animalia
Plegadis falcinellus	Glossy ibis	BIRD	Specially Protected - m MI	MI		8/10/2013	8	10	2013	1312166 178	BIRDATA				0	Meeberrie st. The cr	Meeberrie st. The cr	0	116.043100000000	-26.989200000000	24843	Threskiornithidae	Plegadis	falcinellus		Animalia
Falco peregrinus	Peregrine falcon	BIRD	Specially Protected - ot OS	MI		2/09/2015	2	9	2015	1328376 237	BIRDATA				0	Murchison Settlement	Murchison Settlement	0	115.958900000000	-26.894700000000	25624	Falconidae	Falco	peregrinus		Animalia
Tringa nebularia	Common greenshank, greenshank	BIRD	Specially Protected - m MI	MI		22/08/2016	22	8	2016	1377116 158	BIRDATA				0	Murchison R Twin P	Murchison R Twin P	0	115.902200000000	-27.360800000000	24808	Scolopacidae	Tringa	nebularia		Animalia
Tringa nebularia	Common greenshank, greenshank	BIRD	Specially Protected - m MI	MI		22/08/2016	22	8	2016	1817754 158	BIRDATA				0	Murchison River, Tv	Murchison River, Tv	0	115.897100000000	-27.360000000000	24808	Scolopacidae	Tringa	nebularia		Animalia
Gelochelidon nilotica	Gull-billed tern	BIRD	Specially Protected - m MI	MI		5/10/1980	5	10	1980	107497 111	BIRDATLAS1				0			108000	116.501400000000	-27.498700000000	47954	Sturnidae	Gelochelidon	nilotica		Animalia
Gelochelidon nilotica	Gull-billed tern	BIRD	Specially Protected - m MI	MI		28/09/1980	28	9	1980	107498 111	BIRDATLAS1				0			18000	116.084700000000	-27.082100000000	47954	Sturnidae	Gelochelidon	nilotica		Animalia
Plegadis falcinellus	Glossy ibis	BIRD	Specially Protected - m MI	MI		28/09/1980	28	9	1980	107498 178	BIRDATLAS1				0	MURCHISON	MURCHISON	18000	116.084700000000	-27.082100000000	24843	Threskiornithidae	Plegadis	falcinellus		Animalia
Gelochelidon nilotica	Gull-billed tern	BIRD	Specially Protected - m MI	MI		9/09/1981	9	9	1981	141531 111	BIRDATLAS1				0			18000	116.084700000000	-27.082100000000	47954	Sturnidae	Gelochelidon	nilotica		Animalia
Tringa nebularia	Common greenshank, greenshank	BIRD	Specially Protected - m MI	MI		9/09/1981	9	9	1981	141531 158	BIRDATLAS1				0	MURCHISON	MURCHISON	18000	116.084700000000	-27.082100000000	24808	Scolopacidae	Tringa	nebularia		Animalia
Gelochelidon nilotica	Gull-billed tern	BIRD	Specially Protected - m MI	MI		5/09/1978	5	9	1978	44129 111	BIRDATLAS1				0			18000	116.251400000000	-27.082100000000	47954	Sturnidae	Gelochelidon	nilotica		Animalia
Gelochelidon nilotica	Gull-billed tern	BIRD	Specially Protected - m MI	MI		26/08/1978	26	8	1978	44130 111	BIRDATLAS1				0			18000	116.251400000000	-27.082100000000	47954	Sturnidae	Gelochelidon	nilotica		Animalia
Tringa glareola	Wood sandpiper	BIRD	Specially Protected - m MI	MI		26/08/1978	26	8	1978	44130 154	BIRDATLAS1				0	MURCHISON	MURCHISON	18000	116.251400000000	-27.082100000000	24806	Scolopacidae	Tringa	glareola		Animalia
Calidris ferruginea	curlew sandpiper	BIRD	Threatened - Critically CR	CR		26/08/1978	26	8	1978	44130 161	BIRDATLAS1				0	MURCHISON	MURCHISON	18000	116.251400000000	-27.082100000000	24784	Scolopacidae	Calidris	ferruginea		Animalia
Calidris acuminata	Sharp-tailed sandpiper	BIRD	Specially Protected - m MI	MI		26/08/1978	26	8	1978	44130 163	BIRDATLAS1				0	MURCHISON	MURCHISON	18000	116.251400000000	-27.082100000000	24779	Scolopacidae	Calidris	acuminata		Animalia
Plegadis falcinellus	Glossy ibis	BIRD	Specially Protected - m MI	MI		26/08/1978	26	8	1978	44130 178	BIRDATLAS1				0	MURCHISON	MURCHISON	18000	116.251400000000	-27.082100000000	24843	Threskiornithidae	Plegadis	falcinellus		Animalia
Calidris subminuta	Long-toed Stint	BIRD	Specially Protected - m MI	MI		26/08/1978	26	8	1978	44130 965	BIRDATLAS1				0	MURCHISON	MURCHISON	18000	116.251400000000	-27.082100000000	24789	Scolopacidae	Calidris	subminuta		Animalia
Gelochelidon nilotica	Gull-billed tern	BIRD	Specially Protected - m MI	MI		8/09/1978	8	9	1978	44131 111	BIRDATLAS1				0			108000	116.501400000000	-27.498700000000	47954	Sturnidae	Gelochelidon	nilotica		Animalia
Chlidonias leucopterus	White-winged black tern, white-winged tern	BIRD	Specially Protected - m MI	MI		10/08/1978	10	8	1978	44132 109	BIRDATLAS1				0	MURCHISON	MURCHISON	18000	116.084700000000	-27.082100000000	41332	Laridae	Chlidonias	leucopterus		Animalia
Gelochelidon nilotica	Gull-billed tern	BIRD	Specially Protected - m MI	MI		10/08/1978	10	8	1978	44132 111	BIRDATLAS1				0			18000	116.084700000000	-27.082100000000	47954	Sturnidae	Gelochelidon	nilotica		Animalia
Calidris ruficollis	Red-necked stint	BIRD	Specially Protected - m MI	MI		10/08/1978	10	8	1978	44132 162	BIRDATLAS1				0	MURCHISON	MURCHISON	18000	116.084700000000	-27.082100000000	24788	Scolopacidae	Calidris	ruficollis		Animalia
Gelochelidon nilotica	Gull-billed tern	BIRD	Specially Protected - m MI	MI		25/08/1978	25	8	1978	44134 111	BIRDATLAS1				0			18000	116.251400000000	-27.082100000000	47954	Sturnidae	Gelochelidon	nilotica		Animalia
Tringa glareola	Wood sandpiper	BIRD	Specially Protected - m MI	MI		25/08/1978	25	8	1978	44134 154	BIRDATLAS1				0	MURCHISON	MURCHISON	18000	116.251400000000	-27.082100000000	24806	Scolopacidae	Tringa	glareola		Animalia
Calidris ferruginea	curlew sandpiper	BIRD	Threatened - Critically CR	CR		25/08/1978	25	8	1978	44134 161	BIRDATLAS1				0	MURCHISON	MURCHISON	18000	116.251400000000	-27.082100000000	24784	Scolopacidae	Calidris	ferruginea		Animalia
Plegadis falcinellus	Glossy ibis	BIRD	Specially Protected - m MI	MI		25/08/1978	25	8	1978	44134 178	BIRDATLAS1				0	MURCHISON	MURCHISON	18000	116.251400000000	-27.082100000000	24843	Threskiornithidae	Plegadis	falcinellus		Animalia
Calidris subminuta	Long-toed Stint	BIRD	Specially Protected - m MI	MI		25/08/1978	25	8	1978	44134 965	BIRDATLAS1				0	MURCHISON	MURCHISON	18000	116.251400000000	-27.082100000000	24789	Scolopacidae	Calidris	subminuta		Animalia
Gelochelidon nilotica	Gull-billed tern	BIRD	Specially Protected - m MI	MI		8/10/1978	8	10	1978	52625 111	BIRDATLAS1				0			18000	116.084700000000	-27.082100000000	47954	Sturnidae	Gelochelidon	nilotica		Animalia
Calidris acuminata	Sharp-tailed sandpiper	BIRD	Specially Protected - m MI	MI		8/10/1978	8	10	1978	52625 163	BIRDATLAS1				0	MURCHISON	MURCHISON	18000	116.084700000000	-27.082100000000	24779	Scolopacidae	Calidris	acuminata		Animalia
Plegadis falcinellus	Glossy ibis	BIRD	Specially Protected - m MI	MI		8/10/1978	8	10	1978	52625 178	BIRDATLAS1				0	MURCHISON	MURCHISON	18000	116.084700000000	-27.082100000000	24843	Threskiornithidae	Plegadis	falcinellus		Animalia
Chlidonias leucopterus	White-winged black tern, white-winged tern	BIRD	Specially Protected - m MI	MI		8/10/1978	8	10	1978	54306 109	BIRDATLAS1				0	MURCHISON	MURCHISON	18000	116.084700000000	-27.082100000000	41332	Laridae	Chlidonias	leucopterus		Animalia
Gelochelidon nilotica	Gull-billed tern	BIRD	Specially Protected - m MI	MI		8/10/1978	8	10	1978	54306 111	BIRDATLAS1				0			18000	116.084700000000	-27.082100000000	47954	Sturnidae	Gelochelidon	nilotica		Animalia
Calidris acuminata	Sharp-tailed sandpiper	BIRD	Specially Protected - m MI	MI		8/10/1978	8	10	1978	54306 163	BIRDATLAS1				0	MURCHISON	MURCHISON	18000	116.084700000000	-27.082100000000	24779	Scolopacidae	Calidris	acuminata		Animalia
Plegadis falcinellus	Glossy ibis	BIRD	Specially Protected - m MI	MI		8/10/1978	8	10	1978	54306 178	BIRDATLAS1				0	MURCHISON	MURCHISON	18000	116.084700000000	-27.082100000000	24843	Threskiornithidae	Plegadis	falcinellus		Animalia
Plegadis falcinellus	Glossy ibis	BIRD	Specially Protected - m MI	MI		19/10/2000	19	10	2000	127867 178	BIRDATLAS2				0	Wooleen Station	Wooleen Station	100	116.168900000000	-27.075000000000	24843	Threskiornithidae	Plegadis	falcinellus		Animalia
Gelochelidon nilotica	Gull-billed tern	BIRD	Specially Protected - m MI	MI		17/04/2001	17	4	2001	141703 111	BIRDATLAS2				0	Muggon Station Lak	Muggon Station Lak	500	115.968100000000	-26.715400000000	47954	Sturnidae	Gelochelidon	nilotica		Animalia
Tringa nebularia	Common greenshank, greenshank	BIRD	Specially Protected - m MI	MI		17/04/2001	17	4	2001	141703 158	BIRDATLAS2				0	Muggon Station Lak	Muggon Station Lak	500	115.968100000000	-26.715400000000	24808	Scolopacidae	Tringa	nebularia		Animalia
Plegadis falcinellus	Glossy ibis	BIRD	Specially Protected - m MI	MI		17/04/2001	17	4	2001	141703 178	BIRDATLAS2				0	Muggon Station Lak	Muggon Station Lak	500	115.968100000000	-26.715400000000	24843	Threskiornithidae	Plegadis	falcinellus		Animalia
Tringa nebularia	Common greenshank, greenshank	BIRD	Specially Protected - m MI	MI		14/09/2001	14	9	2001	173065 158	BIRDATLAS2				100	Murchison River, Tv	Murchison River, Tv	100	115.896700000000	-27.359800000000	24808	Scolopacidae	Tringa	nebularia		Animalia
Gelochelidon nilotica	Gull-billed tern	BIRD	Specially Protected - m MI	MI		13/07/2001	13	7	2001	295874 111	BIRDATLAS2				0	Wooleen Station	Wooleen Station	5000	116.201400000000	-27.098700000000	47954	Sturnidae	Gelochelidon	nilotica		Animalia
Gelochelidon nilotica	Gull-billed tern	BIRD	Specially Protected - m MI	MI		23/08/1999	23	8	1999	32731 111	BIRDATLAS2				0	Wooleen Lake flood	Wooleen Lake flood	0	116.173900000000	-27.064600000000	47954	Sturnidae	Gelochelidon	nilotica		Animalia
Tringa nebularia	Common greenshank, greenshank	BIRD	Specially Protected - m MI	MI		28/11/2004	28	11	2004	434663 158	BIRDATLAS2				0	Woolden Homestea	Woolden Homestea	0	116.160800000000	-27.086800000000	24808	Scolopacidae	Tringa	nebularia		Animalia
Gelochelidon nilotica	Gull-billed tern	BIRD	Specially Protected - m MI	MI		27/08/2006	27	8	2006	478805 111	BIRDATLAS2				0	Yewlands	Yewlands	0	116.201900000000	-27.133900000000	47954	Sturnidae	Gelochelidon	nilotica		Animalia
Gelochelidon nilotica	Gull-billed tern	BIRD	Specially Protected - m MI	MI		13/06/2006	13	6	2006	5003828 111	BIRDATLAS2				0	Wooleen	Wooleen	0	116.1600000							



# NatureMap Species Report

Created By Guest user on 04/10/2021

Kingdom Animalia  
 Current Names Only Yes  
 Core Datasets Only Yes  
 Method 'By Circle'  
 Centre 116° 01' 31" E, 27° 18' 32" S  
 Buffer 40km  
 Group By Species Group

Species Group	Species	Records
Amphibian	2	3
Bird	152	3476
Fish	6	27
Invertebrate	36	124
Mammal	12	34
Reptile	40	136
<b>TOTAL</b>	<b>248</b>	<b>3800</b>

Name ID	Species Name	Naturalised	Conservation Code	Endemic To Query Area
<b>Amphibian</b>				
1.	25375 <i>Cyclorana maini</i> (Sheep Frog)			
2.	25392 <i>Litoria rubella</i> (Little Red Tree Frog)			
<b>Bird</b>				
3.	24559 <i>Acanthagenys rufogularis</i> (Spiny-cheeked Honeyeater)			
4.	24260 <i>Acanthiza apicalis</i> (Broad-tailed Thornbill, Inland Thornbill)			
5.	24261 <i>Acanthiza chrysorrhoa</i> (Yellow-rumped Thornbill)			
6.	25527 <i>Acanthiza iredalei</i> (Sapphire Thornbill, Slender-billed Thornbill)			
7.	24264 <i>Acanthiza robustirostris</i> (Slaty-backed Thornbill)			
8.	24265 <i>Acanthiza uropygialis</i> (Chestnut-rumped Thornbill)			
9.	25535 <i>Accipiter cirrocephalus</i> (Collared Sparrowhawk)			
10.	25536 <i>Accipiter fasciatus</i> (Brown Goshawk)			
11.	25755 <i>Acrocephalus australis</i> (Australian Reed Warbler)			
12.	25544 <i>Aegotheles cristatus</i> (Australian Owllet-nightjar)			
13.	24310 <i>Anas castanea</i> (Chestnut Teal)			
14.	24312 <i>Anas gracilis</i> (Grey Teal)			
15.	24315 <i>Anas rhynchotis</i> (Australasian Shoveler)			
16.	24316 <i>Anas superciliosa</i> (Pacific Black Duck)			
17.	47414 <i>Anhinga novaehollandiae</i> (Australasian Darter)			
18.	25528 <i>Aphelocephala leucopsis</i> (Southern Whiteface)			
19.	24268 <i>Aphelocephala nigricincta</i> (Banded Whiteface)			
20.	24285 <i>Aquila audax</i> (Wedge-tailed Eagle)			
21.	25558 <i>Ardea ibis</i> (Cattle Egret)			
22.	25559 <i>Ardea intermedia</i> (Intermediate Egret)			
23.	41324 <i>Ardea modesta</i> (great egret, white egret)			
24.	24341 <i>Ardea pacifica</i> (White-necked Heron)			
25.	24610 <i>Ardeotis australis</i> (Australian Bustard)			
26.	25566 <i>Artamus cinereus</i> (Black-faced Woodswallow)			
27.	24355 <i>Artamus minor</i> (Little Woodswallow)			
28.	24356 <i>Artamus personatus</i> (Masked Woodswallow)			
29.	24318 <i>Aythya australis</i> (Hardhead)			
30.	<i>Barnardius zonarius</i>			
31.	24319 <i>Biziura lobata</i> (Musk Duck)			
32.	24359 <i>Burhinus grallarius</i> (Bush Stone-curlew)			
33.	24722 <i>Cacatua leadbeateri</i> (Major Mitchell's Cockatoo)			
34.	25715 <i>Cacatua roseicapilla</i> (Galah)			
35.	24725 <i>Cacatua roseicapilla</i> subsp. <i>assimilis</i> (Galah)			
36.	25716 <i>Cacatua sanguinea</i> (Little Corella)			
37.	42307 <i>Cacomantis pallidus</i> (Pallid Cuckoo)			
38.	25717 <i>Calyptrorhynchus banksii</i> (Red-tailed Black-Cockatoo)			
39.	24564 <i>Certhionyx variegatus</i> (Pied Honeyeater)			

Name ID	Species Name	Naturalised	Conservation Code	<sup>1</sup> Endemic To Query Area
40.	24377 <i>Charadrius ruficapillus</i> (Red-capped Plover)			
41.	24321 <i>Chenonetta jubata</i> (Australian Wood Duck, Wood Duck)			
42.	47909 <i>Cheramoeca leucosterna</i> (White-backed Swallow)			
43.	<i>Chroicocephalus novaehollandiae</i>			
44.	25580 <i>Cincoloma castaneothorax</i> (Chestnut-breasted Quail-thrush)			
45.	42311 <i>Cincoloma marginatum</i> (Western Quail-thrush)			
46.	24288 <i>Circus approximans</i> (Swamp Harrier)			
47.	24289 <i>Circus assimilis</i> (Spotted Harrier)			
48.	24774 <i>Cladorhynchus leucocephalus</i> (Banded Stilt)			
49.	25581 <i>Climacteris affinis</i> (White-browed Treecreeper)			
50.	25675 <i>Colluricincla harmonica</i> (Grey Shrike-thrush)			
51.	24361 <i>Coracina maxima</i> (Ground Cuckoo-shrike)			
52.	25568 <i>Coracina novaehollandiae</i> (Black-faced Cuckoo-shrike)			
53.	24362 <i>Coracina novaehollandiae</i> subsp. <i>novaehollandiae</i> (Black-faced Cuckoo-shrike)			
54.	24416 <i>Corvus bennetti</i> (Little Crow)			
55.	25592 <i>Corvus coronoides</i> (Australian Raven)			
56.	25593 <i>Corvus orru</i> (Torresian Crow)			
57.	24671 <i>Coturnix pectoralis</i> (Stubble Quail)			
58.	24420 <i>Cracticus nigrogularis</i> (Pied Butcherbird)			
59.	25595 <i>Cracticus tibicen</i> (Australian Magpie)			
60.	25596 <i>Cracticus torquatus</i> (Grey Butcherbird)			
61.	24322 <i>Cygnus atratus</i> (Black Swan)			
62.	25547 <i>Dacelo leachii</i> (Blue-winged Kookaburra)			
63.	25673 <i>Daphoenositta chrysoptera</i> (Varied Sittella)			
64.	24325 <i>Dendrocygna eytoni</i> (Plumed Whistling Duck)			
65.	25607 <i>Dicaeum hirundinaceum</i> (Mistletoebird)			
66.	24470 <i>Dromaius novaehollandiae</i> (Emu)			
67.	24650 <i>Drymodes brunneopygia</i> (Southern Scrub-robin)			
68.	<i>Egretta garzetta</i>			
69.	<i>Egretta novaehollandiae</i>			
70.	<i>Elanus axillaris</i>			
71.	47937 <i>Eileyornis melanops</i> (Black-fronted Dotterel)			
72.	<i>Eolophus roseicapillus</i>			
73.	24567 <i>Epthianura albifrons</i> (White-fronted Chat)			
74.	24568 <i>Epthianura aurifrons</i> (Orange Chat)			
75.	24570 <i>Epthianura tricolor</i> (Crimson Chat)			
76.	24379 <i>Erythronyctes cinctus</i> (Red-kneed Dotterel)			
77.	24368 <i>Eurostopodus argus</i> (Spotted Nightjar)			
78.	25621 <i>Falco berigora</i> (Brown Falcon)			
79.	25622 <i>Falco cenchroides</i> (Australian Kestrel, Nankeen Kestrel)			
80.	25623 <i>Falco longipennis</i> (Australian Hobby)			
81.	25624 <i>Falco peregrinus</i> (Peregrine Falcon)		S	
82.	25727 <i>Fulica atra</i> (Eurasian Coot)			
83.	47954 <i>Gelochelidon nilotica</i> (Gull-billed Tern)		IA	
84.	24401 <i>Geopelia cuneata</i> (Diamond Dove)			
85.	24402 <i>Geopelia humeralis</i> (Bar-shouldered Dove)			
86.	25585 <i>Geopelia striata</i> (Zebra Dove)			
87.	25530 <i>Gerygone fusca</i> (Western Gerygone)			
88.	24443 <i>Grallina cyanoleuca</i> (Magpie-lark)			
89.	24295 <i>Haliastur sphenurus</i> (Whistling Kite)			
90.	24297 <i>Hamirostra melanostemon</i> (Black-breasted Buzzard)			
91.	47965 <i>Hieraaetus morphnoides</i> (Little Eagle)			
92.	25734 <i>Himantopus himantopus</i> (Black-winged Stilt)			
93.	24491 <i>Hirundo neoxena</i> (Welcome Swallow)			
94.	25661 <i>Lichmera indistincta</i> (Brown Honeyeater)			
95.	<i>Lophochroa leadbeateri</i>			
96.	24326 <i>Malacorhynchus membranaceus</i> (Pink-eared Duck)			
97.	25651 <i>Malurus lamberti</i> (Variegated Fairy-wren)			
98.	25652 <i>Malurus leucopterus</i> (White-winged Fairy-wren)			
99.	25654 <i>Malurus splendens</i> (Splendid Fairy-wren)			
100.	24583 <i>Manorina flavigula</i> (Yellow-throated Miner)			
101.	25758 <i>Megalurus gramineus</i> (Little Grassbird)			
102.	47997 <i>Melanodryas cucullata</i> (Hooded Robin)			
103.	24736 <i>Melopsittacus undulatus</i> (Budgerigar)			
104.	24598 <i>Merops ornatus</i> (Rainbow Bee-eater)			
105.	<i>Microcarbo melanoleucos</i>			
106.	25693 <i>Microeca fascians</i> (Jacky Winter)			
107.	25542 <i>Milvus migrans</i> (Black Kite)			
108.	24738 <i>Neophema elegans</i> (Elegant Parrot)			
109.	<i>Neopsephotus bourkii</i>			

Name ID	Species Name	Naturalised	Conservation Code	<sup>1</sup> Endemic To Query Area
110.	25564 <i>Nycticorax caledonicus</i> (Rufous Night Heron)			
111.	24742 <i>Nymphicus hollandicus</i> (Cockatiel)			
112.	24407 <i>Ocyphaps lophotes</i> (Crested Pigeon)			
113.	24618 <i>Oreoica gutturalis</i> (Crested Bellbird)			
114.	25680 <i>Pachycephala rufiventris</i> (Rufous Whistler)			
115.	24627 <i>Pardalotus rubricatus</i> (Red-browed Pardalote)			
116.	25682 <i>Pardalotus striatus</i> (Striated Pardalote)			
117.	24630 <i>Pardalotus striatus</i> subsp. <i>westraliensis</i> (Striated Pardalote)			
118.	<i>Pardalotus striatus</i> subsp. <i>westraliensis</i> <i>Xmurchisoni</i>			
119.	24648 <i>Pelecanus conspicillatus</i> (Australian Pelican)			
120.	48060 <i>Petrochelidon ariel</i> (Fairy Martin)			
121.	48061 <i>Petrochelidon nigricans</i> (Tree Martin)			
122.	24659 <i>Petroica goodenovii</i> (Red-capped Robin)			
123.	25697 <i>Phalacrocorax carbo</i> (Great Cormorant)			
124.	24667 <i>Phalacrocorax sulcirostris</i> (Little Black Cormorant)			
125.	24409 <i>Phaps chalcoptera</i> (Common Bronzewing)			
126.	24841 <i>Platalea flavipes</i> (Yellow-billed Spoonbill)			
127.	24748 <i>Platycercus varius</i> (Mulga Parrot)			
128.	24843 <i>Plegadis falcinellus</i> (Glossy Ibis)		IA	
129.	25703 <i>Podargus strigoides</i> (Tawny Frogmouth)			
130.	24681 <i>Poliocephalus poliocephalus</i> (Hoary-headed Grebe)			
131.	24683 <i>Pomatostomus superciliosus</i> (White-browed Babbler)			
132.	25706 <i>Pomatostomus temporalis</i> (Grey-crowned Babbler)			
133.	24769 <i>Porzana fluminea</i> (Australian Spotted Crane)			
134.	25732 <i>Porzana pusilla</i> (Baillon's Crane)			
135.	24390 <i>Psophodes occidentalis</i> (Western Wedgebill, Chiming Wedgebill)			
136.	<i>Ptilonorhynchus guttatus</i>			
137.	42344 <i>Pumella albifrons</i> (White-fronted Honeyeater)			
138.	24278 <i>Pyrrholaemus brunneus</i> (Redthroat)			
139.	48096 <i>Rhipidura albiscapa</i> (Grey Fantail)			
140.	25614 <i>Rhipidura leucophrys</i> (Willie Wagtail)			
141.	48237 <i>Rostratula australis</i> (Australian Painted Snipe)		T	
142.	30948 <i>Smicromis brevirostris</i> (Weebill)			
143.	25590 <i>Streptopelia senegalensis</i> (Laughing Turtle-Dove)	Y		
144.	25705 <i>Tachybaptus novaehollandiae</i> (Australasian Grebe, Black-throated Grebe)			
145.	24331 <i>Tadorna tadornoides</i> (Australian Shelduck, Mountain Duck)			
146.	30870 <i>Taeniopygia guttata</i> (Zebra Finch)			
147.	24845 <i>Threskiornis spinicollis</i> (Straw-necked Ibis)			
148.	42351 <i>Todiramphus pyrrhopygius</i> (Red-backed Kingfisher)			
149.	25549 <i>Todiramphus sanctus</i> (Sacred Kingfisher)			
150.	48141 <i>Tribonyx ventralis</i> (Black-tailed Native-hen)			
151.	24808 <i>Tringa nebularia</i> (Common Greenshank, greenshank)		IA	
152.	24809 <i>Tringa stagnatilis</i> (Marsh Sandpiper, little greenshank)		IA	
153.	24851 <i>Turnix velox</i> (Little Button-quail)			
154.	24386 <i>Vanellus tricolor</i> (Banded Lapwing)			

### Fish

155.	<i>Amniataba caudavittata</i>			
156.	<i>Atherina</i> sp.			
157.	<i>Craterocephalus cuneiceps</i>			
158.	34022 <i>Hypseleotris aurea</i> (Golden Gudgeon)		P2	
159.	<i>Leiopotherapon unicolor</i>			
160.	<i>Thalassoma</i> sp.			

### Invertebrate

161.	<i>Acariformes</i> sp.			
162.	<i>Aeshnidae</i> sp.			
163.	<i>Baetidae</i> sp.			
164.	<i>Caenidae</i> sp.			
165.	<i>Ceratopogonidae</i> sp.			
166.	<i>Cherax destructor</i>			
167.	<i>Chironominae</i> sp.			
168.	<i>Coenagrionidae</i> sp.			
169.	<i>Conchostraca</i> (unident.)			
170.	<i>Corduliidae</i> sp.			
171.	<i>Corixidae</i> sp.			
172.	<i>Culicidae</i> sp.			
173.	<i>Dytiscidae</i> sp.			
174.	<i>Ecnomidae</i> sp.			
175.	<i>Ephydriidae</i> sp.			
176.	<i>Gerridae</i> sp.			



Name ID	Species Name	Naturalised	Conservation Code	<sup>1</sup> Endemic To Query Area
177.	<i>Gomphidae</i> sp.			
178.	<i>Gyrinidae</i> sp.			
179.	<i>Halipidae</i> sp.			
180.	<i>Hydraenidae</i> sp.			
181.	<i>Hydrophilidae</i> sp.			
182.	<i>Isopedella tindalei</i>			
183.	<i>Leptoceridae</i> sp.			
184.	<i>Lestidae</i> sp.			
185.	<i>Libellulidae</i> sp.			
186.	<i>Lymnaeidae</i> sp.			
187.	<i>Nephila edulis</i>			
188.	<i>Notonectidae</i> sp.			
189.	<i>Oligochaeta</i> sp.			
190.	<i>Orthoclaadiinae</i> sp.			
191.	<i>Planorbidae</i> sp.			
192.	<i>Simuliidae</i> sp.			
193.	<i>Staphylinidae</i> sp.			
194.	<i>Tanypodinae</i> sp.			
195.	<i>Tipulidae</i> sp.			
196.	<i>Urodacus armatus</i>			

### Mammal

197.	24087	<i>Antechinomys laniger</i> (Kultarr)		
198.	24251	<i>Bos taurus</i> (European Cattle)	Y	
199.	24254	<i>Camelus dromedarius</i> (Dromedary, Camel)	Y	
200.	24132	<i>Macropus fuliginosus</i> (Western Grey Kangaroo)		
201.	24136	<i>Macropus rufus</i> (Red Kangaroo, Marlu)		
202.	24224	<i>Notomys alexis</i> (Spinifex Hopping-mouse)		
203.	24142	<i>Petrogale lateralis</i> subsp. <i>lateralis</i> (Black-flanked Rock-wallaby, Black-footed Rock-wallaby)		T
204.	24106	<i>Pseudantechinus woolleyae</i> (Woolley's Pseudantechinus)		
205.	24237	<i>Pseudomys hermannsburgensis</i> (Sandy Inland Mouse)		
206.	24207	<i>Tachyglossus aculeatus</i> (Short-beaked Echidna)		
207.	24176	<i>Taphozous hilli</i> (Hill's Sheath-tail-bat)		
208.	24040	<i>Vulpes vulpes</i> (Red Fox)	Y	

### Reptile

209.	30833	<i>Amphibolurus longirostris</i> (Long-nosed Dragon)		
210.	25318	<i>Antaresia perthensis</i> (Pygmy Python)		
211.	25339	<i>Chelodina steindachneri</i> (Flat-shelled Turtle)		
212.	24873	<i>Ctenophorus fordii</i> (Mallee Sand Dragon)		
213.	25459	<i>Ctenophorus isolepis</i> (Crested Dragon, Military Dragon)		
214.	25460	<i>Ctenophorus maculatus</i> (Spotted Military Dragon)		
215.	24882	<i>Ctenophorus nuchalis</i> (Central Netted Dragon)		
216.	24883	<i>Ctenophorus ornatus</i> (Ornate Crevice-Dragon)		
217.	24886	<i>Ctenophorus reticulatus</i> (Western Netted Dragon)		
218.	24889	<i>Ctenophorus scutulatus</i> (Lozenge-marked Dragon)		
219.	25045	<i>Ctenotus helenae</i>		
220.	25052	<i>Ctenotus leonhardii</i>		
221.	25074	<i>Ctenotus schomburgkii</i>		
222.	25075	<i>Ctenotus severus</i>		
223.	25080	<i>Ctenotus uber</i> subsp. <i>uber</i> (Spotted Ctenotus)		
224.	25004	<i>Delma tinctoria</i>		
225.	24940	<i>Diplodactylus pulcher</i>		
226.	25107	<i>Egernia stokesii</i> subsp. <i>badia</i> (Western Spiny-tailed Skink, Gidgee Skink)		T
227.	25109	<i>Eremiascincus richardsonii</i> (Broad-banded Sand Swimmer)		
228.	24958	<i>Gehyra punctata</i>		
229.	24959	<i>Gehyra variegata</i>		
230.	24961	<i>Heteronotia binoei</i> (Bynoe's Gecko)		
231.		<i>Lerista kingi</i>		
232.	25151	<i>Lerista macropisthopus</i> subsp. <i>fusciceps</i>		
233.	25152	<i>Lerista macropisthopus</i> subsp. <i>galea</i>		
234.	25157	<i>Lerista nichollsi</i>		
235.	25005	<i>Lialis burtonis</i>		
236.	42415	<i>Lucasium squarrosum</i>		
237.	25184	<i>Menetia greyii</i>		
238.	24904	<i>Moloch horridus</i> (Thorny Devil)		
239.	25190	<i>Morethia butleri</i>		
240.	25253	<i>Parasuta gouldii</i>		
241.	25254	<i>Parasuta monachus</i>		
242.	42416	<i>Pseudonaja mengdeni</i> (Western Brown Snake)		

Name ID	Species Name	Naturalised	Conservation Code	<sup>1</sup> Endemic To Query Area
243.	25264 <i>Pseudonaja nuchalis</i> (Gwardar, Northern Brown Snake)			
244.	24982 <i>Rhynchoedura ornata</i> (Western Beaked Gecko)			
245.	25266 <i>Simoselaps bertholdi</i> (Jan's Banded Snake)			
246.	25269 <i>Suta fasciata</i> (Rosen's Snake)			
247.	25218 <i>Varanus gouldii</i> (Bungarra or Sand Monitor)			
248.	25223 <i>Varanus panoptes</i> subsp. <i>rubidus</i>			

**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: 03/10/21 21:23:28

[Summary](#)

[Details](#)

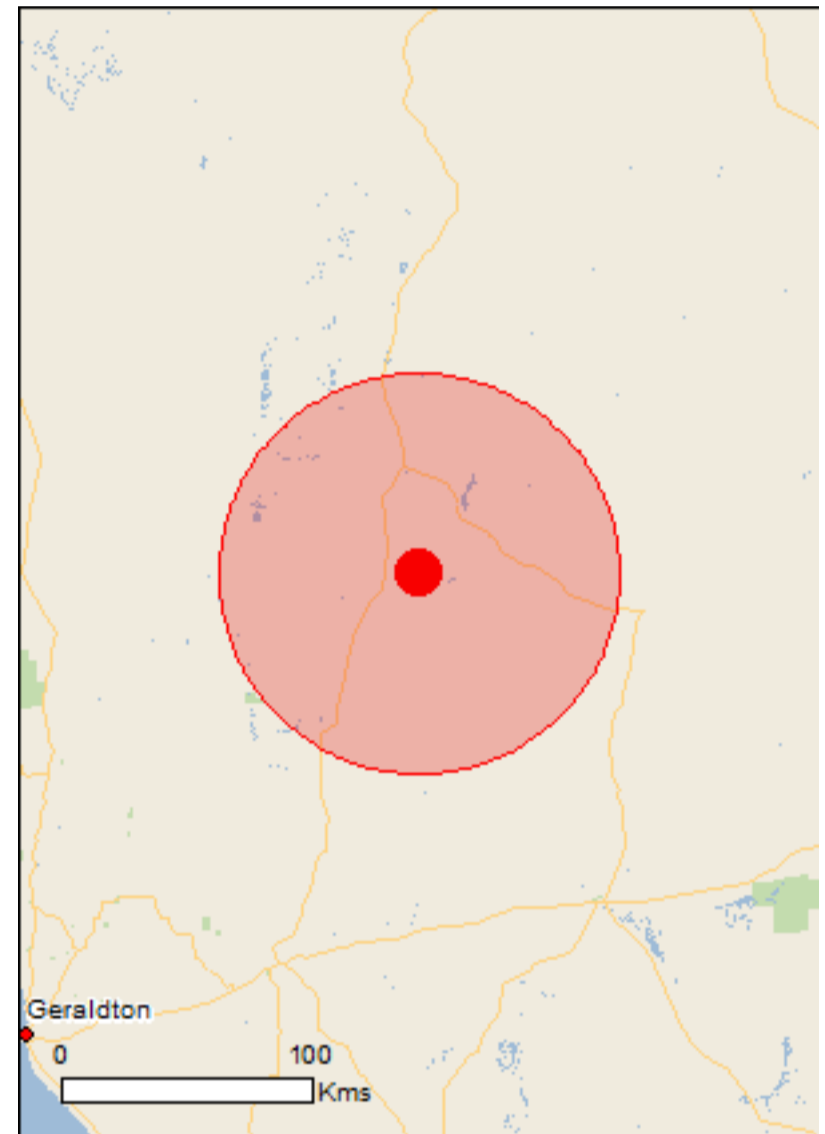
[Matters of NES](#)

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

[Extra Information](#)

[Caveat](#)

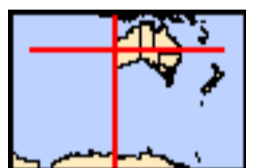
[Acknowledgements](#)



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[Coordinates](#)

Buffer: 80.0Km





# 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>	None
<a href="#">Listed Threatened Species:</a>	10
<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>	None
<a href="#">Commonwealth Heritage Places:</a>	None
<a href="#">Listed Marine Species:</a>	11
<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>	4
<a href="#">Regional Forest Agreements:</a>	None
<a href="#">Invasive Species:</a>	13
<a href="#">Nationally Important Wetlands:</a>	1
<a href="#">Key Ecological Features (Marine)</a>	None

# Details

## Matters of National Environmental Significance

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

Name	Status	Type of Presence
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#### Birds

<a href="#">Calidris ferruginea</a> Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area
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<a href="#">Leipoa ocellata</a> Malleefowl [934]	Vulnerable	Species or species habitat likely 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
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<a href="#">Rostratula australis</a> Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
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#### Mammals

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

<a href="#">Idiosoma nigrum</a> Shield-backed Trapdoor Spider, Black Rugose Trapdoor Spider [66798]	Vulnerable	Species or species habitat likely to occur within area
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#### Plants

<a href="#">Caladenia hoffmanii</a> Hoffman's Spider-orchid [56719]	Endangered	Species or species habitat may occur within area
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<a href="#">Dasymalla axillaris</a> Native Foxglove [38829]	Critically Endangered	Species or species habitat may occur within area
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<a href="#">Eremophila viscida</a> Varnish Bush [2394]	Endangered	Species or species habitat may occur within area
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#### Reptiles

<a href="#">Egernia stokesii badia</a> Western Spiny-tailed Skink, Baudin Island Spiny-tailed Skink [64483]	Endangered	Species or species habitat known to occur within area
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### 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
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#### Migratory Marine Birds

Name	Threatened	Type of Presence
<a href="#">Apus pacificus</a> Fork-tailed Swift [678]		Species or species habitat likely to occur within area
<b>Migratory Terrestrial Species</b>		
<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 likely to occur within area
<a href="#">Calidris melanotos</a> Pectoral Sandpiper [858]		Species or species habitat may occur within area
<a href="#">Tringa nebularia</a> Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

## Other Matters Protected by the EPBC Act

Listed Marine Species		[ <a href="#">Resource Information</a> ]
* 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 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 likely to occur within area
<a href="#">Calidris melanotos</a> Pectoral Sandpiper [858]		Species or species habitat may occur within area
<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



Name	Threatened	Type of Presence area
<a href="#">Motacilla cinerea</a> Grey Wagtail [642]		Species or species habitat may occur within area
<a href="#">Rostratula benghalensis (sensu lato)</a> Painted Snipe [889]	Endangered*	Species or species habitat may occur within area
<a href="#">Tringa nebularia</a> Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

## Extra Information

State and Territory Reserves	[ Resource Information ]
Name	State
Muggon	WA
Narloo, part Yuin & part Twin Peaks Pastoral Leases	WA
Toolonga	WA
Woolgorong	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>		
Streptopelia senegalensis Laughing Turtle-dove, Laughing Dove [781]		Species or species habitat likely to occur within area
<b>Mammals</b>		
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Capra hircus Goat [2]		Species or species habitat likely to occur within area
Equus asinus Donkey, Ass [4]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area

### Plants

Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species habitat likely to occur within area
Prosopis spp. Mesquite, Algaroba [68407]		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

### Nationally Important Wetlands [\[ Resource Information \]](#)

Name	State
<a href="#">Wooleen Lake</a>	WA

# 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

-27.30583 116.02349



# Acknowledgements

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

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

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

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

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**APPENDIX 6: LEVEL 1 AND TARGETED FAUNA SURVEY REPORT  
(WESTERN ECOLOGICAL 2022)**



## Basic and Targeted Fauna Assessment – Woolbung Peak

Prepared for 10M Pty Ltd

May 2022







## Limitations

### Scope of services

This report ("the report") has been prepared by Western Ecological Pty Ltd (WE) in accordance with the scope of services set out in the contract, or as otherwise agreed, between the Client and WE. In some circumstances, a range of factors such as time, budget, access and/or site disturbance constraints may have limited the scope of services. This report is strictly limited to the matters stated in it and is not to be read as extending, by implication, to any other matter in connection with the matters addressed in it.

### Reliance on data

In preparing the report, WE have relied upon data and other information provided by the Client and other individuals and organisations, most of which are referred to in the report ("the data"). Except as otherwise expressly stated in the report, WE have not verified the accuracy or completeness of the data. To the extent that the statements, opinions, facts, information, conclusions and/or recommendations in the report ("conclusions") are based in whole or part on the data, those conclusions are contingent upon the accuracy and completeness of the data. WE have also not attempted to determine whether any material matter has been omitted from the data. WE will not be liable in relation to incorrect conclusions should any data, information or condition be incorrect or have been concealed, withheld, misrepresented or otherwise not fully disclosed to WE. The making of any assumption does not imply that WE have made any enquiry to verify the correctness of that assumption.

The report is based on conditions encountered and information received at the time of preparation of this report or the time that site investigations were carried out. WE disclaim responsibility for any changes that may have occurred after this time. This report and any legal issues arising from it are governed by and construed in accordance with the law of Western Australia as at the date of this report.

Report Version	Revision No.	Purpose	Author/reviewer	Submitted to Client	
				Form	Date
Draft Report	1	For client review	Western Ecological / 10M	Electronic	8/05/2022
Final Report	2	Client submission	Western Ecological	Electronic	



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## Executive Summary

Western Ecological by 10M Pty Ltd to undertake a basic fauna assessment (primarily broad habitat assessment and description) and targeted fauna assessments at Woolbung Peak, which is about 140 km north east of Mullewa. The area to be assessed is approximately 124 ha and consists of the proposed mine and associate infrastructure (pit, waste dump, crush/screen, stock yard, turkeys' nest, workshops etc.) and a proposed haul road.

Western Ecological undertook a targeted Malleefowl assessment in a much smaller area (12 ha) at Woolbung Peak in September 2021. As a result of the targeted Malleefowl assessment in 2021, it was decided to undertake further assessments for five threatened species, with this based on known distributions, database results and to a lesser extent habitat in the current survey area (~124 ha). The five threatened species to be examined as part of this assessment included the following:

- Western Spiny-tailed Skink
- Malleefowl
- Night Parrot
- Long-tailed Dunnart
- Northern Shield-backed Trapdoor Spider.

Searches of the Western Australia Department of Biodiversity, Conservation and Attractions threatened fauna database, NatureMap, and the Commonwealth Environment Protection and Biodiversity Conservation Protected Matters Search Tool were undertaken to identify if there were records of the five species in and or near the survey area in the past.

The field assessment was undertaken from the 22-26 March 2022 by two qualified Zoologists.

None of the five threatened fauna species were recorded during the assessment. During the field survey two broad fauna habitats were described and these were Rocky Mulga Shrubland and Scattered Mulga Shrubland. Based on database search results, targeted assessments in the survey area and habitats present, aa five species are considered unlikely to occur in the survey area.



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# 1. Introduction

## 1.1 Background

Western Ecological (WE) was commissioned by 10M Pty Ltd (10M) to undertake a basic fauna assessment and targeted fauna assessments at Woolbung Peak (the survey area), which is about 140 km north east of Mullewa (Figure 1). The area to be assessed is approximately 124 ha and consists of proposed mine and associate infrastructure (pit, waste dump, crush/screen, stock yard, turkeys' nest, workshops etc.) and a proposed haul road. We understand that these surveys are required as part of the environmental approvals process for the Woolbung Peak project.

Western Ecological undertook a targeted Malleefowl (*Leipoa ocellata*) assessment in a much smaller area (12 ha) at Woolbung Peak in September 2021 (Western Ecological 2021). The area examined in 2021 was understood to represent the proposed mine pit. That assessment demonstrated that there was an absence of suitable habitat in the 12-ha area for Malleefowl to construct their mounds, or to forage in. Note that in 2021 the various mine tenements had not been finalised.

As a result of the targeted Malleefowl assessment in 2021, it was decided to undertake further assessments for five threatened species, with this based on known distributions, database results and to a lesser extent habitat in the current survey area (~124 ha). The five threatened species to be examined as part of this assessment included the following:

- Western Spiny-tailed Skink (*Egernia stokesii badia*) – listed as Endangered (En) under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and Vulnerable (Vu) under the *Western Australian Biodiversity Conservation Act 2016* (BC Act)
- Malleefowl – listed as Vu under the EPBC Act and BC Act
- Night Parrot (*Pezoporus occidentalis*) – listed as En under the EPBC Act and Critically Endangered (CrE) under the BC Act
- Long-tailed Dunnart (*Sminthopsis longicaudata*) – Priority 4
- Northern Shield-backed Trapdoor Spider (*Idiosoma clypeatum*) – Priority 3.

## 1.2 Scope and Objectives

The scope of work (SoW) to be undertaken was as follows:

- Desktop assessment
- Basic fauna assessment (primarily habitat description) and targeted assessment for the five species
- Document the above in a report.

## 1.3 Legislative context

Fauna in Western Australia is protected formally and informally by various legislative and non-legislative measures, which are as follows:

- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) – Australian Government
- *Biodiversity Conservation Act 2016* (BC Act) – WA State Government.

Non-legislative measures:

- WA Department of Biodiversity, Conservation and Attractions (DBCA) Priority lists for flora, ecological communities and fauna
- Recognition of locally significant populations by DBCA.

A short description of each is given below. Other definitions, including species conservation categories, are provided in Appendix 1.

### Environment Protection and Biodiversity Conservation Act (EPBC Act)

The EPBC Act aims to protect matters of national environmental significance, which are detailed in Appendix 1. Under the EPBC Act, the Commonwealth Department of Agriculture, Water and the Environment (DAWE) lists protected species and



Threatened Ecological Communities (TECs) by criteria set out in the Act. Species are conservation significant if they are listed as Threatened (i.e., Critically Endangered, Endangered and Vulnerable) or Migratory.

Bird species protected as Migratory under the EPBC Act include those listed under international migratory bird agreements relating to the protection of birds, which migrate between Australia and other countries, for which Australia has agreed. This includes the Japan-Australia Migratory Bird Agreement (JAMBA), the China-Australia Migratory Bird Agreement (CAMBA), the Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA) and the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention).

Some marine fauna or terrestrial fauna that use marine habitats are listed as Marine under the EPBC Act. These species are only considered conservation significant when a proposed development occurs in a Commonwealth marine area (i.e., any Commonwealth Waters or Commonwealth Marine Protected Area). Outside of such areas, the EPBC Act does not consider these species to be matters of national environmental significance, so are not protected under the Act.

### **Biodiversity Conservation Act (BC Act)**

The BC Act replaced both the *Wildlife Conservation Act 1950* and the *Sandalwood Act 1929* and came into effect on 1 January 2019. The aim of the new Act is to conserve and protect biodiversity and to promote the ecologically sustainable use of biodiversity components in the State, and will bring more activities within the scope of biodiversity laws.

Taxa listed as Threatened in the category of critically endangered, endangered or vulnerable under section 19(1a, 1b, and 1c), or is a rediscovered species to be regarded as threatened species under section 26(2) of the BC Act. Other categories include extinct or extinct in the wild and they are listed under section 23 (1) of the BC Act (Appendix 1).

If species meet 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, they are covered under section 13(1) of the BC Act and are called specially protected species. Species that are listed as threatened species (critically endangered, endangered or vulnerable) or extinct species under the BC Act can't also be listed as Specially Protected species (see Appendix 1 for a more detailed description of each threat category).

Threatened Ecological Communities (TECs) are also covered under the BC Act and are placed into three categories of critically endangered, endangered or vulnerable under section 27(1a, 1b, and 1c) depending on their threat status.

### **DBCA Priority Species and Communities**

DBCA lists species that are possibly threatened but that do not meet criteria for listing under the BC Act, or are otherwise data deficient, and adds them 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. Consideration 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 (see Appendix 1 for more detail of the priority codes).

The DBCA also has a list of Priority Ecological Communities (PECs) that have scant information available to be considered a TEC, or which are rare but not currently threatened. Ecological communities that do not meet survey criteria or that are not sufficiently defined are added to the PEC list 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 a TEC. 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.



### **Informal Recognition of Threatened Fauna**

Certain populations or communities of fauna may be of local significance or interest because of their patterns of distribution and abundance. For example, fauna may be locally significant because they are range extensions to the previously known distribution or are newly discovered species (and have the potential to be of conservation significance). In addition, many species are in decline as a result of threatening processes (land clearing, grazing, and changed fire regimes) and relict populations of such species assume local importance for DBCA. It is not uncommon for DBCA to make comment on these species of interest.



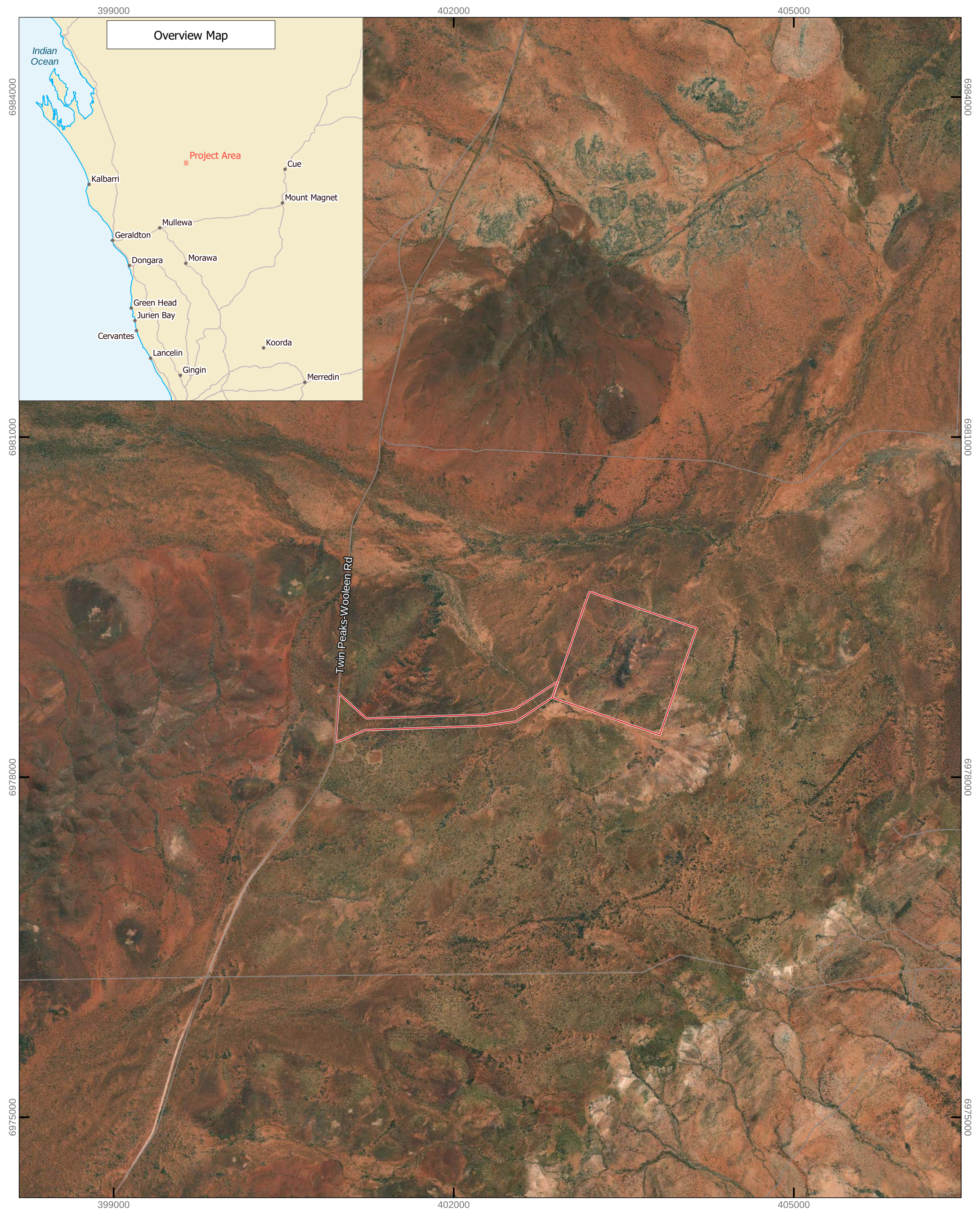
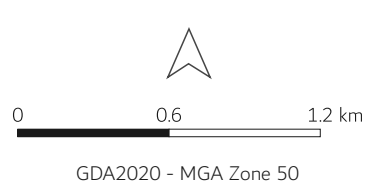


Figure 1: Project Location



Legend  
 Survey Area







## 2. Methods

### 2.1 Survey Guidance

The fauna assessment was completed in accordance with the following EPA, DBCA and DAWE requirements for the environmental surveying and reporting of fauna surveys in WA, where relevant and practical, and as documented in:

- EPA Technical Guidance – Terrestrial vertebrate fauna surveys for environmental impact assessment (EPA 2020)
- Interim Guideline for preliminary surveys of Night Parrot (*Pezoporus occidentalis*) in Western Australia (WA Department of Parks and Wildlife [DPaW] 2017).
- Survey Guidelines for Australia's Threatened Birds. EPBC Act survey guidelines 6.2 (2010) (DSEWPaC)
- National Recovery Plan for Malleefowl (*Leipoa ocellata*), Department for Environment and Heritage (Benshemesh 2007).

### 2.2 Desktop Assessment

Searches of the DBCA threatened fauna database, NatureMap, and the EPBC Protected Matters Search Tool (PMST) were undertaken to identify if there were records of the five species in and or near the survey area in the past (DBCA 2021a, DBCA 2021b, DAWE 2021) (Appendix 2). The DBCA threatened fauna search was centred on coordinates 27° 18' 32" S and 116° 01' 30" E. Originally a radial search area of 40 km was submitted to DBCA for the threatened fauna database, however, a larger buffer of 80 km was applied by DBCA in order to select a greater number of records that adequately demonstrate the potential for this species and others to occur in the search area. NatureMap and PMST database searches were centred on the same (or very similar coordinates) but with a 40 km radial search area for NatureMap (maximum search area) and 80 km for the PMST so that it aligned with the DBCA search.

### 2.3 Targeted Threatened Species Assessment

The field assessment was undertaken from the 22-26 March 2022 (this included travel to and from site) by two qualified Zoologist (Dr Ron Firth and Laura Stevens). The following survey methods were undertaken in the project area.

#### 2.3.1 Western Spiny-tailed Skink Assessment

The targeted Western Spiny-tailed Skink (Skink) survey involved looking for suitable habitat in the survey area. Typical habitat includes isolated stands of granite boulders or more extensive clusters of rock that have crevices and cracks present. We also looked for latrine sites which are piles of faecal droppings that are placed outside of refuges. We also placed out 10 camera traps and bait stations (for four nights), including three in rocky areas (see Plate 1 below). Camera traps had universal bait (peanut butter, sardines, oats and water) placed in bait stations in the cameras field of view (approximately 1.5 m away).





**Plate 1.** An example of a camera trap setup in Rocky Mulga Shrubland in the survey area (camera is in the foreground and the bait station in the background).

### **2.3.2 Malleefowl Survey Assessment**

Prior to the field assessment, the original intent was to walk a series of systematic transects across the survey area looking for Malleefowl and their signs (i.e., nesting mounds and or tracks) if suitable Malleefowl habitat was deemed present. However, when the survey area was visited it was considered unsuitable for Malleefowl (see Results and Discussion sections below). As a consequence, a number of photo points (and habitat assessments) were taken in the survey area to illustrate the broad habitats present (these areas were visited on foot).

### **2.3.3 Night Parrot Assessment**

The Night Parrot preliminary survey methods undertaken in the project area were consistent with relevant guidelines where relevant and practical and were as follows:

- Two Song Meter 4 (SM4) acoustic recording units (ARUs) were placed out for four nights at two locations in the survey area (see Plate 2 below)
- Any recordings on the ARUs were analysed by Bob Bullen (Bat Call WA).

### **2.3.4 Long-tailed Dunnart Assessment**

The targeted Long-tailed Dunnart (Dunnart) survey involved looking for animals in suitable habitat in the survey area. Suitable habitat for the Long-tailed Dunnart is considered more likely to be found in rocky areas. We placed out 10 camera traps and bait stations (for four nights), including three in rocky areas (see Plate 1 above). Camera traps had universal bait (peanut butter, sardines, oats and water) placed in bait stations in the cameras field of view (approximately 1.5 m away).



Plate 2. Example of an SM4 setup in the survey area to detect the calls of the Night Parrot.

### 2.3.5 Northern Shield-backed Trapdoor Spider Assessment

The targeted Northern Shield-backed Trapdoor Spider (Spider) assessment involved looking for the distinctive burrows (the burrow has two tufts of leaf litter radiating out from the centre of the burrow rim, similar to a moustache) in suitable habitat, which is likely to be on the edge of leaf litter or within leaf litter. Suitable habitat for this species appears to be near drainage lines under Acacia vegetation (e.g., Mulga), on plains, low slopes or on rocky slopes with a variety of soils types (dominated by clay and rocks, or clay, sand and rocks). Most burrow sites also appear to be placed in areas with considerable litter (vegetative litter).

## 2.3 Habitat Assessment

A number of habitat assessments were undertaken throughout the project area to define and delineate the main broad habitat types present. The habitat assessment included an evaluation of the potential for habitats to support the five species of conservation significance being examined during the field survey.

Each habitat description includes the following information where relevant:

- GPS co-ordinate will be recorded
- habitat condition will be assessed as 'completely degraded through to pristine, based on the scale given in Keighery (1994)
- landscape position
- dominant vegetation and structure e.g., number of vegetation strata
- hollow-bearing trees and dead stags (e.g., average size and abundance of hollows – should they be present)
- description of any rock and rocky outcrops

- logs (e.g., abundance and size)
- substrate (e.g., leaf litter)
- wetlands, creeks, rivers, dams and other water bodies
- description of any observed nests and roosts
- associated fauna species observed using the habitat
- disturbance e.g., cattle grazing, fire, and historic mining.



### 3. Results

#### 3.1 Fauna Survey limitations

Survey limitations are sometimes difficult to predict prior to undertaking an assessment, as is the extent to which they influence survey effort and results. Broad limitations that might have impacted the survey are outlined below in Table 1.

**Table 1. Broad limitations that might have impacted the survey.**

Limitations	Impact on the assessment
Qualifications and survey experience	The Zoologists that undertook the survey are qualified and experienced and have undertaken numerous targeted surveys for the species being examined in this report. Dr Ron Firth has over 20 years of experience designing, managing and undertaking biodiversity and ecological surveys throughout Western Australia, the Northern Territory, Queensland, New South Wales and Victoria. He has written over 100 consultant reports and has authored or co-authored 15 papers that have been published in peer reviewed scientific journals and has made other contributions to published Books. Laura Stevens has over nine years of experience undertaking fauna surveys in WA and has written more than 25 consultant reports. Therefore, no perceived limitations associated with qualifications and experience.
Timing - Weather, season	The field assessment was undertaken from the 22-26 March 2022 at Woolbung Peak. The survey was primarily a targeted assessment of five species (Western Spiny-tailed Skink, Malleefowl, Night Parrot, Long-tailed Dunnart and Western Shield-backed Trapdoor Spider) that are active all year (or their signs can be detected), consequently, weather and season are not deemed a prime consideration.
Scope - Life forms sampled	The primary objective of the assessment was to undertake a targeted survey and broadly describe fauna habitats and this was achieved.
Sources of information	Sources of information included the DBCA threatened fauna database search with a search radius of 80 km centred on the survey area (DBCA 2021a), NatureMap (40 km search radius) and the EPBC Protected Matters Search Tool (EPBC PMST) with an 80 km search radius (DBCA 2021b, DAWE 2021). Other sources of local information included past surveys undertaken in the project area (Western Ecological 2021).
Completeness	The main objective of the survey was to undertake a targeted assessment for the Skink, Malleefowl, Night Parrot, Dunnart and Spider, and to broadly describe the habitats present in the survey area, and this was achieved.
Disturbance	Disturbance in some sections of the survey area is primarily a result of exploration activity (some vegetation clearing for exploration drill lines and drill pads, access tracks), and pastoral activity over a long period of time i.e., cattle and their tracks and scats.

#### 3.2 Database Search Results

Results of the three databases searches can be seen in Appendix 2. Four of the threatened species being targeted were present in the DBCA threatened fauna database, part from the Night Parrot. Whereas only the Skink was present in the NatureMap search, while the Skink, Malleefowl, and Night Parrot were present in the PMST.

It is important to note that the PMST is not entirely based on point records, but also on broader information, including bioclimatic distribution models, whereas the DBCA threatened fauna database and NatureMap are based on point records. Consequently, the results of the PMST are in some cases less accurate, particularly at a local scale. As a result, the PMST can include species that do not occur in the survey area because, for example, there is no habitat available or they are now known to be locally extinct. In addition, fauna is not distributed evenly across the landscape, are more abundant in some places than others, and consequently more detectable (Currie 2007).

It is important to note that several other species of conservation significance were present in the database searches, however, these species are considered not to occur in the survey area because there is no habitat e.g., no wetland habitat for waterbird species such as lakes (permanent or ephemeral) or large watercourses with permanent water, or even ephemeral water courses that would hold substantial water. However, for clarity all records present in the DBCA threatened fauna database have been illustrated (see Figure 2 below).



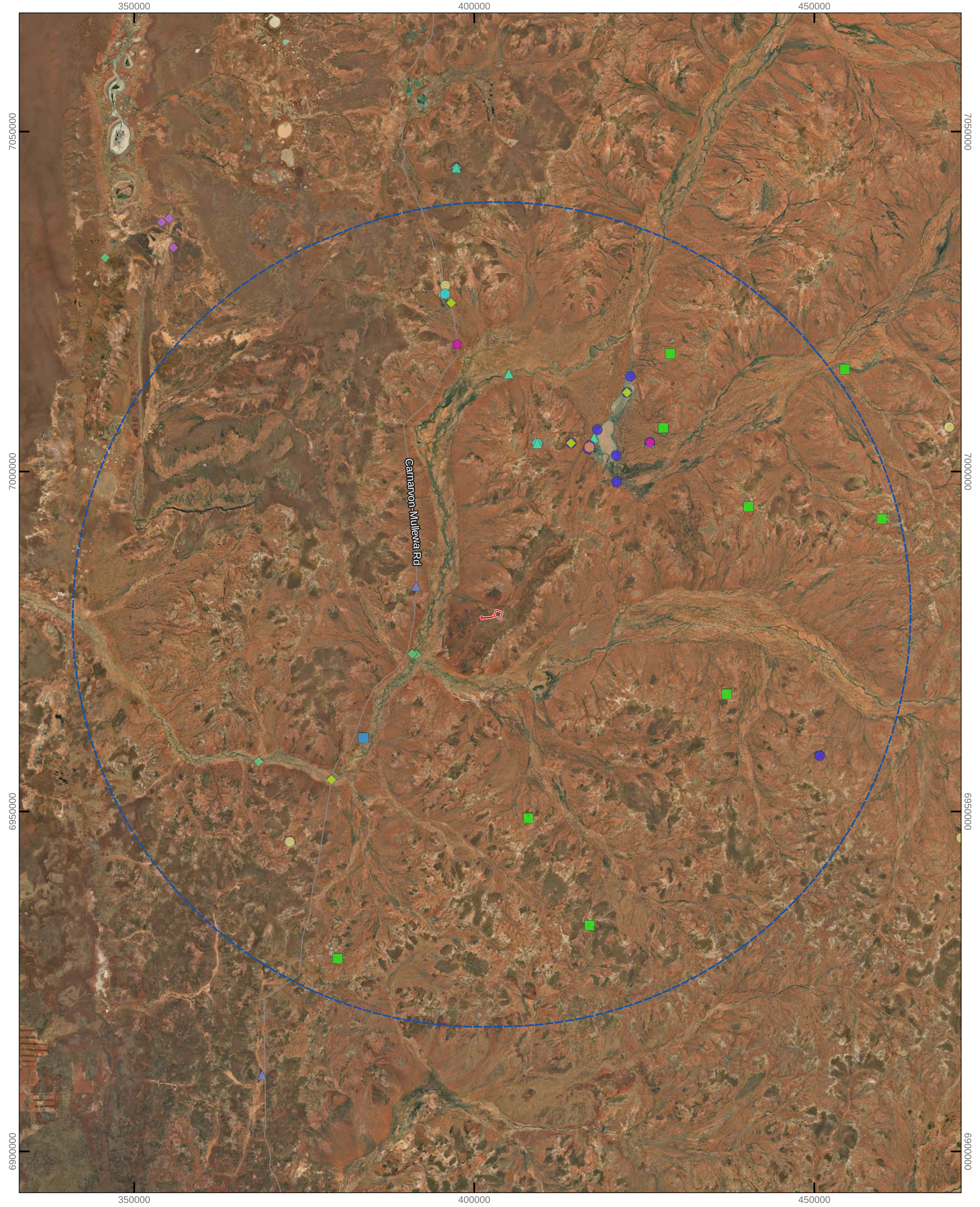
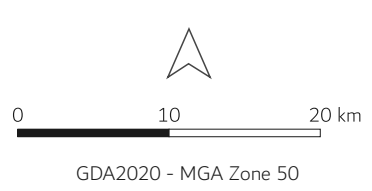


Figure 2: DBCA Threatened Fauna Database Records



- |                              |                     |  |                                |
|------------------------------|---------------------|--|--------------------------------|
| <b>DBCA Threatened Fauna</b> | Gull-billed Tern    | Northern Shield-backed Trapdoor Spider | White-winged Black Tern        |
| Australian Painted Snipe     | Long-tailed Dunnart | Peregrine Falcon                       | Wood Sandpiper                 |
| Common Greenshank            | Long-toed Stint     | Red-necked Stint                       | <b>Survey Area</b>             |
| Curlew Sandpiper             | Malleefowl          | Sharp-tailed Sandpiper                 | <b>60km Survey Area Buffer</b> |
| Glossy Ibis                  | Marsh Sandpiper     | Western Spiny-tailed Skink             |                                |







### 3.3 Field Survey Results

#### 3.3.1 Western Spiny-tailed Skink

During the assessment no Skinks were recorded on the cameras that were placed in rocky habitat. Also, no scats or latrines sites were observed while searching and traversing rocky habitat in the survey area (Figure 3).

#### 3.3.2 Malleefowl

As already mentioned in the methods section above, the habitats in the survey area were unsuitable for Malleefowl (see Appendix 3). This was further confirmed by the absence of Malleefowl and their signs such as nesting mounds and tracks. While traversing the survey area on foot we documented the habitat and its lack of suitability for the Malleefowl within the survey area by undertaking habitat assessments and by taking a number of photos at 16 points, including eight in 2021 and eight in 2022 (see Figure 3, Appendix 3 and 4) (Western Ecological 2021). The survey area consisted broadly of very open Mulga Shrubland on a very rocky (small area of outcropping banded ironstone) to a rocky substrate on relatively gentle slopes and open areas that are relatively flat with little vegetation cover (see plates one to 16 in Appendix 4).

#### 3.3.3 Night Parrot

No Night Parrot calls were recorded on the two SM4s that were placed out in the survey area (Figure 3). There is no suitable habitat for Night Parrots in the survey area (see habitat section results and the discussion sections below) (Appendix 3 and 4).

#### 3.3.4 Long-tailed Dunnart

No Long-tailed Dunnarts were recorded on the camera traps that were placed in rocky habitat during the survey and no signs such as scats were observed.

#### 3.3.5 Northern Shield-backed Trapdoor Spider

While walking in the survey area during the assessment, the distinctive burrows of the Spider were not observed in areas where leaf litter was present, including under Acacia trees and shrubs. Noting that suitable habitat as just mentioned appears to be limited.

### 3.4 Fauna Habitat

During the field survey two broad fauna habitats were described and these were Rocky Mulga Shrubland and Scattered Mulga Shrubland (Figure 3, Appendix 3 and 4). Mulga was the dominant flora species in the canopy across much of the survey area and these two broad habitat types were for the most part differentiated by where they were in the landscape i.e., the small rocky outcrop of banded ironstone and the remaining areas on low slopes and flats. Vegetation cover was sparse throughout the survey area.

These two habitat types are relatively widespread and common in areas adjacent to the project area and, more broadly, across the region. The extent of each habitat type in the survey area is presented below in Table 2 (note that there has been some very minor rounding of the numbers).

**Table 2. Fauna habitat type and extent in the survey area.**

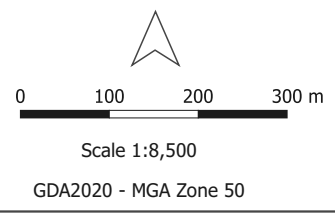
Broad Habitat Type	Habitat Extent in the Project Area (ha)	Habitat Extent in the Project Area (%)
Scattered Mulga Shrubland	110	88.7
Rocky Mulga Shrubland	14	11.3
<b>Total</b>	<b>124</b>	<b>100</b>

Of the two broad habitat types, Scattered Mulga Shrubland is by far the most extensive. Habitat condition was scored as excellent at the habitat assessments sites (Appendix 3). Disturbance in the survey area is primarily a result of exploration activity (some vegetation clearing for exploration drill lines and drill pads, access tracks), and long-term pastoral activity i.e., cattle (habitat degradation as a result of grazing), their tracks and scats.





Figure 3: Fauna Habitat and Survey Assessment Sites



- Legend**
- Camera (2022 Survey)
  - Photo Point (2022 Survey)
  - SM4 (2022 Survey)
  - Tracks (2022 Survey)
  - Tracks (2021 Survey)
  - Photo Point (2021 Survey)
  - Survey Area
  - Fauna Habitat**
  - Rocky Mulga Shrubland
  - Scattered Mulga Shrubland





## 4. Discussion

### 4.1 *Western Spiny-tailed Skink*

While conducting the assessment no Skinks were recorded on camera traps and no scats or latrine sites were recorded in the Rocky Mulga Shrubland habitat. There were 10 records (from 2006 to 2013) of this species in the DBCA threatened fauna database search within an 80 km radial search area and the closest record to the survey area was approximately 40 km south east (Figure 2).

This species occurs in several forms, including a black form that occurs in the upper Murchison, which includes the survey area and surrounds (DEC 2012). Typical the skink habitat includes isolated stands of granite boulders or more extensive clusters of rock that have crevices and cracks present, including lateritic breakaways (Dec 2012, Chapple et al. 2019). The survey area has limited areas of rocky habitat in the form of banded ironstone where there are limited cracks and crevices in which it could shelter. Given the lack of suitable habitat in the survey area this species is considered highly unlikely to occur.

### 4.2 *Malleefowl*

During the assessment of the survey area no Malleefowl were sighted, nor were their mounds or tracks. The DBCA threatened fauna database search returned just two records of the Malleefowl within an 80 km radial search area and the closest record to the survey area was approximately 12.5 km north west (Figure 2).

The habitats present in the survey area are unsuitable because they are too rocky and open and have very little to no vegetation cover in the upper storey for Malleefowl to build their mounds. Malleefowl prefer habitat with a dense canopy and an open ground layer in which they can construct their mounds (Benshemesh 2007). Benshemesh (1992) also found that dense canopy cover was the most important feature associated with high breeding densities at sites in Victoria. There are also very few to no shrub species in the midstorey habitats of the survey area which might provide a food source. Studies have also shown that a wide range of food shrubs, rather than an abundance of any one species is probably important for Malleefowl during for example droughts (Harlen & Priddel 1996). This is supported by studies showing that Malleefowl are more abundant in areas where shrubs are more diverse (Woinarski 1989). These birds also have a relatively large home range that can be up to 4 km<sup>2</sup> in low rainfall areas (Booth 1987).

This current assessment has demonstrated that there is an absence of suitable habitat in the survey area and close by for Malleefowl to construct their mounds, or to forage in, therefore the likelihood of Malleefowl occurring in the survey area is considered highly unlikely.

### 4.3 *Night Parrot*

The Night Parrot is an enigmatic species thought possibly to be extinct until the recent recoveries of two dead specimens from Queensland (and new locations more recently). The type specimen and many early sightings, however, came from WA (Johnstone et al. 2013). Night Parrots are cryptic, nocturnal and endemic to Australia's arid interior. Until the late 19th century, they were widespread and relatively easily found at least at some locations. For instance, 14 of the 25 museum specimens in existence came from the Gawler Ranges in South Australia between 1871 and 1881 (Murphy et al. 2017). The last Night Parrot collected intentionally was in Western Australia in 1912 (Wilson 1937). Then followed 78 years of unconfirmed reports spanning all mainland states and the Northern Territory, until in 1990 a desiccated bird was found by a roadside in western Queensland (Boles et al. 1994, Murphy et al. 2017). In 2006, another dead bird was discovered by a Ranger 200 km to the south-east of the 1990 specimen (McDougall et al. 2009, Murphy et al. 2017). In 2013, the first photographs of a living night parrot were captured close to the site of the 2006 specimen (Dooley 2013, Murphy et al. 2017). Their cryptic nature, remote distribution and apparently rapid decline means that there is scant ecological information about night parrots.

A more recent sighting of the Night Parrot in WA comes from the Pilbara (12 April 2005) at a well near the Fortescue Marshes (Davis & Metcalf 2008). There was also a sighting near Matuwa (Lorna Glen), which is about 160 km north-east of Wiluna, in 2009 (Hamilton et al. 2017).

This species was present only in the PMST database (there were no records in the DBCA threatened fauna database or NatureMap), and there are limitations with this PMST as outlined above in section 3.2. None of their calls were recorded on the SM4s. There is very limited ecological information available for this species such as its preferred habitat (only very broad information). However, with increasing conservation focus being given to this species, more information is likely to become available, e.g., the discovery of Night Parrot nests in large Spinifex hummocks in Queensland (Murphy *et al.* 2017) which is a common and widespread habitat type throughout much of south-east Queensland and WA. There is no suitable habitat in the form of large spinifex hummocks in the survey area, as a result this species is highly unlikely to occur in the survey area.

#### **4.4 Long-tailed Dunnart**

Records of the Long-tailed Dunnart come from widely scattered localities in the arid zone where it inhabits rugged, rocky areas. Little is known of the life history of long-tailed dunnarts, but available evidence suggests that this widely scattered species is restricted to rugged, rocky areas (Burbidge et al. 2008). Habitat includes plateaus composed of boulders and stones, with fine red sand sparsely vegetated with Mulga and miniritchie (*Acacia sp.*) shrubs over spinifex and areas of open woodland of Mulga (Van Dyck & Strahan 2008, Woinarski et al. 2014). The striated foot-pad and long strongly muscular tail of the Long-tailed Dunnart suggest it is an active and capable climber.

There were four records (from 2003 to 2010) of this species in the DBCA threatened fauna database search within an 80 km radial search area, and the closest records to the survey area are more than 60 km north west (Figure 2).

The survey area has limited areas of rocky habitat in the form of banded ironstone where there are limited cracks and crevices in which this species could shelter. Further to this there is no suitable habitat in the form of rugged rocky ridges. Given this the species is unlikely to occur in the survey area.

#### **4.5 Northern Shield-backed Trapdoor Spider**

Suitable habitat for this species appears to be near drainage lines under Acacia vegetation (e.g., Mulga), on plains, low slopes or on rocky slopes with a variety of soils types (dominated by clay and rocks, or clay, sand and rocks). Most burrow sites also appear to be placed in areas with considerable litter (vegetative litter).

There were 28 records (from 2010 to 2014) of this species in the DBCA threatened fauna database search within an 80 km radial search area, and the closest records to the survey area are approximately 45 km south west (Figure 2).

There is some limited suitable habitat present in the survey area i.e., limited areas with leaf litter under some of the Acacia trees and shrubs that are on plains, low slopes or on rocky slopes. However, during the assessment the species distinctive burrow entrance with its two tufts of leaf litter radiating out from the centre of the burrow rim, similar to a moustache were not observed. Given this the species is unlikely to occur in the survey area.



## 5. References

- Benshemesh, J. (1992). The conservation ecology of Malleefowl, with particular regard to fire. Pages 1-224. Monash University, Clayton.
- Boles W. E., Longmore N. W. & Thompson M. C. (1994). A recent specimen of the Night Parrot *Geopsittacus occidentalis*. *Emu* 94, 37–40.
- Booth, D. T. (1987). Home range and hatching success of Malleefowl, *Leipoa ocellata* Gould (Megapodiidae), in Murray mallee near Renmark, S.A. *Australian Wildlife Research* 14, 95-104.
- Burbidge, A. A., McKenzie, N. L. & Fuller, P. J. (2008). Long-tailed Dunnart, *Sminthopsis longicaudata*. In: Van Dyck, S. & R. Strahan (eds), *The mammals of Australia*. Third Edition, pp. 148-150. Reed New Holland, Sydney.
- Chapple, D.G., Tingley, R., Mitchell, N.J., Macdonald, S.L., Keogh, J.S., Shea, G.M., Bowles, P., Cox, N.A. & Woinarski, J.C.Z. (2019). *The Action Plan for Australia Lizards and Snakes 2017*.
- Currie, D. J. (2007). Disentangling the roles of environment and space in ecology. *Journal of Biogeography* 34, 2009-2011.
- Davis, R., & Metcalf, B. (2008). The night parrot (*Pezoporus occidentalis*) in northern Western Australia: a recent sighting from the Pilbara region. *Emu* 108, 233-236.
- Department of Biodiversity, Conservation and Attractions (DBCA) (2021a). Threatened and Priority Fauna Information (custom search).
- Department of Biodiversity, Conservation and Attractions (DBCA) (2021b). NatureMap: Mapping Western Australia's Biodiversity. Retrieved from <https://naturemap.dbca.wa.gov.au>
- Department of Environment and Conservation (2012). Western Spiny-tailed Skink *Egernia stokesii* Recovery Plan. Department of Environment and Conservation, Perth, WA.
- Department of Agriculture, Water and the Environment (DAWE) (2021). Protected Matters Search Tool, Accessed from <<http://www.environment.gov.au/epbc/pmst/index.html>> Commonwealth of Australia.
- Department of Parks and Wildlife (DPAW 2017). Interim guideline for preliminary surveys of Night Parrot (*Pezoporus occidentalis*) in Western Australia. Version 1 – May 2017.
- Dooley S. (2013). Out of the shadows. *Australian Birdlife* 2, 26–30.
- Hamilton, N., A., Onus, M., Withnell, B. & Withnell K. (2017). Recent sightings of the Night Parrot *Pezoporus occidentalis* from Matuwa (Lorna Glen) and Millrose Station in Western Australia. *Australian Field Ornithology* 34, 71-75.
- Harlen, R., & D. Priddel. (1996). Potential food resources available to malleefowl *Leipoa ocellata* in marginal mallee lands during drought. *Australian Journal of Ecology* 21, 418-428.
- Johnstone, R. E., Burbidge, A. H., & Darnell, J. C. (2013). Birds of the Pilbara region, including seas and offshore islands, Western Australia: distribution, status and historical changes. *Records of the Western Australian Museum Supplement* 78, 343–441.
- McDougall, A., Porter G., Mostert M. et al. (2009). Another piece in an Australian ornithological puzzle – a second Night Parrot is found dead in Queensland. *Emu* 109, 198–203.
- Murphy, S.A., Silcock, J., Murphy, R., Reid, J., and Austin, J.J. (2017). Movements and habitat use of the night parrot *Pezoporus occidentalis* in south-western Queensland. *Austral Ecology* 42, 858-868.
- Van Dyck, S., & Strahan, R. (2008). *The Mammals of Australia*. New South Wales: New Holland Publishers.
- Western Ecological (2021). Malleefowl Assessment Woolbung Peak. Report prepared for 10M Pty Ltd, October 2021.
- Wilson, H. (1937) Notes on the Night Parrot, with references to recent occurrences. *Emu* 37, 79–87.



Prepared for 10M Pty Ltd

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Woinarski, J. C. Z. (1989). The vertebrate fauna of Broombush *Melaleuca uncinata* vegetation in north-western Victoria, with reference to effects of broombush harvesting. *Australian Wildlife Research* 16, 217-238.

Woinarski, J. C.Z. Burbidge, A. A., & Harrison, P. L. (2014). *The action plan for Australian Mammals 2012*. CSIRO Publishing.



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# **APPENDICES**





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## ***Appendix 1: Conservation Categories***



### Categories of Threatened Fauna Species under the EPBC Act.

Conservation Code	Description
<b>Ex</b>	Extinct Taxa which at a particular time if, at the time, there is no reasonable doubt that the last member of the species has died.
<b>ExW</b>	Extinct in the Wild Taxa which are known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or it has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.
<b>Cr</b>	Critically Endangered Taxa which at a particular time, it is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.
<b>En</b>	Endangered Taxa which is not critically endangered and it is facing a very high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.
<b>Vu</b>	Vulnerable Taxa which is not critically endangered or endangered and is facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.

Source: Environment Protection and Biodiversity Conservation Act 1999.



# 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).



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## ***Appendix 2: Database Searches***



SCI_NAME	COM_NAME	CLASS	WA_LISTING	WA_status	EPBStatus	Date	DAY	MONTH	YEAR	SOURCE_ID	SOURCE	CERTAINTY	OBS_METHOD	OBS_TYPE	COUNT	LOCALITY	SITE	ACCURACY_M	LONG_GDA	LAT_GDA	NAME_ID	FAMILY	GENUS	SPECIES	SUBSPECIES	KINGDOM
Tringa stagnatilis	Marsh sandpiper, little greenshank	BIRD	Specially Protected - m MI	MI		29/09/2012	29	9	2012	1265918 159	BIRDATA				0	Billabalong Station-f	Billabalong Station-f	0	115.8231000000	-27.4708000000	24809	Scolopacidae	Tringa	stagnatilis		Animalia
Falco peregrinus	Peregrine falcon	BIRD	Specially Protected - ot OS	MI		7/10/2012	7	10	2012	1280914 237	BIRDATA				0	Muggon Stn-Bungar	Muggon Stn-Bungar	0	115.7747000000	-27.5258000000	25624	Falconidae	Falco	peregrinus		Animalia
Tringa nebularia	Common greenshank, greenshank	BIRD	Specially Protected - m MI	MI		9/07/2012	9	7	2012	1300194 158	BIRDATA				100	Mungawalagudi Cla	Mungawalagudi Cla	100	115.4478000000	-26.8300000000	24808	Scolopacidae	Tringa	nebularia		Animalia
Plegadis falcinellus	Glossy ibis	BIRD	Specially Protected - m MI	MI		8/10/2013	8	10	2013	1312166 178	BIRDATA				0	Meeberrie st. The cr	Meeberrie st. The cr	0	116.0431000000	-26.9892000000	24843	Threskiornithidae	Plegadis	falcinellus		Animalia
Falco peregrinus	Peregrine falcon	BIRD	Specially Protected - ot OS	MI		2/09/2015	2	9	2015	1328376 237	BIRDATA				0	Murchison Settlement	Murchison Settlement	0	115.9589000000	-26.8947000000	25624	Falconidae	Falco	peregrinus		Animalia
Tringa nebularia	Common greenshank, greenshank	BIRD	Specially Protected - m MI	MI		22/08/2016	22	8	2016	1377116 158	BIRDATA				0	Murchison R Twin P	Murchison R Twin P	0	115.9022000000	-27.3608000000	24808	Scolopacidae	Tringa	nebularia		Animalia
Tringa nebularia	Common greenshank, greenshank	BIRD	Specially Protected - m MI	MI		22/08/2016	22	8	2016	1817754 158	BIRDATA				0	Murchison River, Tv	Murchison River, Tv	0	115.8971000000	-27.3600000000	24808	Scolopacidae	Tringa	nebularia		Animalia
Gelochelidon nilotica	Gull-billed tern	BIRD	Specially Protected - m MI	MI		5/10/1980	5	10	1980	107497 111	BIRDATLAS1				0			108000	116.5014000000	-27.4987000000	47954	Sturnidae	Gelochelidon	nilotica		Animalia
Gelochelidon nilotica	Gull-billed tern	BIRD	Specially Protected - m MI	MI		28/09/1980	28	9	1980	107498 111	BIRDATLAS1				0			18000	116.0847000000	-27.0821000000	47954	Sturnidae	Gelochelidon	nilotica		Animalia
Plegadis falcinellus	Glossy ibis	BIRD	Specially Protected - m MI	MI		28/09/1980	28	9	1980	107498 178	BIRDATLAS1				0	MURCHISON	MURCHISON	18000	116.0847000000	-27.0821000000	24843	Threskiornithidae	Plegadis	falcinellus		Animalia
Gelochelidon nilotica	Gull-billed tern	BIRD	Specially Protected - m MI	MI		9/09/1981	9	9	1981	141531 111	BIRDATLAS1				0			18000	116.0847000000	-27.0821000000	47954	Sturnidae	Gelochelidon	nilotica		Animalia
Tringa nebularia	Common greenshank, greenshank	BIRD	Specially Protected - m MI	MI		9/09/1981	9	9	1981	141531 158	BIRDATLAS1				0	MURCHISON	MURCHISON	18000	116.0847000000	-27.0821000000	24808	Scolopacidae	Tringa	nebularia		Animalia
Gelochelidon nilotica	Gull-billed tern	BIRD	Specially Protected - m MI	MI		5/09/1978	5	9	1978	44129 111	BIRDATLAS1				0			18000	116.2514000000	-27.0821000000	47954	Sturnidae	Gelochelidon	nilotica		Animalia
Gelochelidon nilotica	Gull-billed tern	BIRD	Specially Protected - m MI	MI		26/08/1978	26	8	1978	44130 111	BIRDATLAS1				0			18000	116.2514000000	-27.0821000000	47954	Sturnidae	Gelochelidon	nilotica		Animalia
Tringa glareola	Wood sandpiper	BIRD	Specially Protected - m MI	MI		26/08/1978	26	8	1978	44130 154	BIRDATLAS1				0	MURCHISON	MURCHISON	18000	116.2514000000	-27.0821000000	24806	Scolopacidae	Tringa	glareola		Animalia
Calidris ferruginea	curlew sandpiper	BIRD	Threatened - Critically CR	CR		26/08/1978	26	8	1978	44130 161	BIRDATLAS1				0	MURCHISON	MURCHISON	18000	116.2514000000	-27.0821000000	24784	Scolopacidae	Calidris	ferruginea		Animalia
Calidris acuminata	Sharp-tailed sandpiper	BIRD	Specially Protected - m MI	MI		26/08/1978	26	8	1978	44130 163	BIRDATLAS1				0	MURCHISON	MURCHISON	18000	116.2514000000	-27.0821000000	24779	Scolopacidae	Calidris	acuminata		Animalia
Plegadis falcinellus	Glossy ibis	BIRD	Specially Protected - m MI	MI		26/08/1978	26	8	1978	44130 178	BIRDATLAS1				0	MURCHISON	MURCHISON	18000	116.2514000000	-27.0821000000	24843	Threskiornithidae	Plegadis	falcinellus		Animalia
Calidris subminuta	Long-toed Stint	BIRD	Specially Protected - m MI	MI		26/08/1978	26	8	1978	44130 965	BIRDATLAS1				0	MURCHISON	MURCHISON	18000	116.2514000000	-27.0821000000	24789	Scolopacidae	Calidris	subminuta		Animalia
Gelochelidon nilotica	Gull-billed tern	BIRD	Specially Protected - m MI	MI		8/09/1978	8	9	1978	44131 111	BIRDATLAS1				0			108000	116.5014000000	-27.4987000000	47954	Sturnidae	Gelochelidon	nilotica		Animalia
Chlidonias leucopterus	White-winged black tern, white-winged tern	BIRD	Specially Protected - m MI	MI		10/08/1978	10	8	1978	44132 109	BIRDATLAS1				0	MURCHISON	MURCHISON	18000	116.0847000000	-27.0821000000	41332	Laridae	Chlidonias	leucopterus		Animalia
Gelochelidon nilotica	Gull-billed tern	BIRD	Specially Protected - m MI	MI		10/08/1978	10	8	1978	44132 111	BIRDATLAS1				0			18000	116.0847000000	-27.0821000000	47954	Sturnidae	Gelochelidon	nilotica		Animalia
Calidris ruficollis	Red-necked stint	BIRD	Specially Protected - m MI	MI		10/08/1978	10	8	1978	44132 162	BIRDATLAS1				0	MURCHISON	MURCHISON	18000	116.0847000000	-27.0821000000	24788	Scolopacidae	Calidris	ruficollis		Animalia
Gelochelidon nilotica	Gull-billed tern	BIRD	Specially Protected - m MI	MI		25/08/1978	25	8	1978	44134 111	BIRDATLAS1				0			18000	116.2514000000	-27.0821000000	47954	Sturnidae	Gelochelidon	nilotica		Animalia
Tringa glareola	Wood sandpiper	BIRD	Specially Protected - m MI	MI		25/08/1978	25	8	1978	44134 154	BIRDATLAS1				0	MURCHISON	MURCHISON	18000	116.2514000000	-27.0821000000	24806	Scolopacidae	Tringa	glareola		Animalia
Calidris ferruginea	curlew sandpiper	BIRD	Threatened - Critically CR	CR		25/08/1978	25	8	1978	44134 161	BIRDATLAS1				0	MURCHISON	MURCHISON	18000	116.2514000000	-27.0821000000	24784	Scolopacidae	Calidris	ferruginea		Animalia
Plegadis falcinellus	Glossy ibis	BIRD	Specially Protected - m MI	MI		25/08/1978	25	8	1978	44134 178	BIRDATLAS1				0	MURCHISON	MURCHISON	18000	116.2514000000	-27.0821000000	24843	Threskiornithidae	Plegadis	falcinellus		Animalia
Calidris subminuta	Long-toed Stint	BIRD	Specially Protected - m MI	MI		25/08/1978	25	8	1978	44134 965	BIRDATLAS1				0	MURCHISON	MURCHISON	18000	116.2514000000	-27.0821000000	24789	Scolopacidae	Calidris	subminuta		Animalia
Gelochelidon nilotica	Gull-billed tern	BIRD	Specially Protected - m MI	MI		8/10/1978	8	10	1978	52625 111	BIRDATLAS1				0			18000	116.0847000000	-27.0821000000	47954	Sturnidae	Gelochelidon	nilotica		Animalia
Calidris acuminata	Sharp-tailed sandpiper	BIRD	Specially Protected - m MI	MI		8/10/1978	8	10	1978	52625 163	BIRDATLAS1				0	MURCHISON	MURCHISON	18000	116.0847000000	-27.0821000000	24779	Scolopacidae	Calidris	acuminata		Animalia
Plegadis falcinellus	Glossy ibis	BIRD	Specially Protected - m MI	MI		8/10/1978	8	10	1978	52625 178	BIRDATLAS1				0	MURCHISON	MURCHISON	18000	116.0847000000	-27.0821000000	24843	Threskiornithidae	Plegadis	falcinellus		Animalia
Chlidonias leucopterus	White-winged black tern, white-winged tern	BIRD	Specially Protected - m MI	MI		8/10/1978	8	10	1978	54306 109	BIRDATLAS1				0	MURCHISON	MURCHISON	18000	116.0847000000	-27.0821000000	41332	Laridae	Chlidonias	leucopterus		Animalia
Gelochelidon nilotica	Gull-billed tern	BIRD	Specially Protected - m MI	MI		8/10/1978	8	10	1978	54306 111	BIRDATLAS1				0			18000	116.0847000000	-27.0821000000	47954	Sturnidae	Gelochelidon	nilotica		Animalia
Calidris acuminata	Sharp-tailed sandpiper	BIRD	Specially Protected - m MI	MI		8/10/1978	8	10	1978	54306 163	BIRDATLAS1				0	MURCHISON	MURCHISON	18000	116.0847000000	-27.0821000000	24779	Scolopacidae	Calidris	acuminata		Animalia
Plegadis falcinellus	Glossy ibis	BIRD	Specially Protected - m MI	MI		8/10/1978	8	10	1978	54306 178	BIRDATLAS1				0	MURCHISON	MURCHISON	18000	116.0847000000	-27.0821000000	24843	Threskiornithidae	Plegadis	falcinellus		Animalia
Plegadis falcinellus	Glossy ibis	BIRD	Specially Protected - m MI	MI		19/10/2000	19	10	2000	127867 178	BIRDATLAS2				0	Wooleen Station	Wooleen Station	100	116.1689000000	-27.0750000000	24843	Threskiornithidae	Plegadis	falcinellus		Animalia
Gelochelidon nilotica	Gull-billed tern	BIRD	Specially Protected - m MI	MI		17/04/2001	17	4	2001	141703 111	BIRDATLAS2				0	Muggon Station Lak	Muggon Station Lak	500	115.9681000000	-26.7154000000	47954	Sturnidae	Gelochelidon	nilotica		Animalia
Tringa nebularia	Common greenshank, greenshank	BIRD	Specially Protected - m MI	MI		17/04/2001	17	4	2001	141703 158	BIRDATLAS2				0	Muggon Station Lak	Muggon Station Lak	500	115.9681000000	-26.7154000000	24808	Scolopacidae	Tringa	nebularia		Animalia
Plegadis falcinellus	Glossy ibis	BIRD	Specially Protected - m MI	MI		17/04/2001	17	4	2001	141703 178	BIRDATLAS2				0	Muggon Station Lak	Muggon Station Lak	500	115.9681000000	-26.7154000000	24843	Threskiornithidae	Plegadis	falcinellus		Animalia
Tringa nebularia	Common greenshank, greenshank	BIRD	Specially Protected - m MI	MI		14/09/2001	14	9	2001	173065 158	BIRDATLAS2				100	Murchison River, Tv	Murchison River, Tv	100	115.8967000000	-27.3598000000	24808	Scolopacidae	Tringa	nebularia		Animalia
Gelochelidon nilotica	Gull-billed tern	BIRD	Specially Protected - m MI	MI		13/07/2001	13	7	2001	295874 111	BIRDATLAS2				0	Wooleen Station	Wooleen Station	5000	116.2014000000	-27.0987000000	47954	Sturnidae	Gelochelidon	nilotica		Animalia
Gelochelidon nilotica	Gull-billed tern	BIRD	Specially Protected - m MI	MI		23/08/1999	23	8	1999	32731 111	BIRDATLAS2				0	Wooleen Lake flood	Wooleen Lake flood	0	116.1739000000	-27.0646000000	47954	Sturnidae	Gelochelidon	nilotica		Animalia
Tringa nebularia	Common greenshank, greenshank	BIRD	Specially Protected - m MI	MI		28/11/2004	28	11	2004	434663 158	BIRDATLAS2				0	Woolden Homestea	Woolden Homestea	0	116.1608000000	-27.0868000000	24808	Scolopacidae	Tringa	nebularia		Animalia
Gelochelidon nilotica	Gull-billed tern	BIRD	Specially Protected - m MI	MI		27/08/2006	27	8	2006	478805 111	BIRDATLAS2				0	Yewlands	Yewlands	0	116.2019000000	-27.1339000000	47954	Sturnidae	Gelochelidon	nilotica		Animalia
Gelochelidon nilotica	Gull-billed tern	BIRD	Specially Protected - m MI	MI		13/06/2006	13	6	2006	5003828 111	BIRDATLAS2				0	Wooleen	Wooleen	0	116.1600000000	-27.0900000000	47954	Sturnidae	Gelochelidon	nilotica		Animalia
Gelochelidon nilotica	Gull-billed tern	BIRD	Specially Protected - m MI	MI		25/08/2006	25	8	2006																	

# NatureMap Species Report

Created By Guest user on 04/10/2021

**Kingdom** Animalia  
**Current Names Only** Yes  
**Core Datasets Only** Yes  
**Method** 'By Circle'  
**Centre** 116° 01' 31" E, 27° 18' 32" S  
**Buffer** 40km  
**Group By** Species Group

Species Group	Species	Records
Amphibian	2	3
Bird	152	3476
Fish	6	27
Invertebrate	36	124
Mammal	12	34
Reptile	40	136
<b>TOTAL</b>	<b>248</b>	<b>3800</b>

Name ID	Species Name	Naturalised	Conservation Code	Endemic To Query Area
<b>Amphibian</b>				
1.	25375 <i>Cyclorana maini</i> (Sheep Frog)			
2.	25392 <i>Litoria rubella</i> (Little Red Tree Frog)			
<b>Bird</b>				
3.	24559 <i>Acanthagenys rufogularis</i> (Spiny-cheeked Honeyeater)			
4.	24260 <i>Acanthiza apicalis</i> (Broad-tailed Thornbill, Inland Thornbill)			
5.	24261 <i>Acanthiza chrysorrhoa</i> (Yellow-rumped Thornbill)			
6.	25527 <i>Acanthiza iredalei</i> (Sapphire Thornbill, Slender-billed Thornbill)			
7.	24264 <i>Acanthiza robustirostris</i> (Slaty-backed Thornbill)			
8.	24265 <i>Acanthiza uropygialis</i> (Chestnut-rumped Thornbill)			
9.	25535 <i>Accipiter cirrocephalus</i> (Collared Sparrowhawk)			
10.	25536 <i>Accipiter fasciatus</i> (Brown Goshawk)			
11.	25755 <i>Acrocephalus australis</i> (Australian Reed Warbler)			
12.	25544 <i>Aegotheles cristatus</i> (Australian Owllet-nightjar)			
13.	24310 <i>Anas castanea</i> (Chestnut Teal)			
14.	24312 <i>Anas gracilis</i> (Grey Teal)			
15.	24315 <i>Anas rhynchotis</i> (Australasian Shoveler)			
16.	24316 <i>Anas superciliosa</i> (Pacific Black Duck)			
17.	47414 <i>Anhinga novaehollandiae</i> (Australasian Darter)			
18.	25528 <i>Aphelocephala leucopsis</i> (Southern Whiteface)			
19.	24268 <i>Aphelocephala nigricincta</i> (Banded Whiteface)			
20.	24285 <i>Aquila audax</i> (Wedge-tailed Eagle)			
21.	25558 <i>Ardea ibis</i> (Cattle Egret)			
22.	25559 <i>Ardea intermedia</i> (Intermediate Egret)			
23.	41324 <i>Ardea modesta</i> (great egret, white egret)			
24.	24341 <i>Ardea pacifica</i> (White-necked Heron)			
25.	24610 <i>Ardeotis australis</i> (Australian Bustard)			
26.	25566 <i>Artamus cinereus</i> (Black-faced Woodswallow)			
27.	24355 <i>Artamus minor</i> (Little Woodswallow)			
28.	24356 <i>Artamus personatus</i> (Masked Woodswallow)			
29.	24318 <i>Aythya australis</i> (Hardhead)			
30.	<i>Barnardius zonarius</i>			
31.	24319 <i>Biziura lobata</i> (Musk Duck)			
32.	24359 <i>Burhinus grallarius</i> (Bush Stone-curlew)			
33.	24722 <i>Cacatua leadbeateri</i> (Major Mitchell's Cockatoo)			
34.	25715 <i>Cacatua roseicapilla</i> (Galah)			
35.	24725 <i>Cacatua roseicapilla</i> subsp. <i>assimilis</i> (Galah)			
36.	25716 <i>Cacatua sanguinea</i> (Little Corella)			
37.	42307 <i>Cacomantis pallidus</i> (Pallid Cuckoo)			
38.	25717 <i>Calyptrorhynchus banksii</i> (Red-tailed Black-Cockatoo)			
39.	24564 <i>Certhionyx variegatus</i> (Pied Honeyeater)			

Name ID	Species Name	Naturalised	Conservation Code	<sup>1</sup> Endemic To Query Area
40.	24377 <i>Charadrius ruficapillus</i> (Red-capped Plover)			
41.	24321 <i>Chenonetta jubata</i> (Australian Wood Duck, Wood Duck)			
42.	47909 <i>Cheramoeca leucosterna</i> (White-backed Swallow)			
43.	<i>Chroicocephalus novaehollandiae</i>			
44.	25580 <i>Cincoloma castaneothorax</i> (Chestnut-breasted Quail-thrush)			
45.	42311 <i>Cincoloma marginatum</i> (Western Quail-thrush)			
46.	24288 <i>Circus approximans</i> (Swamp Harrier)			
47.	24289 <i>Circus assimilis</i> (Spotted Harrier)			
48.	24774 <i>Cladorhynchus leucocephalus</i> (Banded Stilt)			
49.	25581 <i>Climacteris affinis</i> (White-browed Treecreeper)			
50.	25675 <i>Colluricincla harmonica</i> (Grey Shrike-thrush)			
51.	24361 <i>Coracina maxima</i> (Ground Cuckoo-shrike)			
52.	25568 <i>Coracina novaehollandiae</i> (Black-faced Cuckoo-shrike)			
53.	24362 <i>Coracina novaehollandiae</i> subsp. <i>novaehollandiae</i> (Black-faced Cuckoo-shrike)			
54.	24416 <i>Corvus bennetti</i> (Little Crow)			
55.	25592 <i>Corvus coronoides</i> (Australian Raven)			
56.	25593 <i>Corvus orru</i> (Torresian Crow)			
57.	24671 <i>Coturnix pectoralis</i> (Stubble Quail)			
58.	24420 <i>Cracticus nigrogularis</i> (Pied Butcherbird)			
59.	25595 <i>Cracticus tibicen</i> (Australian Magpie)			
60.	25596 <i>Cracticus torquatus</i> (Grey Butcherbird)			
61.	24322 <i>Cygnus atratus</i> (Black Swan)			
62.	25547 <i>Dacelo leachii</i> (Blue-winged Kookaburra)			
63.	25673 <i>Daphoenositta chrysoptera</i> (Varied Sittella)			
64.	24325 <i>Dendrocygna eytoni</i> (Plumed Whistling Duck)			
65.	25607 <i>Dicaeum hirundinaceum</i> (Mistletoebird)			
66.	24470 <i>Dromaius novaehollandiae</i> (Emu)			
67.	24650 <i>Drymodes brunneopygia</i> (Southern Scrub-robin)			
68.	<i>Egretta garzetta</i>			
69.	<i>Egretta novaehollandiae</i>			
70.	<i>Elanus axillaris</i>			
71.	47937 <i>Eileyornis melanops</i> (Black-fronted Dotterel)			
72.	<i>Eolophus roseicapillus</i>			
73.	24567 <i>Epthianura albifrons</i> (White-fronted Chat)			
74.	24568 <i>Epthianura aurifrons</i> (Orange Chat)			
75.	24570 <i>Epthianura tricolor</i> (Crimson Chat)			
76.	24379 <i>Erythronyctes cinctus</i> (Red-kneed Dotterel)			
77.	24368 <i>Eurostopodus argus</i> (Spotted Nightjar)			
78.	25621 <i>Falco berigora</i> (Brown Falcon)			
79.	25622 <i>Falco cenchroides</i> (Australian Kestrel, Nankeen Kestrel)			
80.	25623 <i>Falco longipennis</i> (Australian Hobby)			
81.	25624 <i>Falco peregrinus</i> (Peregrine Falcon)		S	
82.	25727 <i>Fulica atra</i> (Eurasian Coot)			
83.	47954 <i>Gelochelidon nilotica</i> (Gull-billed Tern)		IA	
84.	24401 <i>Geopelia cuneata</i> (Diamond Dove)			
85.	24402 <i>Geopelia humeralis</i> (Bar-shouldered Dove)			
86.	25585 <i>Geopelia striata</i> (Zebra Dove)			
87.	25530 <i>Gerygone fusca</i> (Western Gerygone)			
88.	24443 <i>Grallina cyanoleuca</i> (Magpie-lark)			
89.	24295 <i>Haliastur sphenurus</i> (Whistling Kite)			
90.	24297 <i>Hamirostra melanostemon</i> (Black-breasted Buzzard)			
91.	47965 <i>Hieraaetus morphnoides</i> (Little Eagle)			
92.	25734 <i>Himantopus himantopus</i> (Black-winged Stilt)			
93.	24491 <i>Hirundo neoxena</i> (Welcome Swallow)			
94.	25661 <i>Lichmera indistincta</i> (Brown Honeyeater)			
95.	<i>Lophochroa leadbeateri</i>			
96.	24326 <i>Malacorhynchus membranaceus</i> (Pink-eared Duck)			
97.	25651 <i>Malurus lamberti</i> (Variegated Fairy-wren)			
98.	25652 <i>Malurus leucopterus</i> (White-winged Fairy-wren)			
99.	25654 <i>Malurus splendens</i> (Splendid Fairy-wren)			
100.	24583 <i>Manorina flavigula</i> (Yellow-throated Miner)			
101.	25758 <i>Megalurus gramineus</i> (Little Grassbird)			
102.	47997 <i>Melanodryas cucullata</i> (Hooded Robin)			
103.	24736 <i>Melopsittacus undulatus</i> (Budgerigar)			
104.	24598 <i>Merops ornatus</i> (Rainbow Bee-eater)			
105.	<i>Microcarbo melanoleucos</i>			
106.	25693 <i>Microeca fascians</i> (Jacky Winter)			
107.	25542 <i>Milvus migrans</i> (Black Kite)			
108.	24738 <i>Neophema elegans</i> (Elegant Parrot)			
109.	<i>Neopsephotus bourkii</i>			



Name ID	Species Name	Naturalised	Conservation Code	<sup>1</sup> Endemic To Query Area
110.	25564 <i>Nycticorax caledonicus</i> (Rufous Night Heron)			
111.	24742 <i>Nymphicus hollandicus</i> (Cockatiel)			
112.	24407 <i>Ocyphaps lophotes</i> (Crested Pigeon)			
113.	24618 <i>Oreoica gutturalis</i> (Crested Bellbird)			
114.	25680 <i>Pachycephala rufiventris</i> (Rufous Whistler)			
115.	24627 <i>Pardalotus rubricatus</i> (Red-browed Pardalote)			
116.	25682 <i>Pardalotus striatus</i> (Striated Pardalote)			
117.	24630 <i>Pardalotus striatus</i> subsp. <i>westraliensis</i> (Striated Pardalote)			
118.	<i>Pardalotus striatus</i> subsp. <i>westraliensis</i> <i>Xmurchisoni</i>			
119.	24648 <i>Pelecanus conspicillatus</i> (Australian Pelican)			
120.	48060 <i>Petrochelidon ariel</i> (Fairy Martin)			
121.	48061 <i>Petrochelidon nigricans</i> (Tree Martin)			
122.	24659 <i>Petroica goodenovii</i> (Red-capped Robin)			
123.	25697 <i>Phalacrocorax carbo</i> (Great Cormorant)			
124.	24667 <i>Phalacrocorax sulcirostris</i> (Little Black Cormorant)			
125.	24409 <i>Phaps chalcoptera</i> (Common Bronzewing)			
126.	24841 <i>Platalea flavipes</i> (Yellow-billed Spoonbill)			
127.	24748 <i>Platycercus varius</i> (Mulga Parrot)			
128.	24843 <i>Plegadis falcinellus</i> (Glossy Ibis)		IA	
129.	25703 <i>Podargus strigoides</i> (Tawny Frogmouth)			
130.	24681 <i>Poliocephalus poliocephalus</i> (Hoary-headed Grebe)			
131.	24683 <i>Pomatostomus superciliosus</i> (White-browed Babbler)			
132.	25706 <i>Pomatostomus temporalis</i> (Grey-crowned Babbler)			
133.	24769 <i>Porzana fluminea</i> (Australian Spotted Crane)			
134.	25732 <i>Porzana pusilla</i> (Baillon's Crane)			
135.	24390 <i>Psophodes occidentalis</i> (Western Wedgebill, Chiming Wedgebill)			
136.	<i>Ptilonorhynchus guttatus</i>			
137.	42344 <i>Pumella albifrons</i> (White-fronted Honeyeater)			
138.	24278 <i>Pyrrholaemus brunneus</i> (Redthroat)			
139.	48096 <i>Rhipidura albiscapa</i> (Grey Fantail)			
140.	25614 <i>Rhipidura leucophrys</i> (Willie Wagtail)			
141.	48237 <i>Rostratula australis</i> (Australian Painted Snipe)		T	
142.	30948 <i>Smicromis brevirostris</i> (Weebill)			
143.	25590 <i>Streptopelia senegalensis</i> (Laughing Turtle-Dove)	Y		
144.	25705 <i>Tachybaptus novaehollandiae</i> (Australasian Grebe, Black-throated Grebe)			
145.	24331 <i>Tadorna tadornoides</i> (Australian Shelduck, Mountain Duck)			
146.	30870 <i>Taeniopygia guttata</i> (Zebra Finch)			
147.	24845 <i>Threskiornis spinicollis</i> (Straw-necked Ibis)			
148.	42351 <i>Todiramphus pyrrhopygius</i> (Red-backed Kingfisher)			
149.	25549 <i>Todiramphus sanctus</i> (Sacred Kingfisher)			
150.	48141 <i>Tribonyx ventralis</i> (Black-tailed Native-hen)			
151.	24808 <i>Tringa nebularia</i> (Common Greenshank, greenshank)		IA	
152.	24809 <i>Tringa stagnatilis</i> (Marsh Sandpiper, little greenshank)		IA	
153.	24851 <i>Turnix velox</i> (Little Button-quail)			
154.	24386 <i>Vanellus tricolor</i> (Banded Lapwing)			

### Fish

155.	<i>Amniataba caudavittata</i>			
156.	<i>Atherina</i> sp.			
157.	<i>Craterocephalus cuneiceps</i>			
158.	34022 <i>Hypseleotris aurea</i> (Golden Gudgeon)		P2	
159.	<i>Leiopotherapon unicolor</i>			
160.	<i>Thalassoma</i> sp.			

### Invertebrate

161.	<i>Acariformes</i> sp.			
162.	<i>Aeshnidae</i> sp.			
163.	<i>Baetidae</i> sp.			
164.	<i>Caenidae</i> sp.			
165.	<i>Ceratopogonidae</i> sp.			
166.	<i>Cherax destructor</i>			
167.	<i>Chironominae</i> sp.			
168.	<i>Coenagrionidae</i> sp.			
169.	<i>Conchostraca</i> (unident.)			
170.	<i>Corduliidae</i> sp.			
171.	<i>Corixidae</i> sp.			
172.	<i>Culicidae</i> sp.			
173.	<i>Dytiscidae</i> sp.			
174.	<i>Ecnomidae</i> sp.			
175.	<i>Ephydriidae</i> sp.			
176.	<i>Gerridae</i> sp.			

Name ID	Species Name	Naturalised	Conservation Code	<sup>1</sup> Endemic To Query Area
177.	<i>Gomphidae</i> sp.			
178.	<i>Gyrinidae</i> sp.			
179.	<i>Halipidae</i> sp.			
180.	<i>Hydraenidae</i> sp.			
181.	<i>Hydrophilidae</i> sp.			
182.	<i>Isopedella tindalei</i>			
183.	<i>Leptoceridae</i> sp.			
184.	<i>Lestidae</i> sp.			
185.	<i>Libellulidae</i> sp.			
186.	<i>Lymnaeidae</i> sp.			
187.	<i>Nephila edulis</i>			
188.	<i>Notonectidae</i> sp.			
189.	<i>Oligochaeta</i> sp.			
190.	<i>Orthoclaadiinae</i> sp.			
191.	<i>Planorbidae</i> sp.			
192.	<i>Simuliidae</i> sp.			
193.	<i>Staphylinidae</i> sp.			
194.	<i>Tanypodinae</i> sp.			
195.	<i>Tipulidae</i> sp.			
196.	<i>Urodacus armatus</i>			

### Mammal

197.	24087	<i>Antechinomys laniger</i> (Kultarr)		
198.	24251	<i>Bos taurus</i> (European Cattle)	Y	
199.	24254	<i>Camelus dromedarius</i> (Dromedary, Camel)	Y	
200.	24132	<i>Macropus fuliginosus</i> (Western Grey Kangaroo)		
201.	24136	<i>Macropus rufus</i> (Red Kangaroo, Marlu)		
202.	24224	<i>Notomys alexis</i> (Spinifex Hopping-mouse)		
203.	24142	<i>Petrogale lateralis</i> subsp. <i>lateralis</i> (Black-flanked Rock-wallaby, Black-footed Rock-wallaby)		T
204.	24106	<i>Pseudantechinus woolleyae</i> (Woolley's Pseudantechinus)		
205.	24237	<i>Pseudomys hermannsburgensis</i> (Sandy Inland Mouse)		
206.	24207	<i>Tachyglossus aculeatus</i> (Short-beaked Echidna)		
207.	24176	<i>Taphozous hillii</i> (Hill's Sheath-tail-bat)		
208.	24040	<i>Vulpes vulpes</i> (Red Fox)	Y	

### Reptile

209.	30833	<i>Amphibolurus longirostris</i> (Long-nosed Dragon)		
210.	25318	<i>Antaresia perthensis</i> (Pygmy Python)		
211.	25339	<i>Chelodina steindachneri</i> (Flat-shelled Turtle)		
212.	24873	<i>Ctenophorus fordii</i> (Mallee Sand Dragon)		
213.	25459	<i>Ctenophorus isolepis</i> (Crested Dragon, Military Dragon)		
214.	25460	<i>Ctenophorus maculatus</i> (Spotted Military Dragon)		
215.	24882	<i>Ctenophorus nuchalis</i> (Central Netted Dragon)		
216.	24883	<i>Ctenophorus ornatus</i> (Ornate Crevice-Dragon)		
217.	24886	<i>Ctenophorus reticulatus</i> (Western Netted Dragon)		
218.	24889	<i>Ctenophorus scutulatus</i> (Lozenge-marked Dragon)		
219.	25045	<i>Ctenotus helenae</i>		
220.	25052	<i>Ctenotus leonhardii</i>		
221.	25074	<i>Ctenotus schomburgkii</i>		
222.	25075	<i>Ctenotus severus</i>		
223.	25080	<i>Ctenotus uber</i> subsp. <i>uber</i> (Spotted Ctenotus)		
224.	25004	<i>Delma tinctoria</i>		
225.	24940	<i>Diplodactylus pulcher</i>		
226.	25107	<i>Egernia stokesii</i> subsp. <i>badia</i> (Western Spiny-tailed Skink, Gidgee Skink)		T
227.	25109	<i>Eremiascincus richardsonii</i> (Broad-banded Sand Swimmer)		
228.	24958	<i>Gehyra punctata</i>		
229.	24959	<i>Gehyra variegata</i>		
230.	24961	<i>Heteronotia binoei</i> (Bynoe's Gecko)		
231.		<i>Lerista kingi</i>		
232.	25151	<i>Lerista macropisthopus</i> subsp. <i>fusciceps</i>		
233.	25152	<i>Lerista macropisthopus</i> subsp. <i>galea</i>		
234.	25157	<i>Lerista nichollsi</i>		
235.	25005	<i>Lialis burtonis</i>		
236.	42415	<i>Lucasium squarrosum</i>		
237.	25184	<i>Menetia greyii</i>		
238.	24904	<i>Moloch horridus</i> (Thorny Devil)		
239.	25190	<i>Morethia butleri</i>		
240.	25253	<i>Parasuta gouldii</i>		
241.	25254	<i>Parasuta monachus</i>		
242.	42416	<i>Pseudonaja mengdeni</i> (Western Brown Snake)		

Name ID	Species Name	Naturalised	Conservation Code	<sup>1</sup> Endemic To Query Area
243.	25264 <i>Pseudonaja nuchalis</i> (Gwardar, Northern Brown Snake)			
244.	24982 <i>Rhynchoedura ornata</i> (Western Beaked Gecko)			
245.	25266 <i>Simoselaps bertholdi</i> (Jan's Banded Snake)			
246.	25269 <i>Suta fasciata</i> (Rosen's Snake)			
247.	25218 <i>Varanus gouldii</i> (Bungarra or Sand Monitor)			
248.	25223 <i>Varanus panoptes</i> subsp. <i>rubidus</i>			

**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: 03/10/21 21:23:28

[Summary](#)

[Details](#)

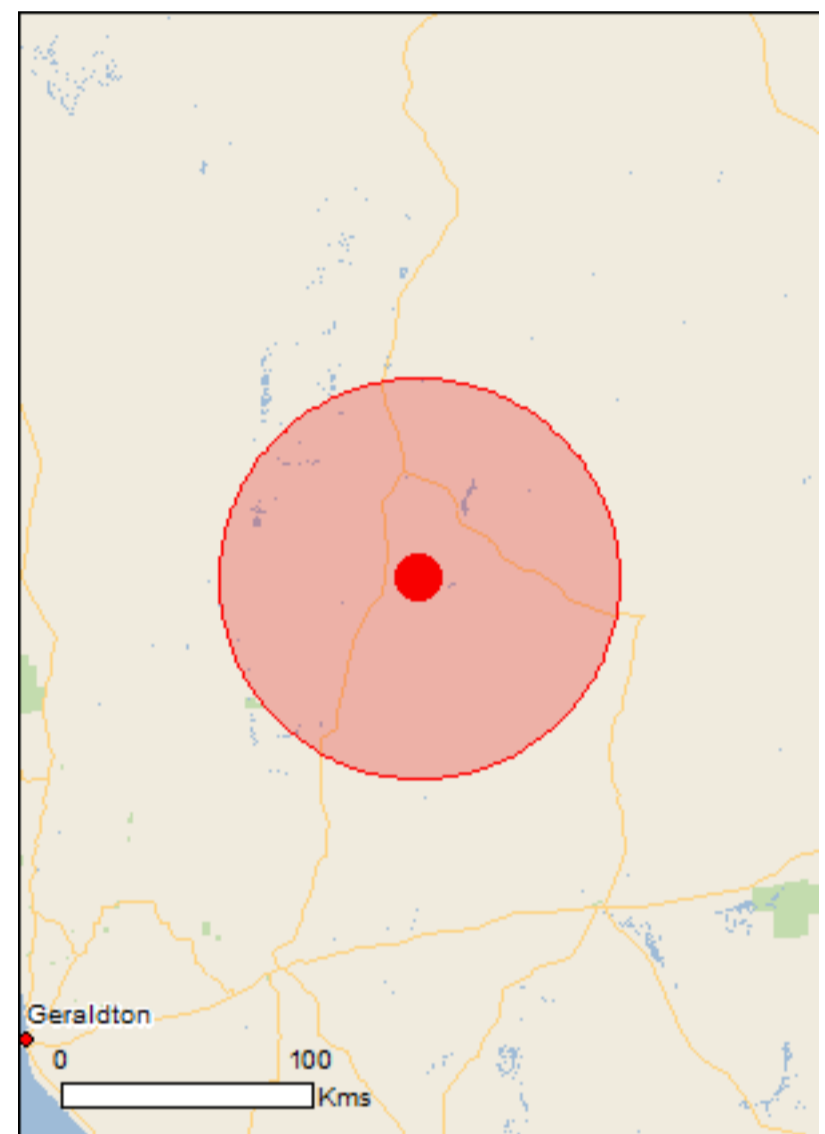
[Matters of NES](#)

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

[Extra Information](#)

[Caveat](#)

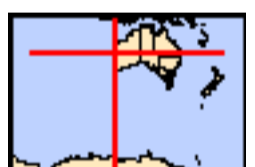
[Acknowledgements](#)



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

Buffer: 80.0Km



# 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>	None
<a href="#">Listed Threatened Species:</a>	10
<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>	None
<a href="#">Commonwealth Heritage Places:</a>	None
<a href="#">Listed Marine Species:</a>	11
<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>	4
<a href="#">Regional Forest Agreements:</a>	None
<a href="#">Invasive Species:</a>	13
<a href="#">Nationally Important Wetlands:</a>	1
<a href="#">Key Ecological Features (Marine)</a>	None

# Details

## Matters of National Environmental Significance

### 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 likely to occur within area
---	-----------------------	--

<a href="#">Leipoa ocellata</a> Malleefowl [934]	Vulnerable	Species or species habitat likely to occur within area
---	------------	--

<a href="#">Pezoporus occidentalis</a> Night Parrot [59350]	Endangered	Species or species habitat may occur within area
--	------------	--

<a href="#">Rostratula australis</a> Australian Painted Snipe [77037]	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
---	------------	--

#### Other

<a href="#">Idiosoma nigrum</a> Shield-backed Trapdoor Spider, Black Rugose Trapdoor Spider [66798]	Vulnerable	Species or species habitat likely to occur within area
--	------------	--

#### Plants

<a href="#">Caladenia hoffmanii</a> Hoffman's Spider-orchid [56719]	Endangered	Species or species habitat may occur within area
--	------------	--

<a href="#">Dasymalla axillaris</a> Native Foxglove [38829]	Critically Endangered	Species or species habitat may occur within area
--	-----------------------	--

<a href="#">Eremophila viscida</a> Varnish Bush [2394]	Endangered	Species or species habitat may occur within area
---	------------	--

#### Reptiles

<a href="#">Egernia stokesii badia</a> Western Spiny-tailed Skink, Baudin Island Spiny-tailed Skink [64483]	Endangered	Species or species habitat known to occur within area
--	------------	---

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

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

Name	Threatened	Type of Presence
------	------------	------------------

#### Migratory Marine Birds



Name	Threatened	Type of Presence
<a href="#">Apus pacificus</a> Fork-tailed Swift [678]		Species or species habitat likely to occur within area
<b>Migratory Terrestrial Species</b>		
<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 likely to occur within area
<a href="#">Calidris melanotos</a> Pectoral Sandpiper [858]		Species or species habitat may occur within area
<a href="#">Tringa nebularia</a> Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

## Other Matters Protected by the EPBC Act

Listed Marine Species		[ <a href="#">Resource Information</a> ]
* 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 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 likely to occur within area
<a href="#">Calidris melanotos</a> Pectoral Sandpiper [858]		Species or species habitat may occur within area
<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

Name	Threatened	Type of Presence area
<a href="#">Motacilla cinerea</a> Grey Wagtail [642]		Species or species habitat may occur within area
<a href="#">Rostratula benghalensis (sensu lato)</a> Painted Snipe [889]	Endangered*	Species or species habitat may occur within area
<a href="#">Tringa nebularia</a> Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

## Extra Information

State and Territory Reserves	[ Resource Information ]
Name	State
Muggon	WA
Narloo, part Yuin & part Twin Peaks Pastoral Leases	WA
Toolonga	WA
Woolgorong	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>		
Streptopelia senegalensis Laughing Turtle-dove, Laughing Dove [781]		Species or species habitat likely to occur within area
<b>Mammals</b>		
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Capra hircus Goat [2]		Species or species habitat likely to occur within area
Equus asinus Donkey, Ass [4]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area

### Plants

Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species habitat likely to occur within area
Prosopis spp. Mesquite, Algaroba [68407]		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

### Nationally Important Wetlands [\[ Resource Information \]](#)

Name	State
<a href="#">Wooleen Lake</a>	WA



# 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

-27.30583 116.02349

# Acknowledgements

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

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

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

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

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## ***Appendix 3: Habitat Assessments***



FAUNA HABITAT ASSESSMENT SHEET											
Mid-west											
Location: Woolbung Peak						Site Number: HA1					
Project Number:											
Date: 23/3/22			Easting: 403572			Aspect	N	NE	SW	NW	
Quadrat Size: 50 x 50 m			Northing: 6979069				E	SE	W	N/A	
											
Soil Texture	sand		sandy-loam		loam	cracking clay		clay			
VEGETATION											
Vegetation Description	Hummock Grassland	Other: Rocky Mulga Shrubland			Average Height in metres	Cover					
	Acacia Shrubland	Stratum				Scattered Plants	Sparse	Moderate	Thick		
	Riverine Woodland	Overstorey	Mixed Acacia sp.(including Mulga)		3	0 <5%	1 <20%	2 20-60%	3 60-100%		
	Other Grassland	Midstorey	Eremophila sp.		1	0 <5%	1 <20%	2 20-60%	3 60-100%		
	Euc Woodland	Ground Cover	Mixed Herbs		<0.5	0 <5%	1 <20%	2 20-60%	3 60-100%		
CONDITION						LAST FIRE					
Scale:	5 Pristine	4 Excellent	3 Very Good	2 Good	1 Degraded	0 Completely Degraded	0 <1 year	1 1-3 Yr	2 Yr	4-5 Yr	3 >5 Yr
(general)				DISTURBANCE			(cattle)				
	0 heavy	1 medium	2 mild	3 none		0 heavy	1 medium	2 mild	3 none		
GROUND COVER											
Bare Ground	0 <5%	1 <20%	2 20-60%	3 60-100%	Hummock Grass	0 <5%	1 <20%	2 20-60%	3 60-100%		
Rock	0 <5%	1 <20%	2 20-60%	3 60-100%	Other Grass	0 <5%	1 <20%	2 20-60%	3 60-100% *		
Leaf Litter	0 <5%	1 <20%	2 20-60%	3 60-100%	Herbs	0 <5%	1 <20%	2 20-60%	3 60-100%		
Logs >10cm	0 <5%	1 <20%	2 20-60%	3 60-100%	Other	0 <5%	1 <20%	2 20-60%	3 60-100%		
MICROHABITATS											
Burrowing Suitability	0 Rock	1 Stony	2 Sandy Loam	3 Sand	Peeling Bark	0 none	1 rare	2 moderate	3 common		
Pebbles Stones	0 none	1 0-30%	2 30-70%	3 70-100%	Large Hollows	0 none	1 rare	2 moderate	3 common		
Exfoliating Slabs	0 none	1 0-30%	2 30-70%	3 70-100%	Small Hollows	0 none	1 rare	2 moderate	3 common		
Rock Crevices	0 none	1 0-30%	2 30-70%	3 70-100%	Water Presence	0 none	1 rare	2 moderate	3 common		
Boulders	0 none	1 0-30%	2 30-70%	3 70-100%	Distance to Water	0 >5km	1 2-5km	2 500m - 2km	3 <500m		
Suitability for Bats	YES		NO		Termite Mounds	0 none	1 rare	2 moderate	3 common		
Caves	Absent	Present			Woody Debris	0 none	1 rare	2 moderate	3 common		
SPECIES											
Malleefowl	YES	NO		DETAILS							
Night Parrot	YES	NO									
Western Spiny-tailed Skink	YES	NO									
Birds					Mammals					Reptiles	

FAUNA HABITAT ASSESSMENT SHEET												
Mid-west												
Location: Woolbung Peak						Site Number: HA2						
Project Number:												
Date: 23/3/22			Easting: 402197			Aspect	N	NE	SW	NW		
Quadrat Size: 50 x 50 m			Northing: 6978516				E	SE	W	N/A		
Soil Texture						sand		sandy-loam		loam	cracking clay	clay
						VEGETATION						
Vegetation Description	Hummock Grassland	Other: Scattered Mulga Shrubland			Average Height in metres	Cover						
	Acacia Shrubland	Stratum				Scattered Plants	Sparse	Moderate	Thick			
	Riverine Woodland	Overstorey	Mixed Acacia sp. (including Mulga)		5	0 <5%	1 <20%	2 20-60%	3 60-100%			
	Other Grassland	Midstorey	Eremophila sp.		1	0 <5%	1 <20%	2 20-60%	3 60-100%			
	Euc Woodland	Ground Cover	Mixed Herbs		<0.5	0 <5%	1 <20%	2 20-60%	3 60-100%			
CONDITION						LAST FIRE						
Scale:	5 Pristine	4 Excellent	3 Very Good	2 Good	1 Degraded	0 Completely Degraded	0 <1 year	1 1-3 Yr	2 Yr	4-5 Yr	3 >5 Yr	
(general)						(cattle)						
	0 heavy	1 medium*	2 mild	3 none		0 heavy	1 medium	2 mild	3 none			
GROUND COVER												
Bare Ground	0 <5%	1 <20%	2 20-60%	3 60-100%	Hummock Grass	0 <5%	1 <20%	2 20-60%	3 60-100%			
Rock	0 <5%	1 <20%	2 20-60%	3 60-100%	Other Grass	0 <5%	1 <20%	2 20-60%	3 60-100%*			
Leaf Litter	0 <5%	1 <20%	2 20-60%	3 60-100%	Herbs	0 <5%	1 <20%	2 20-60%	3 60-100%			
Logs >10cm	0 <5%	1 <20%	2 20-60%	3 60-100%	Other	0 <5%	1 <20%	2 20-60%	3 60-100%			
MICROHABITATS												
Burrowing Suitability	0 Rock	1 Stony	2 Sandy Loam	3 Sand	Peeling Bark	0 none	1 rare	2 moderate	3 common			
Pebbles Stones	0 none	1 0-30%	2 30-70%	3 70-100%	Large Hollows	0 none	1 rare	2 moderate	3 common			
Exfoliating Slabs	0 none	1 0-30%	2 30-70%	3 70-100%	Small Hollows	0 none	1 rare	2 moderate	3 common			
Rock Crevices	0 none	1 0-30%	2 30-70%	3 70-100%	Water Presence	0 none	1 rare	2 moderate	3 common			
Boulders	0 none	1 0-30%	2 30-70%	3 70-100%	Distance to Water	0 >5km	1 2-5km	2 500m - 2km	3 <500m			
Suitability for Bats	YES		NO		Termite Mounds	0 none	1 rare	2 moderate	3 common			
Caves	Absent	Present			Woody Debris	0 none	1 rare	2 moderate	3 common			
SPECIES												
Malleefowl	YES	NO		DETAILS								
Night Parrot	YES	NO										
Western Spiny-tailed Skink	YES	NO										
Birds					Mammals					Reptiles		



## ***Appendix 4: Photo Points***





Photo Point 1 (Scattered Mulga Shrubland)



Photo Point 2 (Scattered Mulga Shrubland)





Photo Point 3 (Scattered Mulga Shrubland)



Photo Point 4 (Rocky Mulga Shrubland)





Photo Point 5 (Rocky Mulga Shrubland)



Photo Point 6 (Scattered Mulga Shrubland)





Photo Point 7 (Rocky Mulga Shrubland)



Photo Point 8 (Rocky Mulga Shrubland)





Photo Point 9 (Scattered Mulga Shrubland)



Photo Point 10 (Scattered Mulga Shrubland)





Photo Point 11 (Scattered Mulga Shrubland)



Photo Point 12 (Scattered Mulga Shrubland)





Photo Point 13 (Scattered Mulga Shrubland)



Photo Point 14 (Scattered Mulga Shrubland)





Photo Point 15 (Scattered Mulga Shrubland)



Photo Point 16 (Scattered Mulga Shrubland)