

BUTCHERBIRD MANGANESE PROJECT NATIVE VEGETATION CLEARING PERMIT

PREPARED FOR:

ELEMENT 25 LIMITED

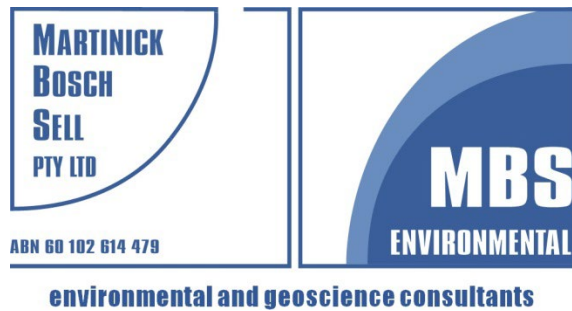
Element 25

DECEMBER 2022

PREPARED BY:

Martinick Bosch Sell Pty Ltd
4 Cook Street
West Perth WA 6005
Ph: (08) 9226 3166
Email: info@mbsenvironmental.com.au
Web: www.mbsenvironmental.com.au

MBS
ENVIRONMENTAL



BUTCHERBIRD MANGANESE PROJECT NATIVE VEGETATION CLEARING PERMIT

Distribution List:

Company	Contact Name	Copies	Date
Element 25 Limited	Ian Huitson- Study Manager	[01]	3 November 2022
Element 25 Limited	Wes Martini General Manager, Operations	[02]	3 November 2022
Department of Mines, Industry Regulation and Safety	Environmental Officer	[02]	3 November 2022
Element 25 Limited	Ian Huitson – Study Manager	[01]	1 December 2022
Department of Mines, Industry Regulation and Safety	Environmental Officer	[02]	1 December 2022

Document Control for Job Number: E25BBAR22

Document Status	Prepared By	Authorised By	Date
Draft Report	Hayden Beltz	Kristy Sell	13 October 2022
Final Report	Orla Tone	Kristy Sell	3 November 2022
Final Report (V2)	Orla Tone	Kristy Sell	30 November 2022

Disclaimer, Confidentiality and Copyright Statement

This report is copyright. Ownership of the copyright remains with Martinick Bosch Sell Pty Ltd (MBS Environmental) and **Element 25 Limited**.

This report has been prepared for **Element 25 Limited** on the basis of instructions and information provided by **Element 25 Limited** and therefore may be subject to qualifications which are not expressed.

No person other than those authorised in the distribution list may use or rely on this report without confirmation in writing from MBS Environmental. MBS Environmental has no liability to any other person who acts or relies upon any information contained in this report without confirmation.

This report has been checked and released for transmittal to **Element 25 Limited**.

These Technical Reports:

- Enjoy copyright protection and the copyright vests in Martinick Bosch Sell Pty Ltd (MBS Environmental) and **Element 25 Limited** unless otherwise agreed in writing.
- May not be reproduced or transmitted in any form or by any means whatsoever to any person without the written permission of the Copyright holder.

TABLE OF CONTENTS

1.	SUMMARY	1
2.	BACKGROUND.....	2
2.1	LOCATION	2
2.2	TENURE	2
2.3	EXISTING APPROVAL AND CLEARING UNDERTAKEN.....	2
2.4	ENVIRONMENTAL SETTING	5
2.4.1	Climate	5
2.4.2	Soils and Landscape	5
2.4.3	Flora and Vegetation	6
2.4.4	Terrestrial Fauna and Habitats	15
2.4.5	Surface Water.....	17
2.4.6	Groundwater.....	18
3.	PROPOSED LAND CLEARING.....	19
4.	ASSESSMENT OF CLEARING PRINCIPLES.....	21
4.1	NATIVE VEGETATION CLEARING PRINCIPLES	21
4.2	BIODIVERSITY.....	22
4.3	SIGNIFICANT FAUNA HABITAT.....	22
4.4	SIGNIFICANT FLORA.....	22
4.5	THREATENED ECOLOGICAL COMMUNITIES	23
4.6	REMNANT VEGETATION	23
4.7	WATERCOURSE OR WETLAND ENVIRONMENTS	24
4.8	LAND DEGRADATION.....	24
4.9	CONSERVATION ESTATE	24
4.10	SURFACE AND GROUNDWATER QUALITY	24
4.11	FLOODING POTENTIAL	25
5.	REPORTING AND AUDITING	26
5.1	MANAGING DIRECTOR	26
5.2	GENERAL MANAGER OPERATIONS	26
5.3	CLEARING SUPERVISOR.....	26
5.4	ALL EMPLOYEES AND CONTRACTORS.....	27
6.	CONCLUSION	28
7.	REFERENCES	29

TABLES

Table 1:	Butcherbird Manganese Project Tenements	2
Table 2:	Baseline Flora and Vegetation Studies.....	6
Table 3:	Vegetation Units in Butcherbird Manganese Project Stage 1	8
Table 4:	Baseline Fauna and Habitat Studies	15
Table 5:	Fauna Habitats Within the Butcherbird Project Area	17
Table 6:	Summary of Proposed Land Clearing.....	19
Table 7:	Summary of Clearing Assessment Against Clearing Principles.....	21
Table 8:	Proposed Loss of Priority Flora Species.....	23

FIGURES

Figure 1:	Location Plan.....	3
Figure 2:	Project Tenements Applicable to NVCP	4
Figure 3:	Climate Data, Newman Aero (1971-2022).....	5
Figure 4:	Vegetation Units Within the Purpose Permit Area	11
Figure 5:	Locations of Priority Flora in Relation to the Project.....	14
Figure 6:	Habitat Types of the Project Area.....	16
Figure 7:	Purpose Permit Area & proposed Clearing Footprint	20

APPENDICES

Appendix 1:	Record of Tenure
Appendix 2:	Ecoscape 2021 – Targeted Flora Survey

1. SUMMARY

A Native Vegetation Clearing Permit (CPS 8991/1) was approved for the Butcherbird Manganese Project to allow clearing of 250 ha of native vegetation on 10 September 2020 (CPS 899/1). An amendment to CPS 8991/ to increase the allowed clearing amount by 15 ha from 250 ha to 265 ha and was granted on 16 February 2021 (CPS8991/2).

Element 25 are planning to expand the Project and this will involve an increase in both the annual mining and ore processing throughputs of the Project. This will necessitate additional mining areas and increase in associated infrastructure footprints.

This NCVP application seeks approval for:

- An increase in clearing of 355.7 ha (from 265 ha to 620.7 ha).
- Removal of two of the four areas currently 'subject to conditions' within the approved clearing area of M52/1074 as depicted in Plan 8991/2 and stated in Condition 5 of Clearing Permit CPS 8991/2. These are located in the western part of the Purpose Permit Area and have an area of 2.81 and 16.83 ha, respectively.

An assessment against the ten clearing principles was undertaken based on information collected from site-specific flora, fauna surveys of the project area.

The assessment of the proposed clearing against the ten clearing principles determined that the proposed additional clearing, including clearing within 'areas subject to conditions' for the Butcherbird Project expansion will not be at variance with the ten clearing principles. Appropriate environmental management procedures will be implemented to ensure potential impacts associated with the clearing are avoided or minimised where practicable.

2. BACKGROUND

2.1 LOCATION

The Butcherbird Manganese Project (Project) is located in the Shire of Meekatharra within the Gascoyne region of Western Australia (Figure 1). The Project is approximately 115 km south of Newman and approximately 35 km north of the Kumarina Roadhouse, with tenure located on both sides of the Great Northern Highway.

2.2 TENURE

The Butcherbird Project consists of one (1) granted Mining Lease and five (5) Miscellaneous Licences covering an area of approximately 1,762.7 ha. Table 1 provides a summary of the tenement applicable to this Clearing Permit Application and these are displayed in Figure 2. Evidence of ownership is provided in Appendix 1.

Table 1: Butcherbird Manganese Project Tenements

Tenement	Area (ha)	Grant Date	Expiry Date
M 52/1074	1,457.5	29 June 2020	28 June 2041
L 52/215	53.9	03 September 2020	03 September 2041
L 52/218	37.7	03 September 2020	03 September 2041
L 52/220	18.2	04 December 2020	03 December 2041
L 52/221	41.5	04 December 2020	03 December 2041

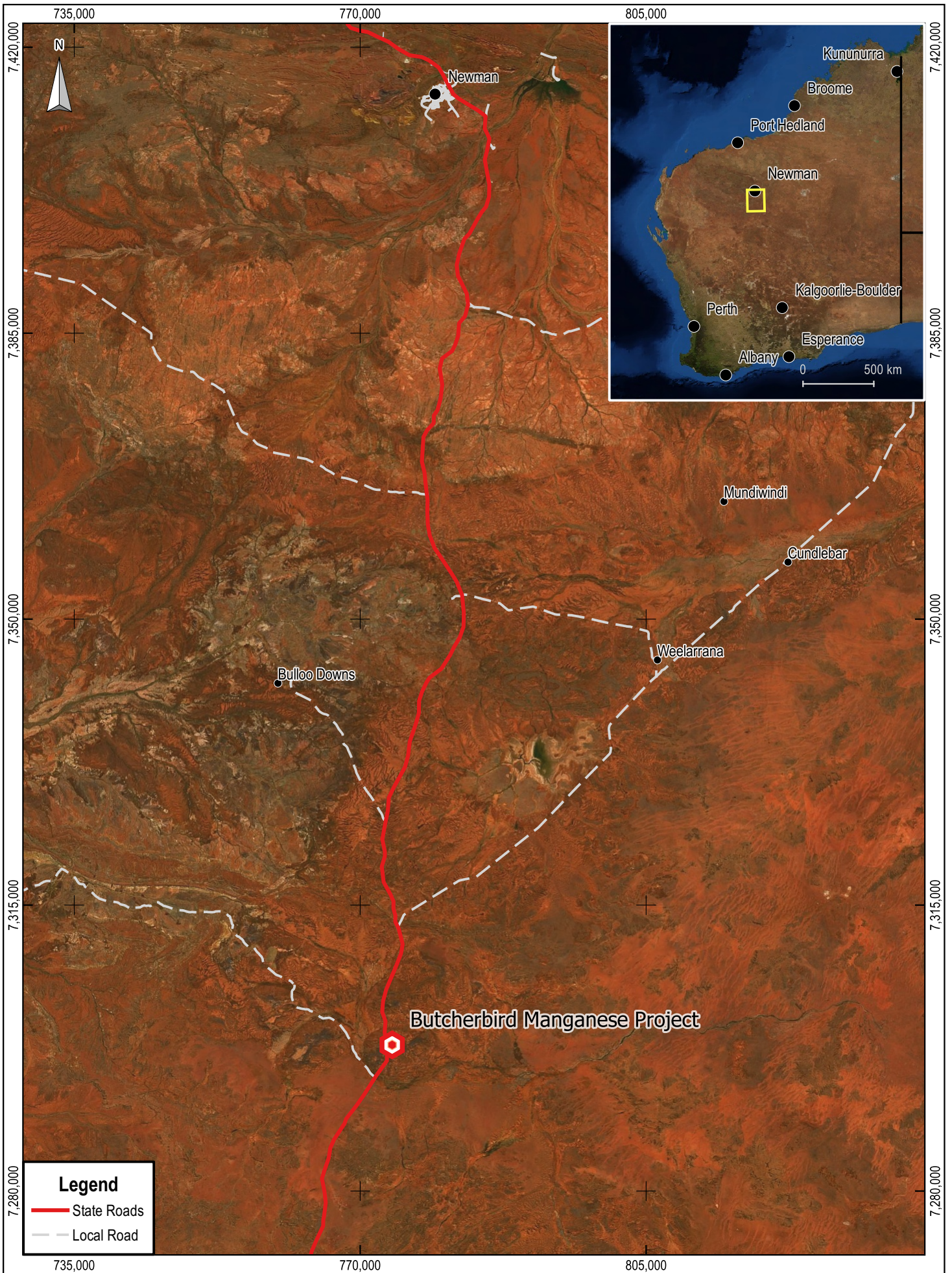
2.3 EXISTING APPROVAL AND CLEARING UNDERTAKEN

The current approved Purpose Permit area for the Butcherbird Project (CPS 8991/2), granted on 16 February 2021 is 1,122.7 ha, with an approved area of clearing footprint of 265 ha.

Condition 5 of CPS8991/2 requires four areas specified on the approved plan within the Purpose Permit area containing Priority flora to be excluded from the approved clearing area.

Condition 9 of CPS8991/2 requires avoidance of clearing of riparian vegetation and maintenance of flow of existing natural watercourses.

As of 1 July 2022, about 123.75 ha of clearing has been undertaken.



Scale: 1:600000
 Original Size: A4
 Image: Copernicus Sentinel Data 2020
 Grid: GDA94 / MGA zone 50

0 10 20 km

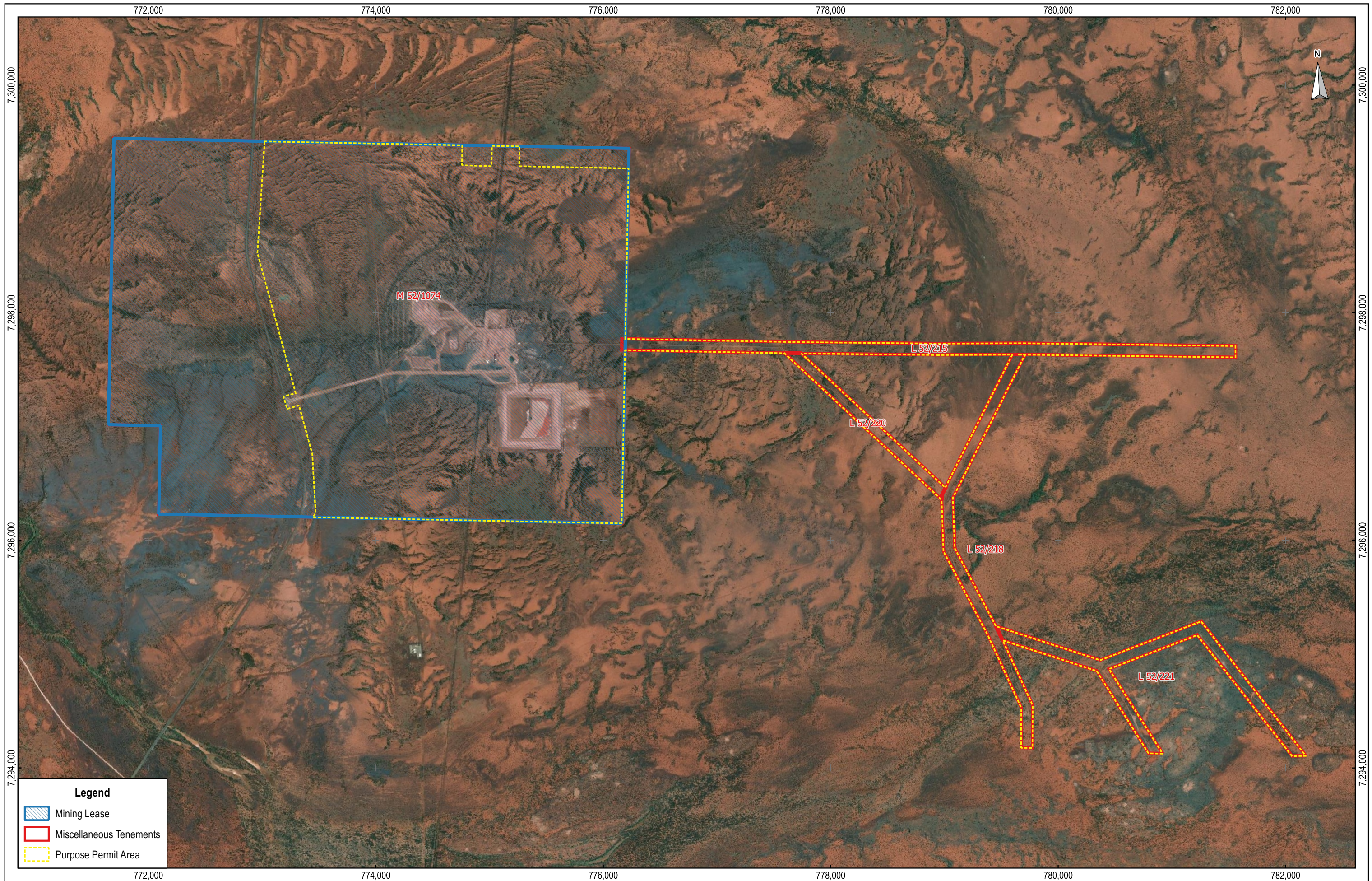
Element 25
 Butcherbird Manganese Project
 Butcherbird NVCP Amendment

Figure 1

Project Location

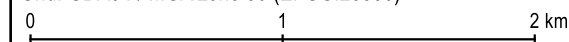
Martinick Bosch Sell Pty Ltd
 4 Cook St
 West Perth WA 6005
 Australia
 t: +61 8 9226 3166
 info@mbsenvironmental.com.au
 www.mbsenvironmental.com.au

MBS
 ENVIRONMENTAL



Scale: 1: 30,000
Original Size: A3

Grid: GDA94 / MGA zone 50 (EPSG:28350)



Element 25
Butcherbird Manganese Project
Butcherbird NVCP Amendment

Figure 2

Tenements within Purpose Permit Area

Martinick Bosch Sell Pty Ltd
4 Cook St
West Perth WA 6005
Australia
t: +61 8 9226 3166
info@mbsenvironmental.com.au
www.mbsenvironmental.com.au



2.4 ENVIRONMENTAL SETTING

2.4.1 Climate

According to the Köppen-Geiger climate classification, the project area is categorised within hot arid desert (Class BWh) (Peel *et al.* 2007). This classification is considered to represent a desert climate where annual rainfall is generally less than 200 mm or the region loses more water via evapotranspiration than it receives as rain, generally a result of hot, sunny weather without significant cloud. The mean average temperature exceeds 18°C, and summer temperatures are frequently over 40°C.

The closest near-coastal Bureau of Meteorology (BoM) site recording long-term rainfall is Newman Aero, station 007176 operating since 1971. This station is located approximately 100 km north of the Project area (BoM 2022). As shown in Figure 3, the mean annual rainfall is 324.4 mm, approximately 75% of which falls in summer (December to April) from thunderstorms or cyclone events.

December is the hottest month with a mean maximum temperature of 39.3°C and mean minimum of 24.2°C, and July is the coldest month in terms of mean maximum temperature with a mean of 23.1°C and mean minimum temperature of 6.6°C.

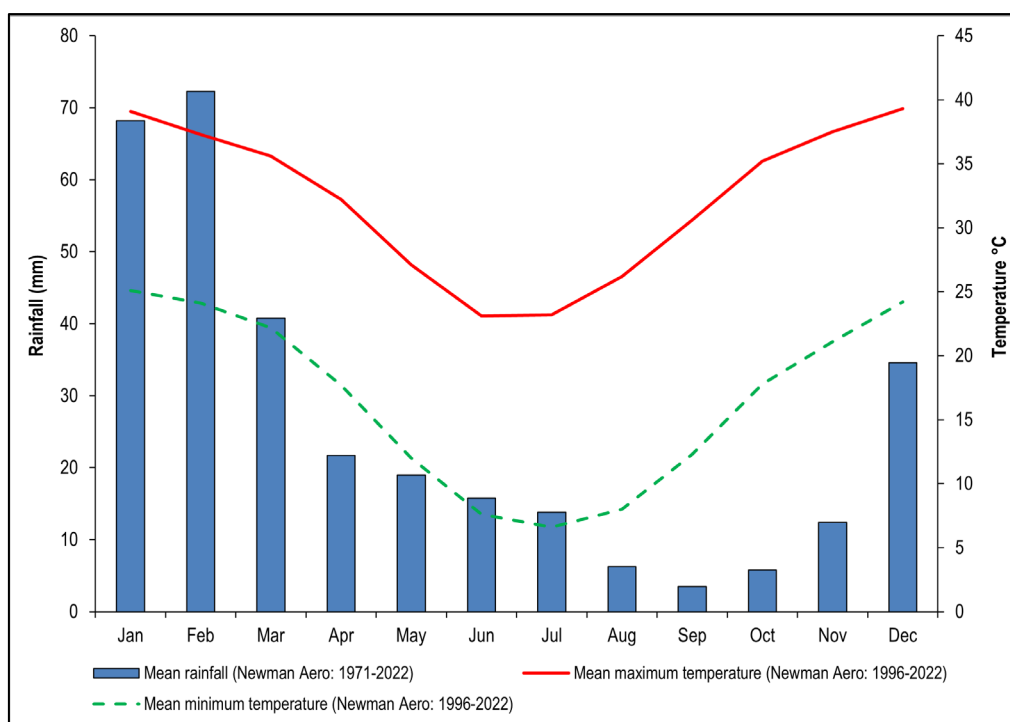


Figure 3: Climate Data, Newman Aero (1971-2022)

2.4.2 Soils and Landscape

A desktop review of soil mapping units was undertaken using the Australian Soil Resources Information System (ASRIS). Two of these soil and landform units are present within the Purpose Permit Area. Characteristics of the units are summarised as follows:

- Jamindie: Level to gently undulating hardpan wash plains with mantles of ironstone grit and pebbles, minor stony plains, low rises, and occasional low ridges with relief up to 30 m. Stony hardpan plains and rises supporting groved mulga shrublands, occasionally with spinifex understorey. Main soil types include red-brown hardpan shallow loams (50%), stony soils and red shallow loams (20%) red loamy earths (15%). Red-brown hardpan shallow loams and minor red loamy earths (5%) may also be present.

- Nooinjin: Hardpan plains with very large groves and sandy banks supporting mulga shrublands and wanderie grasses. These areas are dominated by red-brown hardpan shallow loams (68%) but to a lesser extent also include red loamy earths (10%), red deep sands and red sandy earths (10%) and red-brown hardpan shallow loams (10%).

A site-specific soil assessment was completed by MBS Environmental. The major soil type corresponds to the red-brown hardpan shallow loam (Soil Group 523) within the Jamindie System described by Schoknecht and Pathan (2013), or a Duric Red Kandosol according to the Australian Soil Classification (Isbell 2002). The typical soil profile exhibits a general absence of organic material, crusts or cracking clays on the surface with scattered ferruginous/ironstone gravel lag, a shallow topsoil and subsoil profiles with abundant plant roots, and the presence of an underlying hardpan.

Testing provided physical and geochemical findings whereby some of the subsoils are partially dispersive and areas of topsoil may be sodic, and topsoil and subsoil from the open pit and TSF are acidic, but not saline. Due to general high levels of metals (e.g. manganese and aluminium), soils that are acidic are likely hostile to plant growth.

2.4.3 Flora and Vegetation

The Project is located in the Augustus subregion (GAS3) of the Gascoyne Coolgardie Interim Biogeographical Regionalisation of Australia (IBRA) region (Desmond *et al.* 2001). The subregion can be described as rugged low Proterozoic sedimentary and granite ranges divided by broad flat valleys. The subregion also includes the Narryera Complex and Bryah Basin of the Proterozoic Capricorn Orogen (on northern margin of the Yilgarn Craton), as well as the Archaean Marymia and Sylvania Inliers.

Six flora and vegetation assessments have been completed for the Project area with the most recent survey being a targeted flora survey undertaken by Ecoscape in August 2021 (Appendix 2). The November 2020 Biological Risk Assessment was a desktop assessment based on previous knowledge of the Project area. All other assessments involved field assessment. Flora and vegetation surveys for the Project area are listed in Table 2.

Table 2: Baseline Flora and Vegetation Studies

Survey / Study	Date	Consultant	Description
Level 1 Flora and Vegetation Survey	Nov. – Dec. 2010	EnviroWorks Consulting	Exploration areas
Level 2 Flora and Vegetation Survey	April 2012	EnviroWorks Consulting	Ilgarari exploration area
Reconnaissance Flora and Vegetation Survey	April 2019	Ecoscape	Northern Borefield, Southern Borefield and Renewables Area
Detailed Flora and Vegetation Survey	April 2019	Ecoscape	Mining Lease area
Eastern Borefield Biological Risk Assessment	Nov. 2020	Ecoscape	Eastern Borefield area
Targeted Flora Survey	August 2021	Ecoscape	Mining Lease and adjacent exploration lease areas Southern borefield extension

Since grant of the current NVCP, Ecoscape conducted a targeted flora survey to support future development in the vicinity of the Butcherbird Manganese Project. The area of the targeted surveys was defined based on knowledge of orebody extent and preliminary project expansion plan designs. The purpose of the targeted survey was primarily to collect additional information on the abundance and extent of priority flora species *Eremophila appressa* (P1) and *Eremophila rigida* (P3) as well as *Rhagodia* sp. Hamersley (M. Trudgen 17794) (P3) and *Goodenia nuda* (P4). The targeted survey area included an area outside of the proposed development footprint north of M52/1074 and an

area west of the existing eastern borefield that may form an extension into L52/225. An assessment of riparian and groundwater dependent vegetation in the eastern borefield extension area was also undertaken during the survey.

2.4.3.1 Vegetation

No Threatened Ecological Communities (TECs) pursuant to the Commonwealth's *EPBC Act* or Western Australia's *BC Act* were detected within 50 km of the Project in any survey (Australian Government and DAWE, Ecoscape search reference PMST_BDY4L8, 2019).

No TECs or Priority Ecological Communities (PECs) as listed by DBCA currently reside within 50 km of the project (search reference 06-0419EC).

The survey area is also not located within an Environmentally Sensitive Area, Nature Reserve or DBCA managed land.

Ecoscape (2019b) flora surveys of the project area and surrounds recorded 179 vascular flora species within 30 vegetation units, predominantly comprised *Acacia* species in the Mulga complex. Of these, 10 vegetation units were located within the Mining Lease.

Apart from one community (*Acacia paraneura* Low Open Woodland (**ApaLOW**)), vegetation units are considered to be locally and regionally common and widespread. The *Acacia paraneura* Low Open Woodland vegetation community may be of higher significance given the small area identified (< 3 ha). It is located in the southern part of the Mining Lease near the junction of the Great Northern Highway and Old Road.

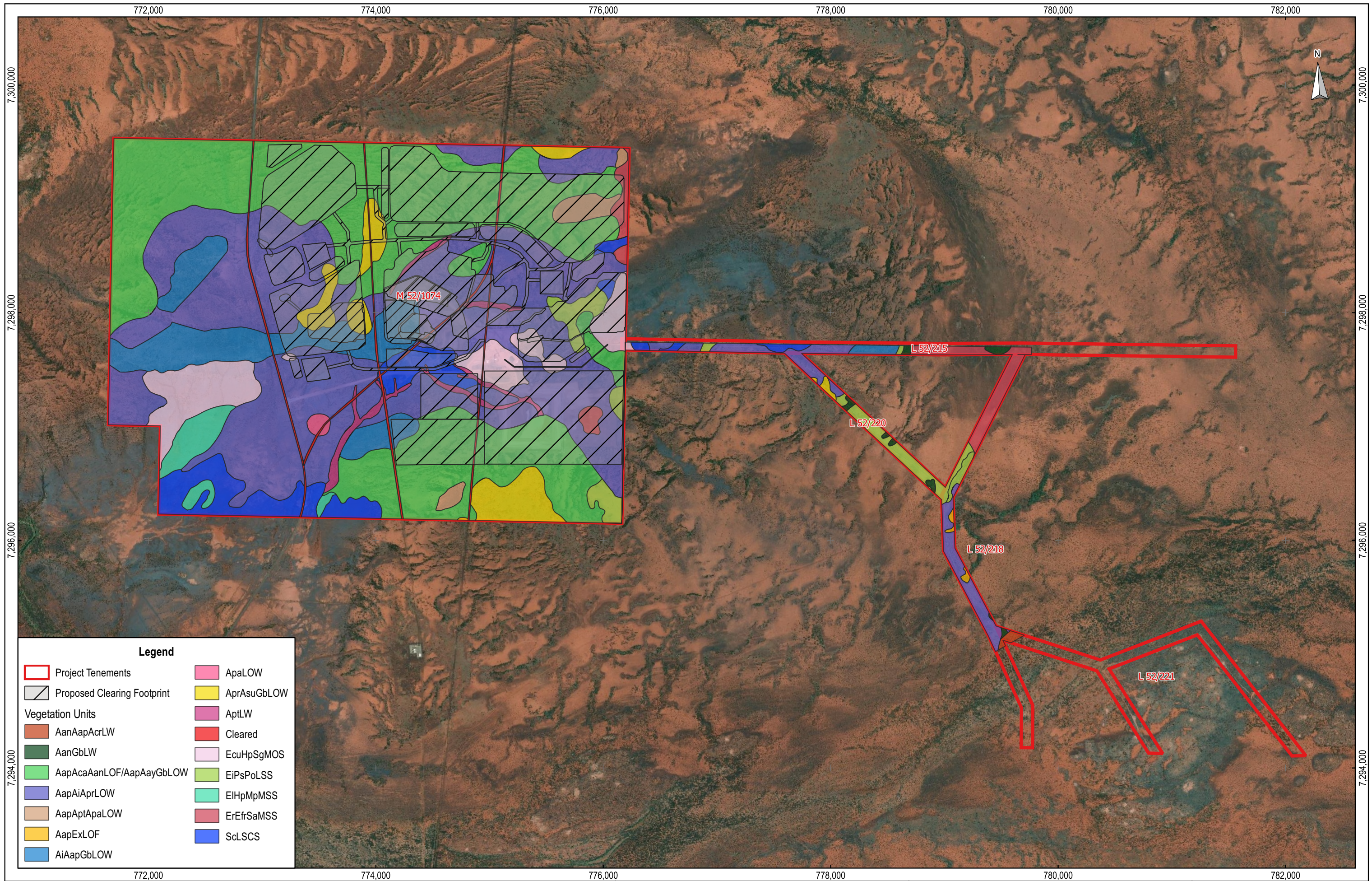
The vegetation units within the Project Area and extents in the proposed project footprint are described in Table 3 and are shown in Figure 4.

Table 3: Vegetation Units in Butcherbird Manganese Project Stage 1

Vegetation Unit	Description	Surveyed Veg. Extent (ha)	Purpose Permit Area (ha)
Cleared	Land cleared of native vegetation	27.1	12.69
Unmapped*	Vegetation not mapped falling in the Eastern Borefield	N/A	95.12
Clay Flat			
AanAapAcrLW	<i>Acacia aneura</i> , <i>A. aptaneura</i> and <i>A. craspedocarpa</i> low woodland over <i>Eremophila galeata</i> and <i>A. tetragonophylla</i> mid sparse shrubland over <i>Aristida inaequiglumis</i> and <i>*Bidens subalternans</i> low scattered tussock grasses/forbs	66.3	1.45
AanAapLOW	<i>Acacia aneura</i> and <i>Acacia aptaneura</i> low open woodland over <i>Eremophila rigida</i> mid sparse shrubland over <i>Sida ectogama</i> and <i>Senna artemisioides</i> subsp. <i>Helmsii</i> low scattered shrubs	12.4	0
AapHILW	<i>Acacia aptaneura</i> and <i>Hakea lorea</i> subsp. <i>Lorea</i> low woodland over <i>Eremophila gilesii</i> subsp. <i>Variabilis</i> low open shrubland	14.6	0
AapLOF	<i>Acacia aptaneura</i> low open forest over <i>Eremophila lanceolata</i> low scattered shrubs	26	0
AcrAsuEfrTOS	<i>Acacia craspedocarpa</i> , <i>A. subcontorta</i> and <i>Eremophila fraseri</i> subsp. <i>Fraseri</i> tall to mid open shrubland over <i>Eremophila rigida</i> , <i>Ptilotus obovatus</i> and <i>Eragrostis eriopoda</i> low scattered shrubs/tussock grasses	271.8	0
AscAtMOS	<i>Acacia sclerosperma</i> subsp. <i>Sclerosperma</i> and <i>Acacia tetragonophylla</i> mid open shrubland over <i>Eragrostis xerophila</i> low sparse tussock grassland	4.1	0
EiPsPoLSS	<i>Eremophila incisa</i> , <i>Ptilotus schwartzii</i> and <i>Ptilotus obovatus</i> low sparse to scattered shrubs/forbs	592.1	38.63
EmSsmLSS	<i>Eremophila maculata</i> subsp. <i>Brevifolia</i> and <i>Senna sp. Meekatharra</i> (E. Bailey 1–26) low sparse shrubland	4	0
ErEfrSaMSS	<i>Eremophila rigida</i> , <i>Eremophila fraseri</i> subsp. <i>Fraseri</i> and <i>Senna artemisioides</i> subsp. <i>Helmsii</i> mid sparse shrubland over <i>Eremophila incisa</i> low scattered shrubs	204.2	26.86
ScLSCS	<i>Sclerolaena cuneata</i> low sparse chenopod shrubland with <i>Hakea preissii</i> and <i>Eremophila lachnocalyx</i> mid scattered shrubs	87.4	37.50
Flat			
AanGbLW	<i>Acacia aneura</i> and <i>Grevillea berryana</i> low woodland over <i>Eremophila forrestii</i> subsp. <i>Forrestii</i> and <i>E. glutinosa</i> mid sparse shrubland over <i>Triodia basedowii</i> , <i>Eragrostis eriopoda</i> and <i>Eriachne helmsii</i> low open hummock grassland/tussock grassland	153.2	3.81
AapAptApaLOW	<i>Acacia aptaneura</i> , <i>Acacia pteraneura</i> and <i>Acacia paraneura</i> low open woodland over <i>Eremophila tietkensii</i> and <i>Acacia sclerosperma</i> subsp. <i>Sclerosperma</i> mid sparse shrubland over <i>Senna sp. Meekatharra</i> (E. Bailey 1–26) and <i>Ptilotus obovatus</i> sparse shrubland	45.5	14.24
AapCcLW	<i>Acacia aptaneura</i> and <i>Corymbia candida</i> low woodland over <i>Eremophila margarethae</i> , <i>Acacia tetragonophylla</i> and <i>Sida ectogama</i> mid sparse shrubland over <i>Ptilotus obovatus</i> and <i>Eriachne helmsii</i> low scattered shrubs/tussock grass	8	0

Vegetation Unit	Description	Surveyed Veg. Extent (ha)	Purpose Permit Area (ha)
AapExLOF	<i>Acacia aptaneura</i> and <i>Eucalyptus xerothermica</i> low open forest over <i>Sida ectogama</i> and <i>Eremophila forrestii</i> subsp. <i>Forrestii</i> mid sparse shrubland	12.3	1.18
AapLW	<i>Acacia aptaneura</i> low woodland over <i>Eremophila galeata</i> , <i>Acacia sclerosperma</i> subsp. <i>Sclerosperma</i> and <i>Acacia tetragonophylla</i> tall sparse shrubland over <i>Ptilotus obovatus</i> and <i>Senna</i> sp. <i>Meekatharra</i> (E. Bailey 1–26) low scattered shrubs	11	0
ApaLOW	<i>Acacia paraneura</i> low open woodland over <i>Eremophila galeata</i> and <i>Senna glutinosa</i> subsp. <i>X luerssenii</i> mid scattered shrubs over <i>Senna artemisioides</i> subsp. <i>Helmsii</i> , <i>Solanum lasiophyllum</i> and <i>Sida platycalyx</i> low scattered shrubs	3	2.99
EcuHpSgMOS	<i>Eremophila cuneifolia</i> , <i>Hakea preissii</i> and <i>Senna glutinosa</i> subsp. <i>X luerssenii</i> mid open to sparse shrubland over <i>Senna</i> sp. <i>Meekatharra</i> (E. Bailey 1–26), <i>Sclerolaena cuneata</i> and <i>Frankenia setosa</i> low sparse shrubland/chenopod shrubland	81.7	38.02
EmSIScLSS	<i>Eremophila maculata</i> subsp. <i>Brevifolia</i> , <i>Solanum lasiophyllum</i> and <i>Sclerolaena cuneata</i> low scattered shrubs/chenopod shrubs	47.6	0
Sandy Flat			
AapAanLW	<i>Acacia aptaneura</i> and <i>A. aneura</i> low woodland over <i>Eremophila forrestii</i> subsp. <i>Forrestii</i> , <i>E. margarethae</i> and <i>Acacia kempeana</i> mid sparse shrubland over <i>Triodia basedowii</i> low hummock grassland	358.3	0
Flat/ Gentle Slopes			
AapAcaAanLOF (Grove)/ AapAayGbLOW (Intergrove)	<i>Acacia aptaneura</i> , <i>A. ?catenulata</i> and <i>A. aneura</i> low open forest over <i>Eremophila forrestii</i> subsp. <i>Forrestii</i> , <i>E. glutinosa</i> and <i>Sida ectogama</i> mid sparse shrubland over <i>Cheilanthes sieberi</i> subsp. <i>Sieberi</i> and <i>Triodia basedowii</i> low sparse ferns/hummock grasses	570.7	381.63
AapAiAprLOW	<i>Acacia aptaneura</i> , <i>A. incurvaneura</i> and <i>A. pruinocarpa</i> low open woodland over <i>Senna glutinosa</i> subsp. <i>X luerssenii</i> , <i>Eremophila citrina</i> and <i>E. glutinosa</i> mid sparse shrubland over <i>Triodia basedowii</i> , <i>Ptilotus schwartzii</i> and <i>P. obovatus</i> low scattered hummock grassland/forbland/shrubland	1,016.5	362.26
Flats/ Low Rises			
AprAsuGbLOW	<i>Acacia pruinocarpa</i> , <i>Acacia ?subcontorta</i> and <i>Grevillea berryana</i> low scattered to open woodland over, <i>Eremophila citrina</i> , <i>E. latrobei</i> and <i>Acacia kempeana</i> mid sparse shrubland over <i>Triodia basedowii</i> low hummock grassland	103.3	52.70

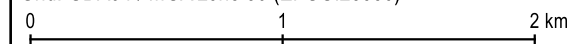
Vegetation Unit	Description	Surveyed Veg. Extent (ha)	Purpose Permit Area (ha)
Calcrete			
AapGsHLOW	<i>Acacia aptaneura</i> , <i>Grevillea striata</i> and <i>Hakea lorea</i> subsp. <i>Lorea</i> low open woodland over <i>Eremophila margarethae</i> , <i>Senna artemisioides</i> subsp. <i>Helmsii</i> and <i>Acacia sclerosperma</i> subsp. <i>Sclerosperma</i> mid open shrubland over <i>Ptilotus obovatus</i> and <i>Eremophea spinosa</i> low scattered shrubs/chenopod shrubs	257.7	0
EvLW	<i>Eucalyptus victrix</i> low woodland over <i>Acacia tetragonophylla</i> , <i>Senna artemisioides</i> subsp. <i>Oligophylla</i> and <i>Rhagodia eremaea</i> mid sparse shrubland/chenopod shrubland over <i>Eremophila maculata</i> subsp. <i>Brevifolia</i> and <i>Ptilotus obovatus</i> low scattered shrubs	24.2	0
ExAanLOW	<i>Eucalyptus xerothermica</i> and <i>Acacia aneura</i> low open woodland over <i>A. tetragonophylla</i> , <i>A. sclerosperma</i> subsp. <i>Sclerosperma</i> and <i>Senna artemisioides</i> subsp. <i>Oligophylla</i> tall-mid open shrubland over <i>Ptilotus obovatus</i> low sparse shrubland	78.7	0
Sand/ Calcrete			
TbLHG	<i>Triodia basedowii</i> low hummock grassland with <i>Acacia sibirica</i> , <i>Petalostylis cassioides</i> and <i>Acacia pachyacra</i> mid scattered shrubs	419.1	0
Crests and Gentle Slopes			
AiAapGbLOW	<i>Acacia incurvaneura</i> , <i>A. aptaneura</i> and <i>Grevillea berryana</i> low open woodland over <i>Eremophila citrina</i> , <i>E. appressa</i> and <i>E. glutinosa</i> mid sparse shrubland over <i>Triodia basedowii</i> low open hummock grassland	119	51.55
Minor Creek			
AptLW	<i>Acacia pteraneura</i> low woodland over <i>Acacia tetragonophylla</i> , <i>Eremophila galeata</i> and <i>Sida ectogama</i> mid sparse shrubland over <i>Solanum lasiophyllum</i> and <i>Ptilotus obovatus</i> low isolated shrubs	20.1	20.08
Outwash Plain/ Flat			
EIHpMpMSS	<i>Eremophila lachnocalyx</i> , <i>Hakea preissii</i> and <i>Maireana pyramidata</i> mid sparse shrubland/chenopod shrubland over <i>Sclerolaena cuneata</i> low sparse to scattered chenopod shrubs	23.7	1.59
Creepline			
EvMW	<i>Eucalyptus victrix</i> mid woodland over <i>Senna artemisioides</i> subsp. <i>Filifolia</i> , <i>Acacia tetragonophylla</i> and <i>Acacia sclerosperma</i> subsp. <i>Sclerosperma</i> mid open shrubland over <i>Rhagodia eremaea</i> low scattered shrubs	34.1	0



Legend	
	Project Tenements
	Proposed Clearing Footprint
Vegetation Units	
	AanAapAcrLW
	AanGbLW
	AapAcaAanLOF/AapAayGbLOW
	AapAiAprLOW
	AapAptApaLOW
	AapExLOF
	AiAapGbLOW
	ApaLOW
	AprAsuGbLOW
	AptLW
	Cleared
	EcuHpSgMOS
	EiPsPoLSS
	EiHpMpMSS
	ErEfrSaMSS
	ScLSCS

Scale: 1: 30,000
Original Size: A3

Grid: GDA94 / MGA zone 50 (EPSG:28350)



Element 25
Butcherbird Manganese Project
Butcherbird NVCP Amendment

Figure 4

Vegetation Units within the Project Tenements and
Proposed Project Footprint

Martinick Bosch Sell Pty Ltd
4 Cook St
West Perth WA 6005
Australia
t: +61 8 9226 3166
info@mbsenvironmental.com.au
www.mbsenvironmental.com.au



2.4.3.2 Groundwater Dependent Ecosystems

The proposal is situated within the Lake Disappointment catchment and Sandy Desert Basin Sub-catchment with no wetlands present in the project area. Yanneri Ridge acts as a watershed with the majority of flows captured in un-named ephemeral creeks.

Several areas potentially supporting groundwater dependent vegetation were identified in the Southern Borefield extension area. It was noted that the minor creekline visible on aerial photography has no distinctive riparian vegetation to separate it from the surrounding area and it was anticipated to have flowing surface water only for a brief period following heavy rainfall. The riparian flora species *Eucalyptus victrix* was observed in the western portion of the Southern Borefield extension area, lowing-lying areas were more likely to have this species present. Ecoscape found it was not possible to determine whether the occurrence of *E. victrix* within this area is representative of Groundwater Dependent Vegetation (GDV). It was noted that *E. victrix* is considered to not be groundwater dependant in most circumstances and is considered tolerant of groundwater decline, particularly where the decline is gradual (Ecoscape, 2021).

2.4.3.3 Significant Flora

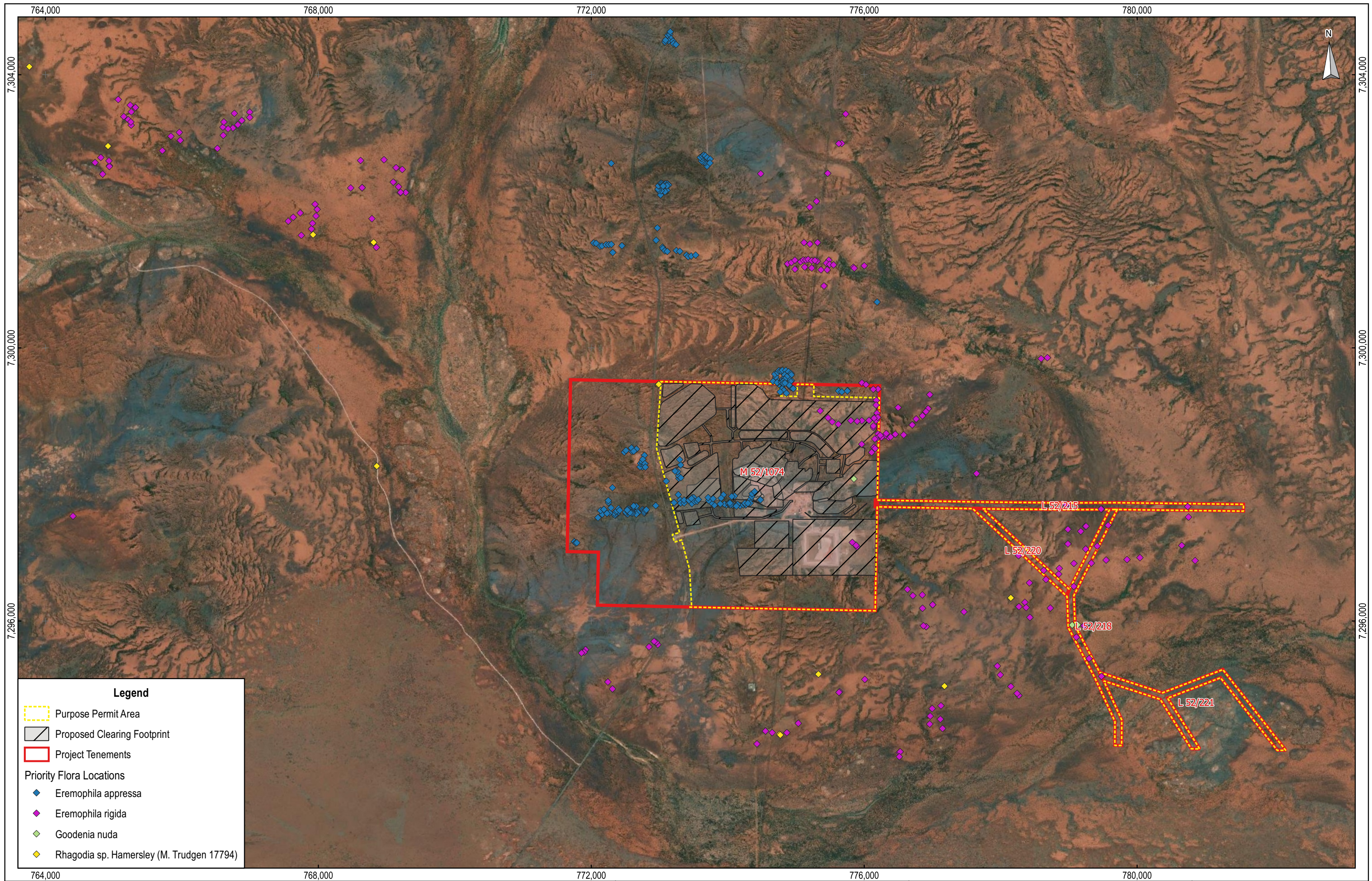
No Threatened flora pursuant to the Commonwealth's *EPBC Act* or Western Australia's *BC Act* have been recorded in any surveys conducted in the Project area.

One Priority 1, two Priority 3 and one Priority 4 listed flora species have been recorded within and adjacent to the Project area as is shown in Figure 5 and discussed below:

- *Eremophila appressa* (P1): locally endemic and poorly collected from other surveys. According to *NatureMap* there are 10 records of this species from the Gascoyne bioregion, with an overall distribution of approximately 50 km (north-south) by 30 km (east-west), largely to the north of the Project specific survey areas. There is one record of this species from within Collier Range National Park. Populations have been identified both within and immediately adjacent to the Purpose Permit Area. The Ecoscape 2019 survey identified about 804 plants. The Ecoscape 2021 targeted flora survey identified an additional 500 plants present in two locations adjacent to the Mining Lease noting that additional plants are also present in contiguous areas outside of the survey area (Ecoscape 2021). Sixty-three individuals are located within the Purpose Permit Area with 36 of these being present with the previous two south western exclusion areas. Three populations have been recorded in areas immediately adjacent to the Purpose Permit Area with an estimate of around 500 plants within these and additional plants also known to be present in contiguous areas outside of the area surveyed in 2021 (Ecoscape 2021).
- *Eremophila rigida* (P3): widespread with 141 locations recorded across the northeastern side of the Mining Lease and in adjacent surveyed areas. There are 37 locations in the Purpose Permit Area with the majority of individuals located in the eastern part of the Mining Lease and scattered locations in the Borefield area. None of these are located in the previous two south western exclusion areas. The Ecoscape 2019 survey identified about 5,373 plants. The Ecoscape 2021 targeted flora survey identified an additional 900 plants present in two locations adjacent to the Mining Lease noting that additional plants are also present in contiguous areas outside of the survey area (Ecoscape 2021). An additional population of about 10–20 plants is also known to be present adjacent to the borefield area (Ecoscape 2021).
- *Rhagodia sp. Hamersley* (M. Trudgen 17794) (P3): isolated plants have been recorded within adjacent survey areas with two locations mapped within the Mining Lease, but outside of the Purpose Permit Area. *This species* occurs in three bioregions (Gibson Desert, Pilbara and Gascoyne; Atlas of Living Australia 2021), with an overall east-west distribution (DBCA 2007) of approximately 280 km and north-south distribution of approximately 150 km. The records from the Butcherbird surveys are a small southern range extension of the species.
- *Goodenia nuda* (P4): isolated plants have been recorded within the surveyed areas with two locations recorded in the Purpose Permit Area (one in the Mining Lease and one in the (Borefield). None of these are located in the previous two south western exclusion areas. This species occurs widely within Western Australia within four bioregions (DBCA 2007) and has an overall distribution of approximately 670 km north-south and 900 km east-west (Ecoscape 2021). The species is sparsely widespread throughout the

Pilbara bioregion. Given the wide ranges of this species and lack of local surveys, the range extension identified by the Project specific surveys is considered unlikely to be significant.

The location of both *Eremophila appressa* and *Eremophila rigida* plants in relation to the Purpose Permit Area and the existing and proposed Project footprint area are shown in Figure 5.



Legend

- Purpose Permit Area
- Proposed Clearing Footprint
- Project Tenements

Priority Flora Locations

- ◆ Eremophila appressa
- ◆ Eremophila rigida
- ◆ Goodenia nuda
- ◆ Rhagodia sp. Hamersley (M. Trudgen 17794)

Scale: 1: 50,000
Original Size: A3

Grid: GDA94 / MGA zone 50 (EPSG:28350)

0 1 2 km

Element 25
Butcherbird Manganese Project
Butcherbird NVCP Amendment

Figure 5

Locations of Priority Flora in Relation to the Project

Martinick Bosch Sell Pty Ltd
4 Cook St
West Perth WA 6005
Australia
t: +61 8 9226 3166
info@mbsenvironmental.com.au
www.mbsenvironmental.com.au



2.4.4 Terrestrial Fauna and Habitats

Five fauna assessments have been completed for the Project area with the most recent field surveys being undertaken by Ecoscape in April 2019. The November 2020 Biological Risk Assessment was a desktop assessment of the eastern borefield area based on previous knowledge of the Project area. Fauna and habitat surveys for the Project area are shown in Table 4.

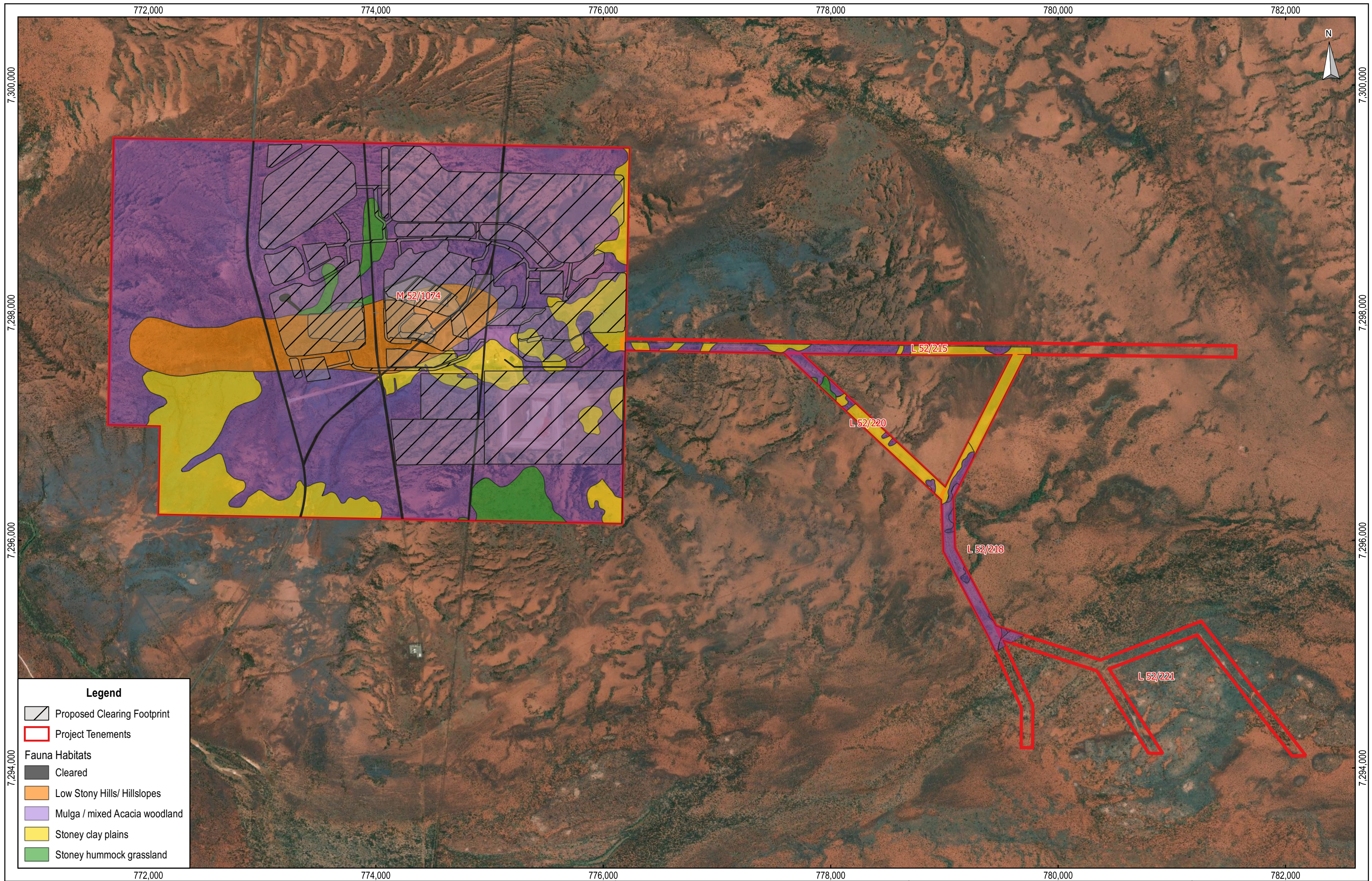
Table 4: Baseline Fauna and Habitat Studies

Survey / Study	Date	Consultant	Description
Level 1 Fauna Survey	March – April 2012	Phoenix Environmental	Vertebrate and short-range endemic invertebrate survey of the Bindi area
Level 2 Fauna survey	March – April 2012	Phoenix Environmental	Yanneri study area
Level 1 Fauna Survey	April 2019	Ecoscape	Northern Borefield, Southern Borefield and Renewables Area
Level 2 Fauna Survey	April 2019	Ecoscape	Mining Lease area
Eastern Borefield Biological Risk Assessment	November 2020	Ecoscape	Eastern Borefield area

2.4.4.1 Habitat

Six fauna habitats were identified within the Project area as are described in Table 5 and shown in Figure 6. Of these, four are located within the Purpose Permit Area. Five of the six habitats are considered widespread and regionally common. One identified outside of the Mining Lease (Sandy Hummock Grassland) is considered atypical of the IBRA sub-bioregion and is more similar to habitat associated with the Little Sandy Desert. Its presence suggests an overlapping ecotone within the survey area.

The Sandy Hummock Grassland is considered a locally significant habitat type as it provides suitable habitat for the Brush-tailed Mulgara and potentially for other conservation significant fauna such as the Greater Bilby. Two of the habitat types within the Purpose Permit Area, Low Stony Hills/Hillslopes and Stony Hummock Grassland, may also be considered as habitat for the Brush-tailed Mulgara (Ecoscape, 2019a).

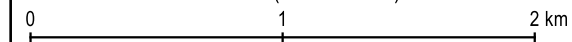


Legend

-  Proposed Clearing Footprint
-  Project Tenements
- Fauna Habitats**
-  Cleared
-  Low Stony Hills/ Hillslopes
-  Mulga / mixed Acacia woodland
-  Stony clay plains
-  Stony hummock grassland

Scale: 1: 30,000
Original Size: A3

Grid: GDA94 / MGA zone 50 (EPSG:28350)



Element 25
Butcherbird Manganese Project
Butcherbird NVCP Amendment

Figure 6

Habitat Types of the Project Area

Martinick Bosch Sell Pty Ltd
4 Cook St
West Perth WA 6005
Australia
t: +61 8 9226 3166
info@mbsenvironmental.com.au
www.mbsenvironmental.com.au



Table 5: Fauna Habitats Within the Butcherbird Project Area

Habitat Type	Habitat Description	Habitat Within Purpose Permit Area
Low Stony Hills/Hillslopes	Low undulating stony hills and is characterised by a stony substrate ranging from a gravel/clay loam combination through to small rocky outcroppings. Vegetation is dominated by scattered Mulga (<i>Acacia aneura sens. Lat.</i>) over sparse <i>Eremophila</i> and <i>Senna</i> spp shrubs. Grass coverage is sporadic, including large areas of <i>Triodia basedowii</i> as well as areas lacking grass entirely. Wood and leaf litter is generally sparse though can be concentrated into pockets in small Mulga groves.	Yes
Mulga/Mixed Acacia Woodland	Dominated by clay-loam plains often with scattered gravel and small stones. The vegetation consists of sparse to moderately dense woodland comprised of Mulga species (<i>Acacia aneura sens. Lat.</i>), <i>Acacia pruinocarpa</i> and <i>Grevillea berryana</i> over <i>Eremophila</i> and <i>Senna</i> spp shrubs. Grass cover is variable including <i>Triodia basedowii</i> , <i>Eragrostis</i> and <i>Aristida</i> spp. Banded Mulga groves feature prominently within this habitat type, often separated by sparsely vegetated intergroves. Wood and leaf litter densities are generally low though can be concentrated beneath Mulga groves.	Yes
Stony Clay Plain	Dominated by clay-loam plains often with scattered gravel and small stones through to gibber plain. Vegetation consists of sparse to moderately dense shrubland comprised of <i>Hakea preissii</i> , <i>Eremophila</i> spp, <i>Senna</i> spp. And <i>Sclerolaena</i> spp. Grass cover at the time of survey was extremely sparse to non-existent.	Yes
Stony Hummock Grassland	Dominated by clay-loam plains with scattered small stones. Vegetation consists of sparse <i>Acacia</i> spp and <i>Hakea</i> spp shrubland over <i>Triodia Basedowii</i> .	Yes
Sandy Hummock Grassland	Soils are sandy, with some clay content, which support moderately dense areas of hummock grasses (<i>Triodia basedowii</i>) and scattered mixed Mulga woodlands, making it an important habitat for burrowing vertebrate. This habitat is more typical of those found in the Little Sandy Desert to the east of the Project and not typical of the Augustus sub-region. Recent fire evidence was noted over much of the habitat.	No
Drainage Line	Comprised of landform features and vegetation associated with Creeks and minor drainage lines.	No

2.4.4.2 Significant Fauna Species

During the 2019 survey, 80 fauna species were recorded including 13 species of native mammals, 6 introduced mammals, 32 bird species and 29 reptile species. Of the 13 species of mammals, seven were bats, however none were species of conservation significance.

Only one fauna species of significance, the Brush-tailed Mulgara (*Dasyercus blythi*, DBCA Priority 4), was recorded. The record was within the Mining Lease and Purpose Permit Area outside of the proposed project footprint and is consistent with the previous record from the 2012 survey.

2.4.5 Surface Water

An investigation of surface water hydrology was conducted for the Yanneri Ridge (including Butcherbird Manganese Project Stage 1) by Water Technology in October 2012. The report identifies one key un-named ephemeral creek in the immediate vicinity of the Project area. The un-named creek flows from north of the Project area to the immediate west of the Purpose Permit Area where it flows into Yanneri Pool located south of the Mining Lease.

Yanneri Ridge is in the centre of the Purpose Permit Area and rainfall generates overland flows in all directions over a hardpan surface from the ridge, but which predominantly flows into the main un-named creek. Flow velocities across the project area are generally less than 0.5 m/s, with some higher velocities adjacent to the Old Road and the Great Northern Highway. Water accumulation within the Mining Lease generally remains between 0 and 50 cm deep under all rainfall events (10-, 50- and 100- year Average Recurrence Intervals (ARI)). Modelling identified one area of localised ponding up to 2 m deep near the 'Old Road' to the east of the Mining Lease where drainage is unable to traverse the track. Modelling also predicted some accumulation of water on the eastern side of the Great Northern Highway, where drainage follows bunding along the Great Northern Highway.

A more detailed investigation of flows in the Mining Lease was carried out in August 2020 by MBS, it identified that Yanneri ridge has very little upstream catchment (no catchments extend more than 2 km upstream of proposed activities), resulting in low surface flow potential across the project site.

The Project area does not occur within a proclaimed surface water area under the *Rights in Water and Irrigation Act 1991 (RIWI Act)*.

2.4.6 Groundwater

The Project is situated in the Collier Basin in the Ilgarari Formation which consists of grey/white siltstone/shale, with minor sandstone, chert and limestone. The site is located immediately west and north of a continental divide at an elevation of about 625 mAHD. The upper eastern limits of the Ashburton River catchment are 25 km to the west, and the Gascoyne River catchment boundary is 20 km to the south. Yanneri Ridge, which hosts the orebody, is contained within a broader basin formed by strike ridges at elevations up to 740 mAHD and draining east into dune-fields of the Gibson Desert.

Results of project specific drilling in the deposit area have shown that depth to groundwater is typically less than 20 m and groundwater levels are flat across the site with little variation in depth. Results of water quality sampling typically show range of salinity between 600 to 1,600 mg/L Total Dissolved Salts (TDS) (i.e. freshwater) (MBS, 2020).

A number of pastoral bores are present surrounding the project area with more bores present on Bulloo Downs station than Kumarina Station.

Groundwater monitoring bores, constructed by Element 25 exist in and around the project area and are sampled as per various environmental reporting requirements.

The Project is situated in the East Murchison Groundwater Proclamation Area under Section 26B (1) of the *RIWI Act*.

3. PROPOSED LAND CLEARING

The proposed land clearing for this NVCP is:

- Change (increase) in Purpose Permit boundary by removal of two of the four "areas subject to conditions" on tenement M52/1074 identified in CPS 8991/2.
- Increase in clearing footprint to allow expansion of operations.

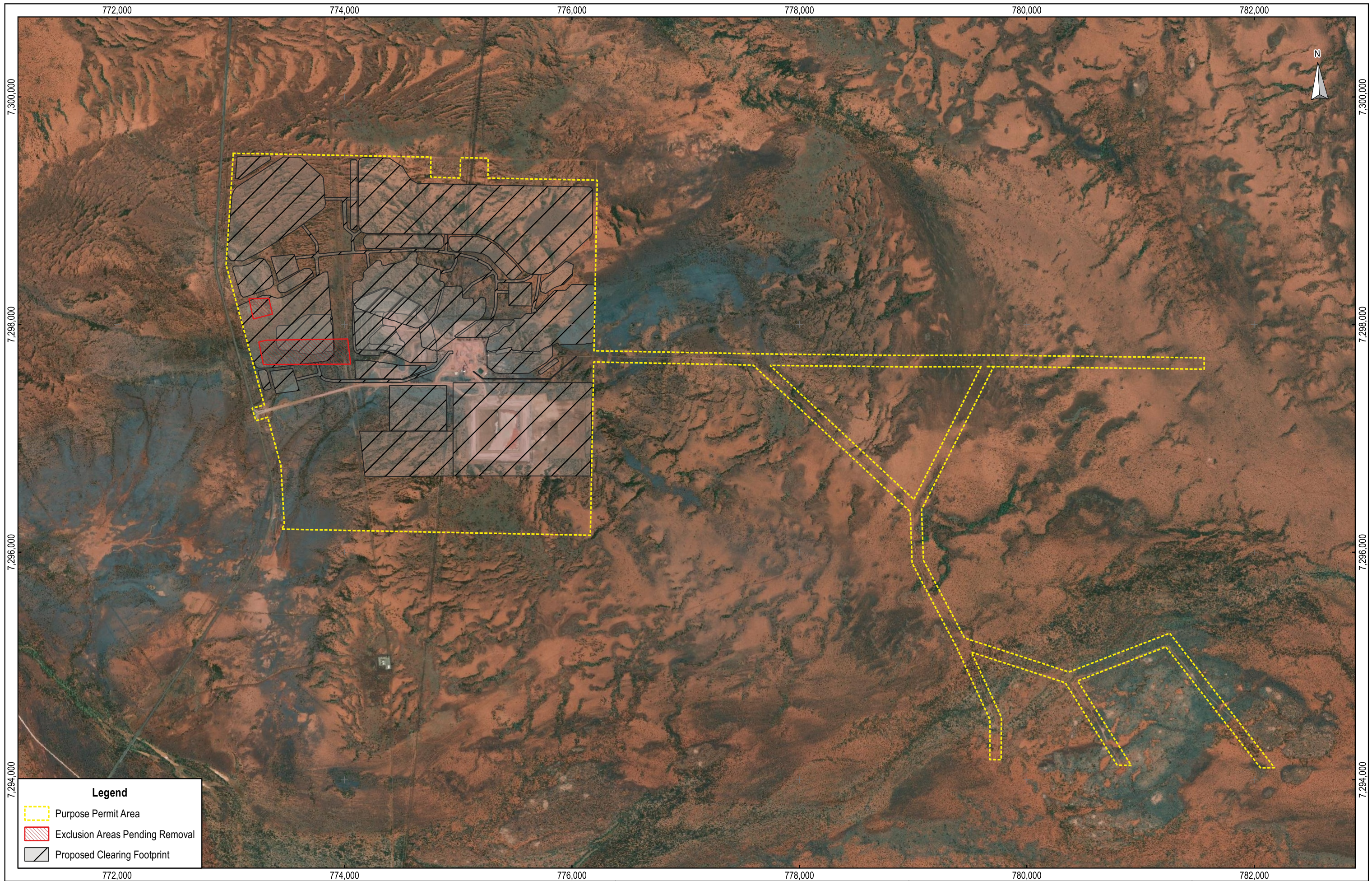
The revised Purpose Permit area is approximately 1,142.3 ha noting that the only change is removal of two of the four exclusion areas located within the Purpose Permit Area. The removal of the exclusion areas will not have adverse impacts on the conservation status of *Eremophila appressa* (P1) as more populations of this species have been identified outside of the Purpose Permit Area since approval of the existing NVCP which required the exclusion zones based on limited knowledge about the species. Results of the additional targeted surveys have shown the extent and population of this species is greater than previously recognised.

The Butcherbird Project will require clearing of 620.7 ha. This reflects a net increase of 355.7 ha within the Purpose Permit area. The footprint of the proposed clearing is shown in Figure 7.

A shapefile is provided for the amended Purpose Permit application area, as displayed in Figure 7 and summary of changes is provided in Table 6.

Table 6: Summary of Proposed Land Clearing

Item	Description	Area (ha)
Change in Purpose Permit area	Removal of exclusion areas (Condition 5 of CPS 8991/2)	19.64
Additional Area	Additional footprint within Purpose Permit area	355.7

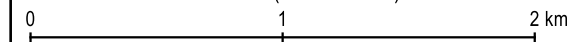


Legend

- Purpose Permit Area
- Exclusion Areas Pending Removal
- Proposed Clearing Footprint

Scale: 1: 30,000
Original Size: A3

Grid: GDA94 / MGA zone 50 (EPSG:28350)



Element 25
Butcherbird Manganese Project
Butcherbird NVCP Amendment

Figure 7

Purpose Permit Amendment

Martinick Bosch Sell Pty Ltd
4 Cook St
West Perth WA 6005
Australia
t: +61 8 9226 3166
info@mbsenvironmental.com.au
www.mbsenvironmental.com.au



4. ASSESSMENT OF CLEARING PRINCIPLES

4.1 NATIVE VEGETATION CLEARING PRINCIPLES

Clearing applications are assessed against ten principles outlined in Schedule 5 of the EP Act 1986. These principles aim to ensure that all potential impacts resulting from removal of native vegetation are assessed in an integrated way and apply to all lands throughout Western Australia. The principles address the four environmental areas of biodiversity significance, land degradation, conservation estate and ground and surface water quality.

Of the 10 Clearing Principles, 6 were re-assessed for the proposed clearing considering the environmental values of the proposed changes to the Purpose Permit area and project footprint.

The following sections discuss the potential impacts associated with the clearing for the Project. A summary of the outcomes of the assessment against the ten Clearing Principles is provided in Table 7.

Table 7: Summary of Clearing Assessment Against Clearing Principles

Principle	Clearing Principle	Outcome
a	Native vegetation should not be cleared if it comprises a high level of biological diversity	Not at variance
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 at variance
c	Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, rare (Threatened) flora	Not at variance
d	Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a Threatened Ecological Community (TEC)	Not at variance
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	Not at variance
f	Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland	Unlikely to be at variance
g	Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation	Not at variance
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 areas	Not at variance
i	Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water	Unlikely to be at variance
j	Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence of flooding	Unlikely to be at variance

4.2 BIODIVERSITY

Clearing Principle A: Native vegetation should not be cleared if it comprises a high level of biological diversity.

The Gascoyne bioregion in which the Purpose Permit Area is located is not generally considered to have high floristic diversity (when compared with the adjacent Pilbara or southwestern Western Australia) (Ecoscape 2019b).

Impacts to the biological diversity of native vegetation associated with clearing for the project expansion are limited to localised flora/habitat loss from clearing in the Project area. No Threatened flora or fauna species, TECs or PECs were identified within or adjacent to the Project Area. Direct impacts on Priority flora species will be localised with Project specific surveys demonstrating significant populations of both *Eremophila appressa* (P1) and *Eremophila rigida* (P3) are present outside of the Purpose Permit Area that will not be directly or indirectly impacted by Project activities.

It is not expected that the proposal would significantly impact on biodiversity and subsequently the proposed clearing is unlikely to be at variance with Clearing Principle A.

No additional management or mitigation measures to those previously addressed in CPS8991/2 are proposed.

4.3 SIGNIFICANT FAUNA HABITAT

Clearing 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.

The three habitat types present in the Purpose Permit Area are represented over wide areas and include no significant habitat types, with no Threatened fauna specifically associated with individual habitat types within the Augustus IBRA sub-region. The three habitat types of the Project area represent mostly transitory utilisation by significant species (Ecoscape 2019c).

One Brush-tailed Mulgara (*Dasyercus blythi*, Priority 4) was observed during the Level 2 Fauna Survey in April 2019 (Ecoscape 2019c) and its presence was linked to the Stony Hummock Grasslands habitat type in the Mining Lease area, west of the Borefield, and within the Borefield. This habitat type was recorded as being present in all survey areas in Project specific baseline studies and is not regarded as uncommon within the region (Ecoscape, 2019). The proposed additional clearing impacts about 7.8 ha of this habitat type of the 437.9 ha mapped by baseline surveys.

No additional management or mitigation measures to those previously addressed in CPS8991/2 are proposed.

4.4 SIGNIFICANT FLORA

Clearing Principle C: Native vegetation should not be cleared if it includes, or is necessary for the continued existence of rare (Threatened) flora.

Site-specific surveys have not identified any Threatened flora species present within or adjacent to the approved or proposed amended Purpose Permit Area.

The proposed additional clearing will result in additional loss of Priority flora populations. The number of Priority flora proposed to be affected by the Project is documented in Table 8.

Table 8: Proposed Loss of Priority Flora Species

	<i>Eremophila appressa</i> (P1)	<i>Eremophila rigida</i> (P3)	<i>Rhagodia sp. Hamersley (M. Trudgen 17794)</i> (P3)	<i>Goodenia nuda</i> (P4)
Known Locations of Plants	246	217	20	5
Locations Within Purpose Permit Area	63	37	0	2
Locations in Removed Exclusion Areas	36	0	0	0
Locations in Retained Exclusion Areas	12	3	0	0
Approved Loss Locations	6	3	0	0
Additional Loss Locations	25	10	0	1
Total Proposed Loss Locations	31	13	0	1

Results of the additional targeted surveys have shown the extent and population of *Eremophila appressa* is greater than previously recognised.

Clearing within the two south western exclusion areas is likely to remove about 36 individuals from the local population of Priority species *Eremophila appressa* (P1) but will not affect the population of *Eremophila rigida* (P3). Planning has considered the northern and eastern populations of *Eremophila appressa* and *Eremophila rigida* within the Mining lease constraints and has consciously avoided those areas to minimise local impact on the species.

Clearing within the proposed Project footprint will remove a further 25 locations of *Eremophila appressa* (P1), 10 locations of *Eremophila rigida* (P3) and one location of *Goodenia nuda* (P4) with the total take considering the already approved loss being about 31 *Eremophila appressa* (P1) locations (estimated to be about 183 individuals of the 1,304 known plants in the local area), 13 *Eremophila rigida* (P3) populations and 1 *Goodenia nuda* (P4) population. These Priority flora species are well represented outside of the Purpose Permit area and the proposed additional loss will not adversely impact their conservation status.

No additional management or mitigation measures to those previously addressed in CPS 8991/2 are proposed.

4.5 THREATENED ECOLOGICAL COMMUNITIES

Clearing Principle D: Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a threatened ecological community.

No Threatened Ecological Communities (TEC) listed under the *Environmental Protection and Biodiversity Conservation Act 1990 (EPBC Act)* or *Biodiversity Conservation Act 2016 (BC Act)* were identified within a 50 km search radius.

4.6 REMNANT VEGETATION

Clearing 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.

Two pre-European vegetation associations were identified in the survey area (DPIRD 2018). Both pre-European vegetation associations have more than 99% remaining. Clearing associated with the Project will not result in loss of a significant remnant of native vegetation.

4.7 WATERCOURSE OR WETLAND ENVIRONMENTS

Clearing Principle 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 proposal is situated within the Lake Disappointment catchment and Sandy Desert Basin Sub-catchment and no wetlands are present. Yanneri Ridge acts as a watershed with the majority of flows captured in an un-named ephemeral creek. No vegetation within the mining lease or miscellaneous tenements L52/215-221 are considered likely to be groundwater dependent due to the lack of landscapes with significant reserves of groundwater and the lack of surface expression of groundwater. Several areas within the miscellaneous tenement L52/225 are described as potentially representative of GDV due to the occurrence of *Eucalyptus victrix*, however; Ecoscape found it was not possible to determine if the vegetation with *Eucalyptus victrix* is representative of GDV as the species is not considered to be dependent on groundwater in most circumstances and is tolerant to gradual groundwater decline (Ecoscape, 2021). These areas have not been included in the Purpose Permit Area.

As the additional proposed clearing will not impact watercourses or wetlands, the proposal will not be at variance with Clearing Principle F.

4.8 LAND DEGRADATION

Clearing Principle G: Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.

Parts of the Purpose Permit Area are degraded as a result of existing mining and pastoral operations. Existing degraded areas are proposed to be utilised where practicable to minimise additional clearing and associated degradation.

The proposal will not result in appreciable land degradation and as such it will not be at variance with Clearing Principle G.

4.9 CONSERVATION ESTATE

Clearing Principle 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.

The Purpose Permit Area and the proposed additional clearing is not associated with any conservation lands and the nearest conservation estate, Collier Range National Park, is located approximately 6 km to the south of the Purpose Permit Area's southern boundary (Figure 7).

Due to the distance from the Collier Range National Park, the additional clearing is not considered to be at variance with Clearing Principle H.

4.10 SURFACE AND GROUNDWATER QUALITY

Clearing Principle 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 quality has the potential to be affected by increased sedimentation caused through clearing from soil disturbance and removal of vegetation that acts to bind soil.

Surface water flows across the Project area at generally low velocities (0.5 m/s) in the form of sheet flows and shallow drainage lines that run toward Ilgarri Creek. Rainfall events are irregular due to the arid climate and surface water is infrequently present, but it is expected to be similar to rainwater. Additional clearing is in deposit

area which are typically elevated in the landform. Impacts from land clearing on minor ephemeral watercourses as such are not predicted.

No impacts to groundwater from the proposed clearing are anticipated as there are no aquifers in the mine deposit areas. No additional clearing is proposed for the Borefield area where the Silcrete Aquifer is known to be present.

There are no Priority Drinking Water Source Areas located nearby (Department of Water and Environment Regulation, 2020).

Overall, the proposed additional clearing is considered unlikely to be at variance with Clearing Principle I.

4.11 FLOODING POTENTIAL

Clearing Principle J: Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence of flooding.

The proposed clearing is within an area of desert climate where annual rainfall is generally less than 200 mm and the region loses more water via evapotranspiration than it receives as rain, generally a result of hot, sunny weather without significant cloud. The mean annual rainfall is 329.5 mm, approximately 75% of which falls in summer (December to April) from thunderstorms or cyclone events.

Hydrological studies observed that flow velocities across the Project area are generally less than 0.5 m/s, with some higher velocities adjacent to the Old Road and the Great Northern Highway (Water Technology 2012).

Removal of vegetation generally increases flooding, whereby uptake, infiltration, moisture retention and physical barriers to reduce flow velocities provided by vegetation are removed. Substantial removal of vegetation, generally in at-risk areas can increase the potential for flooding. Due to the limited extent of vegetation to be removed through the clearing proposed, it is considered unlikely that flooding will either be exacerbated or will increase in frequency.

Overall, the proposed additional clearing will have no detectable increased impact on flooding potential for the Project area or its immediate surrounds. Therefore, the proposed clearing will not be at variance with Clearing Principle J.

5. REPORTING AND AUDITING

Disturbance as a result of the proposed vegetation clearing will be reported yearly under the Butcherbird Annual Environmental Report (AER) and Mine Rehabilitation Fund (MRF) reporting.

An Annual Report will continue to be completed as per current Clearing Permit Conditions:

- The Permit Holder shall provide a report to the CEO by 31 July each year for the life of this Permit, demonstrating adherence to all conditions of this Permit, and setting out the records required under Condition 10 of this Permit in relation to clearing carried out between 1 July and 30 June of the previous financial year
- If no clearing authorised under this Permit was undertaken between 1 July and 30 June of the previous financial year, a written report confirming that no clearing under this permit has been carried out, must be provided to the CEO by 31 July of each year.

5.1 MANAGING DIRECTOR

The Managing Director will:

- Ensure appropriate resources and systems are provided to implement the management and mitigation measures outlined in this document.
- Ensure adequate processes are established to communicate relevant information with internal and external stakeholders.

5.2 GENERAL MANAGER OPERATIONS

The General Manager Operations will:

- Ensure all land clearing within the Butcherbird Manganese Project is conducted in compliance with this document and other regulatory requirements.
- Ensure all employees and contractors on site are aware of and adhere to obligations regarding clearing requirements.
- Ensure adequate processes are maintained to communicate relevant information with internal stakeholders.
- Ensure that all the required information is provided in the Vegetation Clearing Application and that data is accurate.
- Record environmental incidents.
- Report environmental incidents to the Managing Director.
- Review and approve all Vegetation Clearing Applications.
- Report environmental incidents to the relevant Regulator.
- Ensure that the Butcherbird Internal Clearing Permit Register is maintained.
- Ensure that data is compiled and collated as it relates to vegetation clearing for use in annual reporting.

5.3 CLEARING SUPERVISOR

The Clearing Supervisor will:

- Ensure management measures contained in this application and associated plans and procedures are implemented.
- Ensure that land clearing is undertaken only as authorised by the Vegetation Clearing Application.

- Conduct site walkovers of areas with clearing machinery operators prior to clearing.
- Ensure that post-clearing surveys are conducted, and that data is provided to the General Manager Operations.
- Report environmental incidents as per internal incident reporting systems.

5.4 ALL EMPLOYEES AND CONTRACTORS

Employees and contractors are responsible for:

- Preventing contamination of vegetation, topsoil and subsoil stockpiles.
- Adhering to obligations in relation to vegetation clearing procedures.
- Reporting environmental incidents.
- Keeping to existing tracks unless following advice from their Supervisor.
- Adhering to standard soil hygiene practices and spill response when operating machinery.
- Aiding in implementing and maintaining environmental impact minimisation programs when requested by their supervisor and the General Manager Operations.

6. CONCLUSION

The proposed clearing will not impact significantly upon the 10 Clearing Principles. The existing environmental management procedures implemented for the Project will be extended to the additional clearing to minimise potential adverse impacts.

Loss of Priority flora, particularly *Eremophila appressa* (P1), *Eremophila rigida* (P3) and *Goodenia nuda* (P4) are not considered to be significant enough to adversely impact the conservation status of these species. All three species have populations identified by Project specific baseline studies outside of the Purpose Permit Area both locally and regionally.

The known populations of *Eremophila appressa* have been substantially increased as a result of Project specific baseline studies. A significant number of plants are known to be in populations identified immediately adjacent to the Purpose Permit Area that will not be impacted by the Project. The proposed loss of an additional 25 populations is not considered significant in this context.

Eremophila rigida is known to be widespread locally and regionally (range over 20,000 km²). The proposed loss of an additional 10 populations is not considered significant in this context.

Goodenia nuda is widespread in arid parts of Western Australia and is known to be present in four bioregions. The proposed loss of one population is not considered to be significant.

Removal of the two current southwestern exclusion zones will not result in impacts on the Priority flora species *Eremophila appressa* that would result in a significant change to their conservation status. Additional targeted flora surveys in areas adjacent to the Purpose Permit Area identified more populations and individual plants than are present in the exclusion zones proposed to be removed.

Conditions on the approved NVCP are considered adequate to address potential impacts from land clearing. No different conditions are considered to be required for the additional NVCP.

7. REFERENCES

Atlas of Living Australia 2021, Atlas of Living Australia website. Available from: <https://www.ala.org.au/australias-species/>.

Bureau of Meteorology (BoM). 2022. Climate Data Online. Available from: <http://www.bom.gov.au/climate/data/> (accessed 15 August 2022).

Department of Biodiversity Conservation and Attractions 2007, *NatureMap: Mapping Western Australia's Biodiversity*. Available from: <https://naturemap.dbca.wa.gov.au/>.

Department of Biodiversity Conservation and Attractions 2019, *Conservation codes for Western Australian Flora and Fauna (18 July 2021)*. Available from: [Conservation Codes for Western Australian Flora and Fauna \(dpaw.wa.gov.au\)](http://dpaw.wa.gov.au)

Ecoscape (Australia) Pty Ltd 2019a, *Butcherbird Manganese Project Flora and Vegetation Assessment*. Unpublished report prepared for Element 25 Ltd.

Ecoscape (Australia) Pty Ltd 2019b, *Butcherbird Flora and Vegetation Recommendations*. Unpublished report prepared for Element 25 Ltd.

Ecoscape (Australia) Pty Ltd 2019c, *Butcherbird Manganese Project Fauna Assessment*. Unpublished report prepared for Element 25 Ltd.

Ecoscape (Australia) Pty Ltd 2021. *Butcherbird Targeted Flora Surveys*. Unpublished report prepared for Element 25 Ltd.

Water Technology 2012. *Yanneri Hydrological Study Document 226101R02V05*. Unpublished report prepared for Element 25 Ltd

APPENDIX 1: RECORD OF TENURE

Register for Tenement M 52/1074



Identifier: M 52/1074

Status: Live
Area: 1,456.82100 HA
Markout: 15/02/2018 10:00:00
Received: 23/02/2018 16:05:00
Term Granted: 21 Years
Commence: 29/06/2020
Expiry: 28/06/2041
Death:

Rent Status

Due for Year End 28/06/2023: PAID IN FULL
Rental for Year End 28/06/2024: \$34,968.00

Expenditure Status

Expended Year End 28/06/2022: EXPENDED IN FULL
Current Year Commitment: \$145,700.00

Holdings	Description	Relationships	Survey	General	Shire	Grant	Conditions	Dealings
Payments	Expenditure	Combined Reporting	Bond	Map	Native Title	Documents		

Current Holders Holder Changes Applicants On Receipt

Organisation	ELEMENT 25 LIMITED	100/100
ACN	119 711 929	ABN 46 119 711 929
Correspondence Details		
Address	LEVEL 1, BUILDING B, GARDEN OFFICE PARK, 355 SCARBOROUGH BEACH ROAD, OSBORNE PARK, WA, 6017	
Email	xxxxxx@e25.com.au	
Telephone	xxxxxxxx400	
Designated Tenement Contact (Correspondence Details)		
Name	TENEMENT MANAGER	
Address	PO BOX 1167, OSBORNE PARK DC, WA, 6916	
Email	xxxxxx@e25.com.au	
Telephone	xxxxxxxx400	

Register for Tenement L 52/215



Identifier: L 52/215

Status: Live
Area: 53.87735 HA
Markout:
Received: 20/04/2020 16:10:20
Term Granted: 21 Years
Commence: 03/09/2020
Expiry: 02/09/2041
Death:

Rent Status

Due for Year End 02/09/2023: PAID IN FULL
Rental for Year End 02/09/2024: \$1,188.00

Expenditure Status

Expended Year End : NO EXPENDITURE REQUIRED
Current Year Commitment: NO EXPENDITURE REQUIRED

Holdings	Description	Relationships	Survey	General	Shire	Grant	Conditions	Dealings
Payments	Expenditure	Combined Reporting	Bond	Map	Native Title	Documents		

Current Holders Holder Changes Applicants On Receipt

Organisation	ELEMENT 25 LIMITED	100/100
ACN	119 711 929	ABN 46 119 711 929
Correspondence Details		
Address	LEVEL 1, BUILDING B, GARDEN OFFICE PARK, 355 SCARBOROUGH BEACH ROAD, OSBORNE PARK, WA, 6017	
Email	xxxxxx@e25.com.au	
Telephone	xxxxxxxx400	
Designated Tenement Contact (Correspondence Details)		
Name	TENEMENT MANAGER	
Address	PO BOX 1167, OSBORNE PARK DC, WA, 6916	
Email	xxxxxx@e25.com.au	
Telephone	xxxxxxxx400	

Register for Tenement L 52/218



Identifier: L 52/218

Status: Live
Area: 37.67312 HA
Markout:
Received: 21/04/2020 16:27:37
Term Granted: 21 Years
Commence: 03/09/2020
Expiry: 02/09/2041
Death:

Rent Status

Due for Year End 02/09/2023: PAID IN FULL
Rental for Year End 02/09/2024: \$836.00

Expenditure Status

Expended Year End : NO EXPENDITURE REQUIRED
Current Year Commitment: NO EXPENDITURE REQUIRED

Holdings	Description	Relationships	Survey	General	Shire	Grant	Conditions	Dealings
Payments	Expenditure	Combined Reporting	Bond	Map	Native Title	Documents		

Current Holders Holder Changes Applicants On Receipt

Organisation	ELEMENT 25 LIMITED	100/100
ACN	119 711 929	ABN 46 119 711 929
Correspondence Details		
Address	LEVEL 1, BUILDING B, GARDEN OFFICE PARK, 355 SCARBOROUGH BEACH ROAD, OSBORNE PARK, WA, 6017	
Email	xxxxxx@e25.com.au	
Telephone	xxxxxxxx400	
Designated Tenement Contact (Correspondence Details)		
Name	TENEMENT MANAGER	
Address	PO BOX 1167, OSBORNE PARK DC, WA, 6916	
Email	xxxxxx@e25.com.au	
Telephone	xxxxxxxx400	

Register for Tenement L 52/220



Identifier:

L 52/220

Status: Live
Area: 18.16664 HA
Markout:
Received: 27/07/2020 15:08:03
Term Granted: 21 Years
Commence: 04/12/2020
Expiry: 03/12/2041
Death:

Rent Status

Due for Year End 03/12/2022: PAID IN FULL
Rental for Year End 03/12/2023: \$0.00

Expenditure Status

Expended Year End : NO EXPENDITURE REQUIRED
Current Year Commitment: NO EXPENDITURE REQUIRED

Holders	Description	Relationships	Survey	General	Shire	Grant	Conditions	Dealings																																	
Payments	Expenditure	Combined Reporting	Bond	Map	Native Title	Documents																																			
Current Holders	Holder Changes	Applicants On Receipt																																							
<table border="1"> <tr> <td>Organisation</td> <td>ELEMENT 25 LIMITED</td> <td>100/100</td> </tr> <tr> <td>ACN</td> <td>119 711 929</td> <td>ABN 46 119 711 929</td> </tr> <tr> <td colspan="3">Correspondence Details</td> </tr> <tr> <td>Address</td> <td colspan="2">LEVEL 1, BUILDING B, GARDEN OFFICE PARK, 355 SCARBOROUGH BEACH ROAD, OSBORNE PARK, WA, 6017</td> </tr> <tr> <td>Email</td> <td colspan="2">xxxxxx@e25.com.au</td> </tr> <tr> <td>Telephone</td> <td colspan="2">xxxxxxxx400</td> </tr> <tr> <td colspan="3">Designated Tenement Contact (Correspondence Details)</td> </tr> <tr> <td>Name</td> <td colspan="2">TENEMENT MANAGER</td> </tr> <tr> <td>Address</td> <td colspan="2">PO BOX 1167, OSBORNE PARK DC, WA, 6916</td> </tr> <tr> <td>Email</td> <td colspan="2">xxxxxx@e25.com.au</td> </tr> <tr> <td>Telephone</td> <td colspan="2">xxxxxxxx400</td> </tr> </table>									Organisation	ELEMENT 25 LIMITED	100/100	ACN	119 711 929	ABN 46 119 711 929	Correspondence Details			Address	LEVEL 1, BUILDING B, GARDEN OFFICE PARK, 355 SCARBOROUGH BEACH ROAD, OSBORNE PARK, WA, 6017		Email	xxxxxx@e25.com.au		Telephone	xxxxxxxx400		Designated Tenement Contact (Correspondence Details)			Name	TENEMENT MANAGER		Address	PO BOX 1167, OSBORNE PARK DC, WA, 6916		Email	xxxxxx@e25.com.au		Telephone	xxxxxxxx400	
Organisation	ELEMENT 25 LIMITED	100/100																																							
ACN	119 711 929	ABN 46 119 711 929																																							
Correspondence Details																																									
Address	LEVEL 1, BUILDING B, GARDEN OFFICE PARK, 355 SCARBOROUGH BEACH ROAD, OSBORNE PARK, WA, 6017																																								
Email	xxxxxx@e25.com.au																																								
Telephone	xxxxxxxx400																																								
Designated Tenement Contact (Correspondence Details)																																									
Name	TENEMENT MANAGER																																								
Address	PO BOX 1167, OSBORNE PARK DC, WA, 6916																																								
Email	xxxxxx@e25.com.au																																								
Telephone	xxxxxxxx400																																								

Register for Tenement L 52/221



Identifier:

L 52/221

Status: Live
Area: 41.54201 HA
Markout:
Received: 27/07/2020 15:08:03
Term Granted: 21 Years
Commence: 04/12/2020
Expiry: 03/12/2041
Death:

Rent Status

Due for Year End 03/12/2022: PAID IN FULL
Rental for Year End 03/12/2023: \$0.00

Expenditure Status

Expended Year End : NO EXPENDITURE REQUIRED
Current Year Commitment: NO EXPENDITURE REQUIRED

Holders	Description	Relationships	Survey	General	Shire	Grant	Conditions	Dealings																																	
Payments	Expenditure	Combined Reporting	Bond	Map	Native Title	Documents																																			
Current Holders	Holder Changes	Applicants On Receipt																																							
<table border="1"> <tr> <td>Organisation</td> <td>ELEMENT 25 LIMITED</td> <td>100/100</td> </tr> <tr> <td>ACN</td> <td>119 711 929</td> <td>ABN 46 119 711 929</td> </tr> <tr> <td colspan="3">Correspondence Details</td> </tr> <tr> <td>Address</td> <td colspan="2">LEVEL 1, BUILDING B, GARDEN OFFICE PARK, 355 SCARBOROUGH BEACH ROAD, OSBORNE PARK, WA, 6017</td> </tr> <tr> <td>Email</td> <td colspan="2">xxxxxx@e25.com.au</td> </tr> <tr> <td>Telephone</td> <td colspan="2">xxxxxxxx400</td> </tr> <tr> <td colspan="3">Designated Tenement Contact (Correspondence Details)</td> </tr> <tr> <td>Name</td> <td colspan="2">TENEMENT MANAGER</td> </tr> <tr> <td>Address</td> <td colspan="2">PO BOX 1167, OSBORNE PARK DC, WA, 6916</td> </tr> <tr> <td>Email</td> <td colspan="2">xxxxxx@e25.com.au</td> </tr> <tr> <td>Telephone</td> <td colspan="2">xxxxxxxx400</td> </tr> </table>									Organisation	ELEMENT 25 LIMITED	100/100	ACN	119 711 929	ABN 46 119 711 929	Correspondence Details			Address	LEVEL 1, BUILDING B, GARDEN OFFICE PARK, 355 SCARBOROUGH BEACH ROAD, OSBORNE PARK, WA, 6017		Email	xxxxxx@e25.com.au		Telephone	xxxxxxxx400		Designated Tenement Contact (Correspondence Details)			Name	TENEMENT MANAGER		Address	PO BOX 1167, OSBORNE PARK DC, WA, 6916		Email	xxxxxx@e25.com.au		Telephone	xxxxxxxx400	
Organisation	ELEMENT 25 LIMITED	100/100																																							
ACN	119 711 929	ABN 46 119 711 929																																							
Correspondence Details																																									
Address	LEVEL 1, BUILDING B, GARDEN OFFICE PARK, 355 SCARBOROUGH BEACH ROAD, OSBORNE PARK, WA, 6017																																								
Email	xxxxxx@e25.com.au																																								
Telephone	xxxxxxxx400																																								
Designated Tenement Contact (Correspondence Details)																																									
Name	TENEMENT MANAGER																																								
Address	PO BOX 1167, OSBORNE PARK DC, WA, 6916																																								
Email	xxxxxx@e25.com.au																																								
Telephone	xxxxxxxx400																																								

APPENDIX 2: ECOSCAPE 2021 – TARGETED FLORA SURVEY

BUTCHERBIRD TARGETED FLORA SURVEYS

Element 25

ecoscape



COPYRIGHT STATEMENT FOR:
Butcherbird Targeted Flora Surveys
Our Reference: 4671-21R Butcherbird Targeted Flora Surveys
Copyright © 1987-2021
Ecoscape (Australia) Pty Ltd
ABN 70 070 128 675

Except as permitted under the Copyright Act 1968 (Cth), the whole or any part of this document may not be reproduced by any process, electronic or otherwise, without the specific written permission of the copyright owner, Ecoscape (Australia) Pty Ltd. This includes microcopying, photocopying or recording of any parts of the report.

Revision	Author	QA Reviewer	Approved	Date
Draft	Lyn Atkins	LS	LS	12/10/2021
Final	Lyn Atkins	LS	LS	29/10/2021

Direct all inquiries to:
Ecoscape (Australia) Pty Ltd
9 Stirling Highway • PO Box 50 NORTH FREMANTLE WA 6159
Ph: (08) 9430 8955
Prepared for Element 25

This document should be cited as 'Ecoscape (Australia) Pty Ltd (2021) Butcherbird Targeted Flora Surveys, prepared for Element 25'

TABLE OF CONTENTS

Acknowledgements	1
Executive Summary	2
Acronyms and Abbreviations	3
1 Introduction	4
1.1 Background	4
1.2 Survey Area.....	4
1.3 Survey requirements	5
1.4 Compliance	5
2 Desktop Assessment (Threatened and Priority Flora)	6
2.1 DBCA Database Search.....	6
2.1.1 <i>Seringia exastia</i>	6
2.1.2 Ecological Communities	7
2.2 Previous Surveys	7
2.3 Threatened and Priority Flora Likelihood Assessment	7
2.4 Relevant Literature	8
2.4.1 Previous Surveys	8
3 Methods	9
3.1 Survey Aims	9
3.2 Field Survey Methods.....	9
3.2.1 Field Survey Methods.....	9
3.2.2 Post-survey Likelihood Assessment	10
3.2.3 Riparian and Groundwater Dependent Vegetation	10
4 Field Survey Results	12
4.1 Southern Borefield Extension Area	12
4.1.1 Threatened Flora.....	12
4.1.2 Priority Flora	12
4.1.3 Riparian / GDV Areas.....	13
4.2 Non-Impact Area	14
4.2.1 Threatened Flora.....	14
4.2.2 Priority Flora	14
4.3 Recorded Species	16
4.4 Botanical Limitations	18
5 Discussion	20
5.1 Conservation-listed Flora	20
5.1.1 Threatened Flora.....	20
5.1.2 Priority Flora	20
5.1.3 Post-survey Likelihood Assessment	20
5.2 Riparian and GDV in the Southern Borefield Extension Area.....	21
References	22
Maps	24
Appendix One Legislative Context, Definitions and Criteria	28
Commonwealth Environment Protection and Biodiversity Conservation Act 1999.....	28

Western Australian Environmental Protection Act 1986.....	29
Western Australian Biodiversity Conservation Act 2016	30
Priority-listed Flora and Fauna	30
Appendix Two Desktop Assessment Results and Likelihood Assessments	33
Appendix Three DBCA Report Forms	36

FIGURES

Figure 1: Survey area location.....	4
Figure 2: Rainfall deciles for the 6 months prior to the field survey (Bureau of Meteorology 2021)	19

TABLES

Table 1: Acronyms and abbreviations	3
Table 2: Categories for likelihood of occurrence of TF and PF	8
Table 3: <i>Eremophila appressa</i>	16
Table 4: <i>Eremophila rigida</i>	17
Table 5: Botanical limitations	18
Table 6: EPBC Act categories for flora, fauna and ecological communities	28
Table 7: Conservation codes for Western Australian flora and fauna (DBCA 2019)	30
Table 8: Flora database search results, habitat and likelihood assessment.....	33

MAPS

Map 1: Flora database search results	25
Map 2: Borefield extension area	26
Map 3: Non-impact area north of M52/1074.....	27

IMAGES

Image 1: <i>Eremophila rigida</i>	12
Image 2: <i>Eremophila appressa</i> (foreground, visible only as faint branches) habit and habitat.....	14
Image 3: <i>Eremophila rigida</i> habit and habitat.....	15

ACKNOWLEDGEMENTS

Ecoscope would like to acknowledge the assistance of Leo Boynton (MBS Environmental) and Element 25 personnel (Ian Huitson, Pat Ratacharern) during these works.

EXECUTIVE SUMMARY

Ecoscope was appointed by Element 25 to conduct a targeted conservation-listed flora survey of two areas associated with its Butcherbird Manganese mine in the Gascoyne bioregion, south of Newman. The survey concentrated on locating and mapping two *Eremophila* species (*Eremophila appressa*, P1 and *Eremophila rigida*, P3) although any conservation-listed species occurring were to be recorded.

Ecoscope conducted the field surveys during 30 August to 2 September 2021 which was within the flowering period of both main target species.

Element 25 is proposing to expand its borefield into an area known as the 'borefield extension area' in this report, located south of its current Mining Lease (M) 52/1074. The field survey located 10-20 *Eremophila rigida* plants within and adjacent to the survey area. No additional plants or other species are considered likely to occur in this area.

An area located to the north of M 52/1074, herein known as the 'non-impact area', was surveyed to identify the distribution of local populations of Priority Flora species detected within the Mining Lease. This area was subject to grid searches during which approximately 500 *Eremophila appressa* plants were recorded within the survey area, with two of the three populations extending outside the survey area. Approximately 900 *Eremophila rigida* plants were recorded; populations of these also extended outside the survey area.

ACRONYMS AND ABBREVIATIONS

Table 1: Acronyms and abbreviations

Acronyms	
BC Act	Western Australian <i>Biodiversity Conservation Act 2016</i>
CR	Critically Endangered (listed under Commonwealth EPBC Act and/or Western Australian BC Act)
DAWE	Commonwealth Department of Agriculture, Water and Environment (2020-)
DBCA	Western Australian Department of Biodiversity, Conservation and Attractions
EN	Endangered (listed under Commonwealth EPBC Act and/or Western Australian BC Act)
Ecoscape	Ecoscape (Australia) Pty Ltd
EP Act	Western Australian <i>Environmental Protection Act 1986</i>
EPA	Western Australian Environmental Protection Authority
EPBC Act	Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i>
ha	hectare/hectares
IBRA	Interim Biogeographic Regionalisation for Australia
km	kilometre/kilometres
m	metre/metres
P; P1, P2, P3, P4, P5	Priority Flora and Fauna species rankings (P1-P4) or Priority Ecological Communities (P1-P5)
PF	Priority Flora
sp.	Species (generally referring to an unidentified taxon or when a phrase name has been applied)
subsp.	Subspecies (infrataxon)
TF	Threatened Flora (formerly termed Declared Rare Flora, DRF, in Western Australia)
var.	Variety (infrataxon)
VU	Vulnerable (listed under Commonwealth EPBC Act and/or Western Australian BC Act)

1 INTRODUCTION

1.1 BACKGROUND

Element 25 is proposing to extend its Butcherbird open pit manganese mine, processing and export operations into the wider Yanneri Resource.

Ecoscape was appointed to conduct a targeted conservation-listed flora survey of two areas to support an environmental impact assessment and future development in the vicinity of the Butcherbird Manganese Project. The two areas are known herein as the ‘southern borefield extension’ area, where Element 25 is proposing to expand its borefield and will require clearing for bores, other infrastructure (pipelines) and access, and the ‘non-impact area north of M52/1074’ where there are no plans for future expansion. The targeted survey in the non-impact area was to demonstrate the extent of conservation-listed flora outside the proposed development footprint.

1.2 SURVEY AREA

The Element 25 project area, known as the ‘survey area’ in this report, is located within the Shire of Meekatharra in the Gascoyne region, approximately 100 km south of Newman and 30 km north of Kumarina Roadhouse (**Figure 1**). The southern borefield extension area occupies approximately 131 ha and is located on Miscellaneous Licence (L) L 52/225 south of the project area. L 52/225 also links up with the eastern borefield tenements. The non-impact area north of M 52/1074 (abbreviated to ‘non-impact area’) occupies approximately 872 ha.

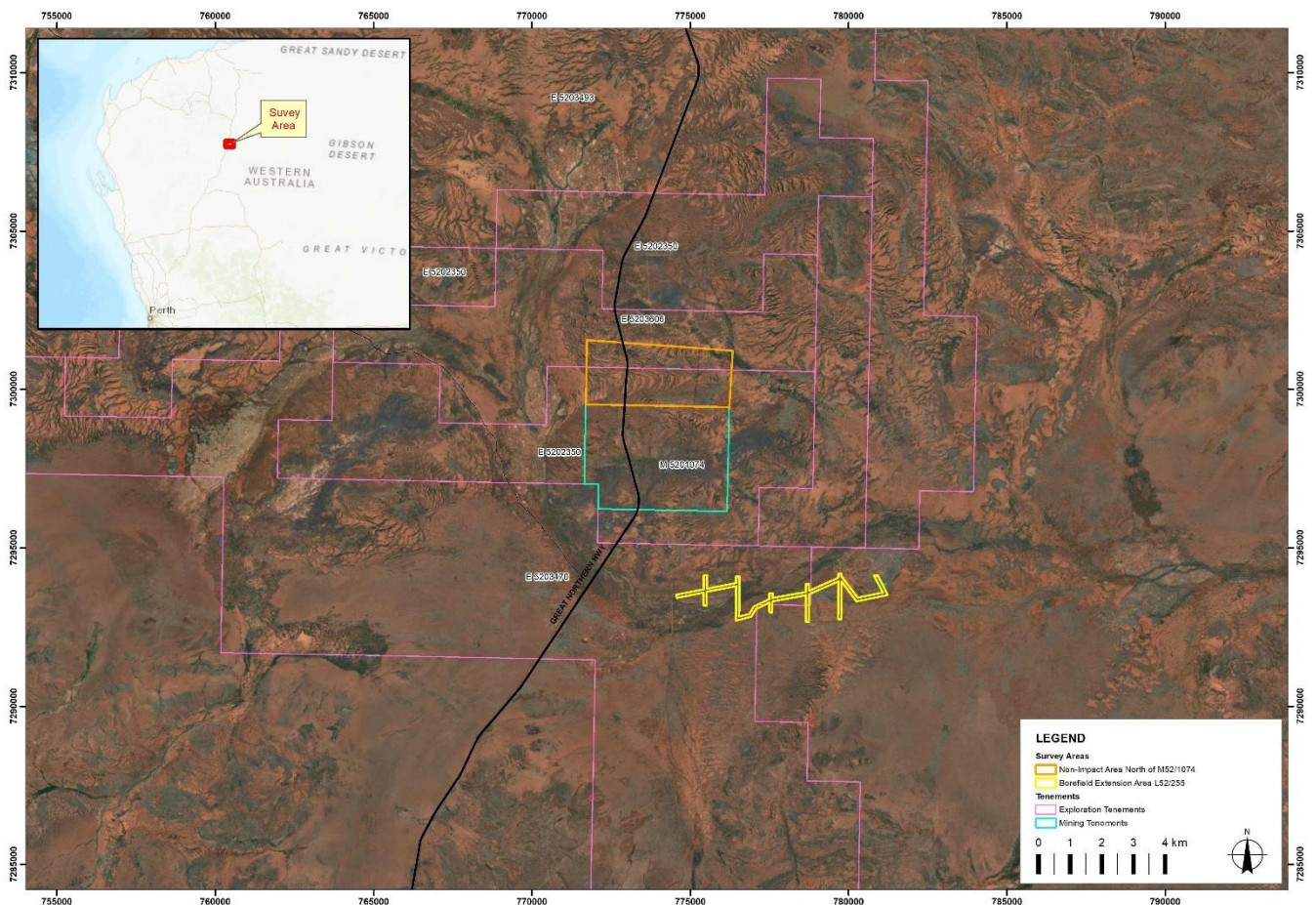


Figure 1: Survey area location

1.3 SURVEY REQUIREMENTS

The requirements of the survey were to conduct searches for conservation-listed flora, in particular *Eremophila appressa* (listed as Priority 1 by the Department of Biodiversity, Conservation and Attractions; DBCA) and *Eremophila rigida* (P3), within the two survey areas. A survey for Groundwater Dependent Vegetation (GDV) and/or riparian vegetation within the southern borefield extension area was also required.

1.4 COMPLIANCE

This environmental assessment took into consideration the following Commonwealth and State legislation and guidelines:

- Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)
- *Western Australian Environmental Protection Act 1986* (EP Act)
- *Western Australian Biodiversity Conservation Act 2016* (BC Act)
- *Western Australian Biodiversity Conservation Regulations 2018*
- Department of Environment, Water, Heritage and the Arts (DEWHA 2009) *Matters of National Environmental Significance. Significant impact guidelines 1.1 - Environment Protection and Biodiversity Conservation Act 1999*.

Summaries of the main Acts under which this assessment was conducted, and related criteria and definitions, are available in **Appendix One**.

As well as those listed above, the assessment complied with relevant parts of:

- Environmental Protection Authority (EPA 2016) *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment*, known herein as the Flora and Vegetation Technical Guidance
- EPA (2020) *Statement of Environmental Principles, Factors and Objectives*.

Additional details (definitions and criteria) relevant to these works are available in **Appendix One**.

2 DESKTOP ASSESSMENT (THREATENED AND PRIORITY FLORA)

2.1 DBCA DATABASE SEARCH

The requested DBCA databases (search reference 06-0821) was conducted using a 105 km buffer around the supplied shapefiles that encompassed the two survey areas. The results incorporate the TPFL List, taken from Threatened and Priority Flora Report Forms and DBCA surveys, and WA Herb, taken from vouchered specimens held in the Western Australian Herbarium. **Map 1** shows the locations of conservation-listed flora identified by the DBCA database search.

The combined database searches identified 56 taxa, listed in **Table 8** in **Appendix Two**, consisting of two Threatened Flora (TF), 26 P1, three P2, 21 P3 and four P4 taxa. There are no DBCA records corresponding with the survey areas.

2.1.1 SERINGIA EXASTIA

One TF listed under the Commonwealth EPBC Act and Western Australian BC Act was included in the DBCA database search results; *Seringia exastia* (EPBC - CR; BC – CR).

However, the advice provided by DBCA with some database search results (reproduced below) indicates this species' listing as TF is a technicality based on outdated taxonomy:

The search results include records for Seringia exastia. S. exastia (previous known as Keraudrenia exastia) was a species only known from the Kimberley Region. A recently completed taxonomic study that assessed genomic and morphological characters in several Seringia taxa (Wilkins & Whitlock 2016) has concluded that Seringia exastia and S. elliptica are the same species. The taxonomy of the genus has been revised to synonymise S. exastia and S. elliptica under the oldest valid name of S. exastia. As S. elliptica is common and widespread throughout the Pilbara region, central WA and the Northern Territory and extends into South Australia, following the taxonomic revision S. exastia is now considered common and widespread.

A nomination to delist the species due to no plausible significant threats to the species has been prepared and considered by the WA Threatened Species Scientific Committee (TSSC). We anticipate that at the next TSSC meeting recommendations will be made to the Minister to delist. However until changes are officially made to the threatened species list, S. exastia is still legally listed as threatened flora, and authorisation to take under section 40 of the Biodiversity Conservation Act 2016 is still required. Although some loss of plants is likely to have occurred and will continue to occur during mining and road works in some parts of the species' distribution, this is not expected to be significant in the context of the entire population. Therefore there should be no impediments to granting authorisation, following the standard process of application made to DBCA's Species and Communities Program.

To reduce timeframes and costs associated with approvals under the BC Act, DBCA will not require the standard targeted surveys to be undertaken to inform the threatened flora authorisation impact assessment for Seringia exastia. However, survey reports should still consider Seringia exastia as a listed threatened species and note the presence of the species within a survey area when encountered. Authorisation applications with basic details that the species is known to occur within the applied project area will be accepted and fast-tracked for approval.

2.1.2 ECOLOGICAL COMMUNITIES

No Threatened or Priority Ecological Communities have been identified from near the survey area (as viewed on *NatureMap*, DBCA 2007-2021) thus this survey did not take ecological communities into consideration.

2.2 PREVIOUS SURVEYS

Earlier flora and vegetation surveys incorporating searches for conservation-listed flora have been conducted in the vicinity, in part intersecting some of the current survey areas:

- Ecoscape (2019) *Butcherbird Manganese Project Flora and Vegetation Assessment*
- EnviroWorks Consulting (2012) *Level 2 Flora and Vegetation Survey: Illgarrie*
- EnviroWorks Consulting (2011) *Flora, Vegetation and Fauna Habitat Survey Butcher Bird Exploration Area.*

One species not included in the DBCA database search results, *Goodenia nuda* (P4), was recorded by Ecoscape in 2019, although not within these survey areas.

A desktop-based risk assessment to identify if significant flora, ecological communities or fauna are likely to occur was undertaken over an area known as the 'eastern borefield' in 2021 (Ecoscape 2020). The eastern borefield is immediately adjacent to this survey's southern borefield extension area.

All species recorded in previous surveys are combined into the likelihood assessment that follows.

2.3 THREATENED AND PRIORITY FLORA LIKELIHOOD ASSESSMENT

Ecoscape conducted a likelihood assessment to identify the TF and Priority Flora (PF) species that have potential to occur within the survey area. Information to assess the likelihood of a species occurring includes their ecology as listed on *FloraBase* (WAH 1998-2021; 2021, including specimen collection information) and information from recent nearby surveys.

The attributes taken into consideration 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
- distance of record from the survey area, taking locational accuracy into consideration
- time since recorded (i.e., within the previous 25 years), taking into consideration land use changes since collection
- reliability of record: species identified by only a TPFL record, without an accompanying verified vouchered specimen, may have been incorrectly identified or been subject to taxonomic updates since the record was entered
- number of records for the species
- if the record is for a not naturally occurring population (planted).

The likelihood rating is assigned using the categories listed in **Table 2**.

Table 2: Categories for likelihood of occurrence of TF and PF

Likelihood Category	Criteria
Known to occur	Species previously recorded within the survey area.
Likely to occur	Suitable habitat is known to occur within the survey area and multiple records of the species exist within close proximity*
May occur	Suitable habitat is expected to occur within the survey area and the species has previously been recorded within proximity**
Unlikely to occur	Suitable habitat is expected to occur within the survey area however previous records are limited and/or historic and/or not in proximity** OR Suitable habitat is not expected to occur within the survey area although previous records exist in proximity**
Very Unlikely to occur	Suitable habitat is not expected to occur in the survey area AND/OR previous records are limited and/or historic and/or not in proximity**

* close proximity = within 20 km of the survey area

** proximity = within 60 km of the survey area

The likelihood assessment is available in **Table 8** in **Appendix Two**. Two species have been previously recorded from within the non-impact area or immediately adjacent and therefore considered to have been previously recorded from within this survey area: *Eremophila appressa* (P1) and *Eremophila rigida* (P3). *Rhagodia* sp. Hamersley (M. Trudgen 17794) (P3) and *Goodenia nuda* (P4) were identified as likely to occur as they had previously been recorded from nearby (Ecoscape 2019), as well as *Seringia exastia* (see **Section 2.1.1**). The first four listed species were considered the most likely to occur and were targeted for field survey.

The likelihood of occurrence was re-evaluated following the field survey when actual survey area characteristics (vegetation types, vegetation condition, visibility for individual species) were better understood, and the level of survey effort was considered. The post-survey likelihood is also incorporated into this table and discussed further in **Section 5.1.3**.

2.4 RELEVANT LITERATURE

2.4.1 PREVIOUS SURVEYS

Previous surveys conducted within the greater Butcherbird area are listed above in **Section 2.2**.

No other surveys are known to have occurred near the survey area.

3 METHODS

3.1 SURVEY AIMS

The aim of the targeted flora surveys was to search the two survey areas (borefield extension and non-impact area) for conservation-listed flora, in particular searching for and mapping the extents of:

- *Eremophila appressa* (P1)
- *Eremophila rigida* (P3)
- *Rhagodia* sp. Hamersley (M. Trudgen 17794) (P3)
- *Goodenia nuda* (P4).

Whilst these species were the targets of the surveys, any other conservation-listed flora encountered during the survey were also to be recorded.

3.2 FIELD SURVEY METHODS

3.2.1 FIELD SURVEY METHODS

The methods utilised during the field survey followed those for a targeted survey as outlined in the Flora and Vegetation Technical Guidance (2016).

Conservation criteria used in this assessment are outlined in **Table 6** and **Table 7** in **Appendix One**.

3.2.1.1 Targeted Searches

Threatened and Priority Flora identified during the desktop analysis and previous surveys as known or having potential to occur were targeted for searches in areas of potential habitat. The habitat of the main target species are described below.

Eremophila appressa has been previously recorded from ridge slopes in ironstone gravel (EnviroWorks 2011), disturbed stony areas and exposed crests and slopes over shallow soils (EnviroWorks 2012) and on red ironstone soils and conglomerated rock (Ecoscape 2019). It was observed prior to the field survey on Yanneri Ridge in conglomerated rock. *Eremophila appressa* is considered to be confined to areas of shallow, frequently stony, soil on hillslopes and crests. Its habit is a wispy, open shrub and its flowers are sparse and unobtrusive thus it is difficult to detect at a distance.

Eremophila rigida has previously been recorded from red alluvial sand, hardpan plains and stony clay depressions (EnviroWorks 2011), manganese-derived soils, open stony areas and seasonally inundated locations (EnviroWorks 2012) and in similarly described areas by Ecoscape (2019). It is a rigid, dense yellowish grey-green shrub with distinctive leaves and habit thus is readily observed at a distance of at least 50 m, particularly as it has been previously recorded in open, rather than shrubby, areas frequently as a dominant and characteristic species.

Rhagodia sp. Hamersley (M. Trudgen 17794) was recorded as isolated plants during Ecoscape's (2019) survey, from scattered locations generally in association with Mulga or *Eremophila* species. The nearest record from the Ecoscape (2019) survey was from close to the southern boundary of the non-impact area.

Goodenia nuda was recorded as isolated plants during Ecoscape's (2019) survey, from low-lying areas south of the non-impact area and north of the southern borefield extension area. This species is most commonly recorded from the Pilbara bioregion although it also occurs in the Gascoyne and Little Sandy Desert (*NatureMap*; DBCA 2007-2021), with Ecoscape generally recording it from riparian areas adjacent to drainage lines.

Southern Borefield Extension Area

The entire borefield extension area was surveyed on foot or by slowly travelling vehicle where vehicle tracks corresponded with the survey area.

Non-Impact Area

The non-impact area was traversed in a grid pattern, with the outer edges more intensively searched than the central area as the habitat for the above target species was primarily in these parts of the survey area.

Recording Conservation-Significant Flora

The locations of all targeted taxa collected were recorded using a handheld GPS with the following data recorded:

- observer, date and time
- local abundance/population size and/or population boundary, including outside the development envelopes where possible
- landform
- brief vegetation community description
- representative photos of each species and habitat
- collection of representative specimens.

3.2.2 POST-SURVEY LIKELIHOOD ASSESSMENT

Following the field survey, a post-survey likelihood assessment was conducted to identify conservation-listed species that have potential to occur on site. This assessment was based on survey results, survey effort (i.e. survey area coverage) and habitat identified within in the survey area.

3.2.3 RIPARIAN AND GROUNDWATER DEPENDENT VEGETATION

Riparian areas (creeks, rivers, wetlands, drainage sumps characterised by having wetland vegetation) and Groundwater Dependent Vegetation (GDV; vegetation with flora species dependent on groundwater for at least part of their life) were included in the investigation of the southern borefield extension area. The following species are considered as groundwater dependent with their presence potentially indicating a GDV.

Eucalyptus camaldulensis subsp. *obtusata*, depending on local hydrological conditions, is considered to be either an obligate phreatophyte i.e. requires groundwater or facultative phreatophyte i.e. it can access groundwater (Rio Tinto 2018; Woodman Environmental Consulting 2019). It is considered to be more dependent on groundwater than *Eucalyptus victrix* (Astron Environmental Services 2016), see below. It may occur in the vicinity although there are no records for this taxon (or other subspecies) from within 50 km of the survey area although the survey area lies within the species' overall range (Atlas of Living Australia 2021). It has not been recorded during previous surveys (Ecoscape 2019; EnviroWorks 2011, 2012). In general, *Eucalyptus camaldulensis sens. lat.* presence is considered to indicate a GDV (Eamus 2009; Eamus *et al.* 2006).

Eucalyptus victrix is considered to be a facultative phreatophyte in only some situations as it draws the majority of its water requirements from the unsaturated zone, only using groundwater opportunistically (Astron Environmental Services 2016). It is relatively drought tolerant (in comparison to *Eucalyptus camaldulensis*) and accesses groundwater when the depth to groundwater is relatively low (<10 m) (Barron *et al.* 2012; Rio Tinto 2018; Woodman Environmental Consulting 2019). The survey area is within the usual range of *Eucalyptus victrix* (Atlas of Living Australia 2021) and it has been reported as occurring in the vicinity during previous surveys (Ecoscape 2019; EnviroWorks 2011, 2012). Ecoscape's (2020) desktop assessment of the eastern borefield area (north-east of the southern borefield extension area) included photographs indicating presence of *Eucalyptus victrix*.

As the depth to groundwater has previously been estimated to be approximately 5 m below the ground surface in the eastern borefield, (MWES Consulting 2020), it is anticipated to range from 3- to 20 m below ground level in the southern borefield extension area (Ian Huitson, *pers. com.* 21/10/2021). Where present *Eucalyptus victrix* may represent a GDV, although it is not possible within the context of this project to determine if this species can or does access groundwater, or dependence on this resource. *Corymbia candida* may also be a facultative phreatophyte (Astron Environmental Services 2009), although there appears to be little consensus

on this as no other authors in agreement with this assessment were identified during literature searches. *Corymbia candida* is known to occur in the vicinity of the survey areas (Ecoscape 2019).

No other potential phreatophytes indicating a GDV are likely to occur in the southern borefield extension area.

4 FIELD SURVEY RESULTS

The flora and vegetation survey was conducted by Lyn Atkins (Principal Ecologist/Botanist, Flora Collecting Permit FB62000003; Threatened Flora Collecting Permit TFL 73-1920) and Terri Jones (Senior Ecologist, FB62000191, TFL-2021) between 30 August and 2 September, 2021.

4.1 SOUTHERN BOREFIELD EXTENSION AREA

The survey results and survey track log (survey effort) for the southern borefield extension area is indicated on **Map 2**. Descriptions of the Priority-listed flora recorded during the field survey are in **Table 3** and **Table 4**.

4.1.1 THREATENED FLORA

No Commonwealth EPBC Act or Western Australian BC Act-listed TF were recorded from the southern borefield extension area during the field survey.

4.1.2 PRIORITY FLORA

Seven *Eremophila rigida* (P3) plants were recorded within representative areas i.e. within circles of 20 m radius. The population extended sparsely to the north and east of the survey area, with an estimated 10-20 plants in total (within and outside the survey area), on a sparsely vegetated flat clay plain (**Image 1**). All plants were in healthy condition although not flowering, and no other conservation-listed flora were recorded from this survey area.



Image 1: *Eremophila rigida*

No other conservation-listed flora were observed in the southern borefield extension area during the survey.

4.1.3 RIPARIAN / GDV AREAS

A minor sandy creekline, occupying 0.066 ha, intersected the southern borefield extension survey area towards the western portion, flowing between calcrete rises, indicated on **Map 2**. The vegetation was not distinctively riparian although it did include *Eucalyptus victrix* (**Image 2**). The structure of the creek suggested that it would flow after heavy rainfall. No other areas showing distinctive flow lines indicating a clearly demarcated riparian area were observed although it is anticipated that the denser (darker) vegetation indicated on **Map 2** would have dispersed surface water flow during and shortly after heavy rainfall. There were some minor clay sumps between calcrete shields, however, they did not have any distinctive vegetation to indicate they would be considered as a wetland/riparian area.

Eucalyptus victrix occurred within the southern borefield extension survey area, generally as widely spaced but clumped trees that characterised the vegetation (**Map 2**). Lower-lying areas and parts adjacent to exposed calcrete were more likely to have this species as characteristic. These areas may represent GDV and occupied 14.52 ha.

Isolated trees also occurred on occasion but were not considered to represent a vegetation type.



Image 2: Minor creekline (between the trees)

4.2 NON-IMPACT AREA

4.2.1 THREATENED FLORA

No Commonwealth EPBC Act or Western Australian BC Act-listed TF were recorded from the non-impact area during the field survey.

4.2.2 PRIORITY FLORA

Eremophila appressa (P1) and *Eremophila rigida* (P3) were recorded from the non-impact area, as indicated on **Map 3**. No other species were confidently identified as occurring although a small number of *Rhagodia* species plants that could not be confidently identified to species level were observed. It is possible that some may have been the P3-listed *Rhagodia* sp. Hamersley (M. Trudgen 17794), however, all were heavily (preferentially) grazed with virtually all foliage removed. The post-survey likelihood assessment is discussed in **Section 5.1.3**.

Eremophila appressa was recorded from four locations (three populations) as below:

- on the northern edge of the survey area, west of Great Northern Highway. This group of plants occurred on sloping shallow stony clay soil and undulating rises; the soil surface was generally bare (**Image 3**). The population extended to the north outside of the survey area and is likely to be considered a contiguous population with the following location.



Image 3: *Eremophila appressa* (foreground, visible only as faint branches) habit and habitat

- on the northern edge of the survey area, east of Great Northern Highway. This group of plants also occurred on sloping stony clay soil with virtually no ground cover, with the population extending to the north of the survey area. The population did not extend far to the south (the estimated extent is shown on **Map 3**), where there was more ground cover (*Triodia* sp.).

- on the southern edge of the survey area west of the old highway. This population occurred on a hilltop and slope. EnviroWorks (2012) also recorded this population over a larger extent than during this survey. No plants were recorded to the north of Ecoscape's 2021 locations. The mapped EnviroWorks (2012) plants may no longer persist as there was significant ground cover (*Triodia* sp.) in this area and in 2021 no plants were observed further than 10 m from the edge of where the *Triodia* was present. The population extended to the south of the survey area into the area where EnviroWorks recorded this species.
- a small group (three plants) were recorded near the eastern edge of the survey area.

Overall, 242 plants were recorded, however, these were representative of densities rather than a complete count and at least twice this number of plants occur within the survey area. Most plants had significant dead parts and there were at least as many dead plants as living in all areas, likely caused by the lower than average rainfall over the previous years.

Eremophila rigida was recorded from three locations (two populations) as follows:

- both sides of the old highway near the northern edge of the survey area (**Image 4**), extending to the north and contiguous with a population recorded by EnviroWorks (2012)
- to the east of but considered part of the same population as above and extending to the north
- a small group (nine plants) on the southern side of the survey area near the eastern edge, contiguous with a population to the south recorded to by Ecoscape (2019).



Image 4: *Eremophila rigida* habit and habitat

A total of 455 plants were recorded; this is representative of densities rather than a total count with the number of plants within the survey area estimated at double this number. Most plants were generally healthy although occasionally had dead branches, and most plants were not flowering.

Except for the small southern group, all were on alluvial clay plains with little or no ground cover, generally as a dominant or co-dominant shrub species. The southern group was somewhat anomalous in that the plants were growing amongst *Acacia* shrubs rather than in more open areas as was typical (as illustrated in Image 4).

4.3 RECORDED SPECIES

Table 3: *Eremophila appressa*

<i>Eremophila appressa</i> (P1)	
<p>Description: <i>Eremophila appressa</i> is a wispy open shrub 1-3 m high with narrow terete leaves appressed against stem and pinkish-purple or white pendulous flowers (Brown & Buirchell 2011). Within the survey area this species was observed to meet the general description of the plant although only to 1.5 m high. The flowers were whiteish or, when young, yellowish-white and obviously hairy.</p>	<p>Habitat: Sloping, shallow stony clay soil or (outside the survey area) hilltops with conglomerate rocks.</p> <p>Populations: Three populations in the non-impact area (estimated to be at least 500 plants), continuing outside of the survey area (no population estimates are available); none in the borefield extension area.</p> <p>Known records and distribution: According to <i>NatureMap</i> (DBCA 2007-2021) there are 10 records of this species from the Gascoyne bioregion, with an overall distribution of approximately 50 km (north-south) by 30 km (east-west), largely to the north of the survey areas placing these populations within the known range of the species. There is one record of this species from within Collier Range National Park.</p>
	

Table 4: *Eremophila rigida****Eremophila rigida* (P3)****Description:**

Eremophila rigida is an erect shrub 0.5-1.2 m high with thick rigid leaves and yellowish to cream coloured flowers (Brown & Buirchell 2011).

Within the survey area this species was observed to meet the general species description although only a few plants were flowering at the time of survey and the flowers were more white- than cream-coloured.



Habitat: Hardpan clay soils, generally flat and low-lying.

Populations: Two populations in the non-impact area (at least 900 plants) and one population in the borefield extension (seven plants); all populations were contiguous with and extending outside of the survey areas.

Known records and distribution: According to *NatureMap* (DBCA 2007-2021) there are 12 records of this species largely from the Gascoyne bioregion but also extending into the southern Pilbara bioregion, with an overall distribution of approximately 160 km (north-south) by 160 km (east-west). Butcherbird is approximately central to this species' distribution on the north-south axis, and on the eastern edge of its distribution.

4.4 BOTANICAL LIMITATIONS

Survey design: Targeted survey for conservation-listed flora species.

Survey type: Largely surveyed on foot by grid traverses.

Type of vegetation classification system: n/a.

A full summary of botanical limitations is presented in **Table 5**.

Table 5: Botanical limitations

Possible limitations	Constraints (yes/no): Significant, moderate or negligible	Comment
Availability of contextual information at a regional and local scale	No	Previous surveys have identified the main target species habitat within the general area. There is sufficient taxonomic information to enable accurate field identification of <i>Eremophila appressa</i> and <i>Eremophila rigida</i> , and most other species that may occur within the survey area.
Competence/experience of the team conducting the survey, including experience in the bioregion surveyed	No	The lead botanist conducting the field survey has over 30 years botanical survey experience in Western Australia; the assisting botanist has over 15 years relevant experience.
Proportion of the flora recorded and/or collected, and any identification issues	No	This was a targeted survey largely focussing on two readily identifiable <i>Eremophila</i> species. Other conservation-listed flora were also included in the search, particularly <i>Rhagodia</i> sp. Hamersley (M. Trudgen 17794) and <i>Goodenia nuda</i> , neither of which were recorded. <i>Rhagodia</i> sp. Hamersley may occur sparsely particularly in the non-impact area, however, due to heavy cattle grazing most foliage of plants of this genus had been eaten thus confirmation of identity was not possible. There was no optimal habitat for <i>Goodenia nuda</i> within either survey area.
Was the appropriate area fully surveyed (effort and extent)	No	The southern borefield extension area was traversed on foot and by slow moving vehicle where tracks aligned with the survey area. All areas were visible and fully surveyed. The non-impact area was traversed in a grid at spacings of generally 100-200 m although the central portion was not traversed. The central portion did not have habitat suitable for <i>Eremophila appressa</i> . All areas of habitat suitable for <i>Eremophila appressa</i> was surveyed in sufficient intensity to adequately identify and map where the species occurred. <i>Eremophila rigida</i> was highly visible at 50-100 m distance and all areas of suitable habitat were at least visible if not traversed.
Access restrictions within the survey area	No	The survey area was fully accessible by walking.
Survey timing, rainfall, season of survey	No	The field survey was conducted during the flowering period of the two main species targeted for survey (August-September). The rainfall in the 6 months prior to the field survey was below the average for this period indicated by the rainfall deciles (Figure 2). There is no constraint as a result of the seasonal conditions as target species were identifiable despite the lack of flowering material.

Possible limitations	Constraints (yes/no): Significant, moderate or negligible	Comment
Disturbance that may have affected the results of the survey e.g., fire, flood, clearing	No	There were no recent disturbances that would have affected the results of the survey.

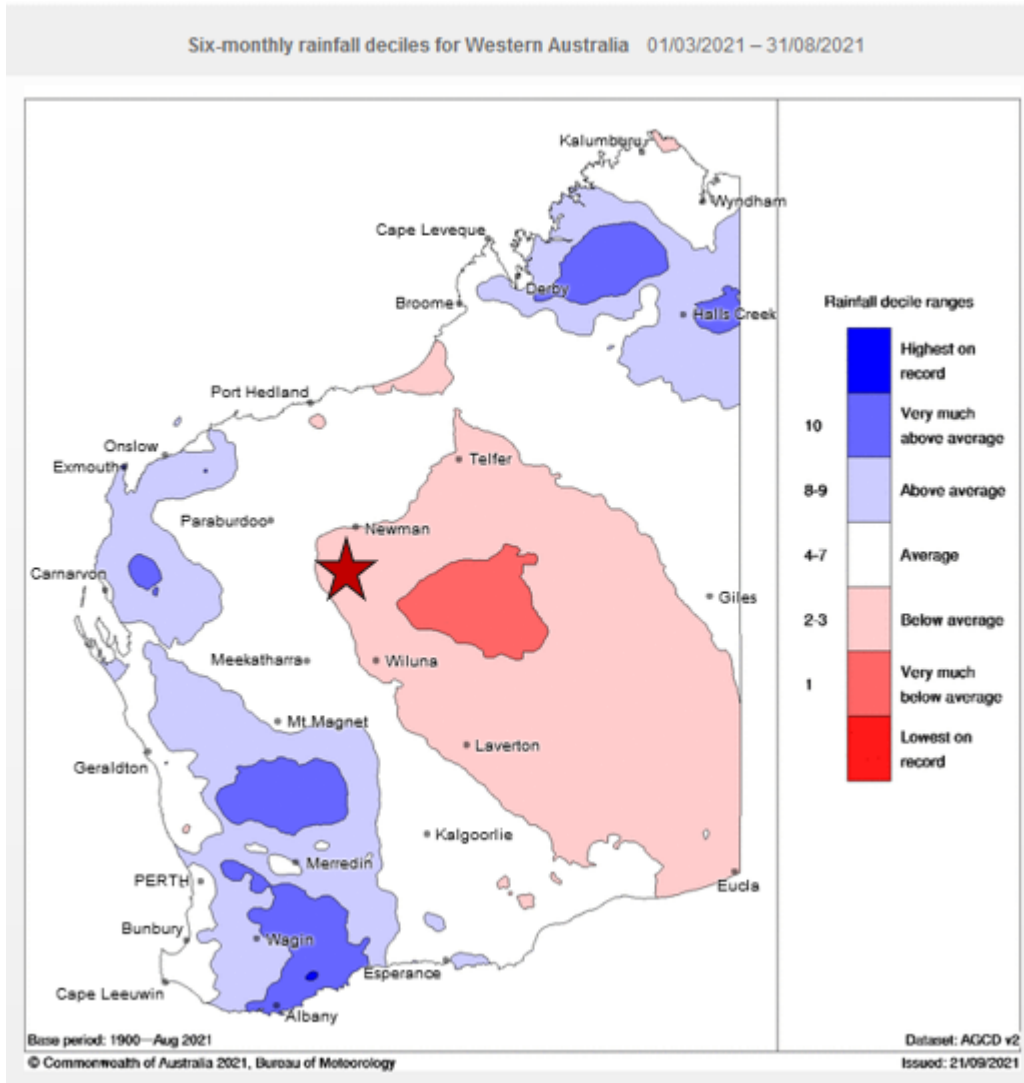


Figure 2: Rainfall deciles for the 6 months prior to the field survey (Bureau of Meteorology 2021)

The star in **Figure 2** indicates the approximate location of the field survey.

5 DISCUSSION

5.1 CONSERVATION-LISTED FLORA

5.1.1 THREATENED FLORA

No Threatened Flora species listed for protection under the Commonwealth EPBC Act or Western Australian BC Act were recorded. As part of the survey unidentified taxa were recorded but none of the unidentified taxa resemble any currently described TF.

5.1.2 PRIORITY FLORA

Two Priority-listed Flora species were recorded.

Eremophila appressa (P1) was recorded from four locations representing three populations in the non-impact area. The two larger populations extended to the north and south outside of the survey area, with 242 plants counted and at least double this number (i.e., approximately 500) occurring within the survey area. The populations outside the survey area have not been estimated during the surveys that recorded them (Ecoscape 2019; EnviroWorks 2011, 2012) although it is anticipated that they represent a larger count of plants than have been recorded from within the survey area. All areas of suitable habitat were viewed and it is unlikely that a significant number of plants would have been missed during the survey.

Eremophila rigida (P3) was recorded from two locations, estimated to be at least 900 plants, within the non-impact survey area and contiguous with populations outside the survey area for which there are no documented population estimates (Ecoscape 2019; EnviroWorks 2011, 2012). It is anticipated that more plants occur outside the survey area in contiguous populations than occur within it, particularly to the north. All areas of suitable habitat were traversed or visible during foot traverses of the site and it is unlikely that a significant number of plants would have been missed during the field survey.

Eremophila rigida was recorded from one location in the southern borefield extension survey area and contiguous area to the north and east; 10-20 plants in total (inside and adjacent to the survey area) were recorded. The area was extensively traversed, and it is highly unlikely that any plants of this species or *Eremophila appressa* (for which there was no suitable habitat) would have been missed during the field survey.

5.1.3 POST-SURVEY LIKELIHOOD ASSESSMENT

The likelihood of conservation significant flora occurring in the survey area was revised following the field survey. This revised likelihood, that took into account vegetation condition, grazing and other disturbances, actual habitat availability and search effort (survey coverage), is included in **Table 8** in **Appendix Two**. Species that were considered during the desktop assessment to have a high ('likely to occur') likelihood of occurring are discussed below.

Rhagodia sp. Hamersley (M. Trudgen 17794) (P3) is the only species that retains a high ('likely to occur') post-survey likelihood of occurring particularly in the non-impact area. *Rhagodia* species were observed, although they were a preferred species for cattle grazing and generally had little to no foliage to enable accurate identification between the more common *Rhagodia eremaea* and the conservation-listed species. All plants with remaining foliage in the non-impact area, and all plants in the southern borefield extension area, were *Rhagodia eremaea*.

P3 species are poorly known and not considered currently threatened (DBCA 2019). *Rhagodia* sp. Hamersley occurs in two bioregions (Pilbara and Gascoyne; *NatureMap*, DBCA 2007-2021); or three bioregions (adding Gibson Desert; Atlas of Living Australia 2021), with an overall east-west distribution (according to *NatureMap*) of approximately 280 km and north-south distribution of approximately 150 km (or approximately 230 km, taking Ecoscape's nearby records into consideration). Therefore, if this species occurs in the southern borefield extension, it is unlikely that removal of a small number of plants would significantly impact the population as a whole.

Seringia exastia (T, although currently awaiting delisting as a conservation-listed species; see **Section 2.1.1**) was not recorded during the field survey. It was observed along the roadsides outside the survey area and was flowering and highly visible, therefore would have been observed if present in the survey area. It is not considered to have a high likelihood of occurring in the survey area.

Goodenia nuda (P4) is considered unlikely to occur due to the small extent of broadly suitable habitat (alluvial areas in and adjacent to drainage lines in the non-impact area). The habitat was sub-optimal as it was overgrown with weeds and grasses thus not suitable for this species, with no suitable alluvial areas in the southern borefield extension area.

P4 species are not considered currently threatened. Even if it does occur, it is unlikely that removal of a small number of plants within the southern borefield extension area would significantly affect the population of *Goodenia nuda* as a whole given that it occurs widely within Western Australia within, according to *NatureMap* (DBCA 2007-2021), four bioregions and having an overall distribution of approximately 670 km north-south and 900 km east-west.

5.2 RIPARIAN AND GDV IN THE SOUTHERN BOREFIELD EXTENSION AREA

Several areas potentially having GDV occurred within the southern borefield extension area. Actual depth to groundwater is unknown but is anticipated to range from 3- to 20 m below ground level and is likely to be at its shallowest in the western portion of the southern borefield extension area, which includes a minor creekline and areas of dense vegetation likely to indicated dispersed surface water flow. The creekline has no distinctive riparian vegetation to separate it from the surrounding area; it is anticipated to have flowing surface water only for a brief period following heavy rainfall.

It is not possible to determine if the vegetation with *Eucalyptus victrix* is representative of GDV as:

- actual depth to groundwater is unknown and may, at least in parts, be outside of the range that *Eucalyptus victrix* is known to reach, considered to be 10 m (Barron *et al.* 2012; Rio Tinto 2018; Woodman Environmental Consulting 2019)
- *Eucalyptus victrix* is considered to not be dependent on groundwater in most circumstances (Astron Environmental Services 2016; Batini 2009; Eamus 2009; Resource and Environmental Management Pty Ltd 2007)
- *Eucalyptus victrix* is considered tolerant of groundwater decline, particularly if the decline is gradual (Maunsell Australia Pty Ltd 2006).

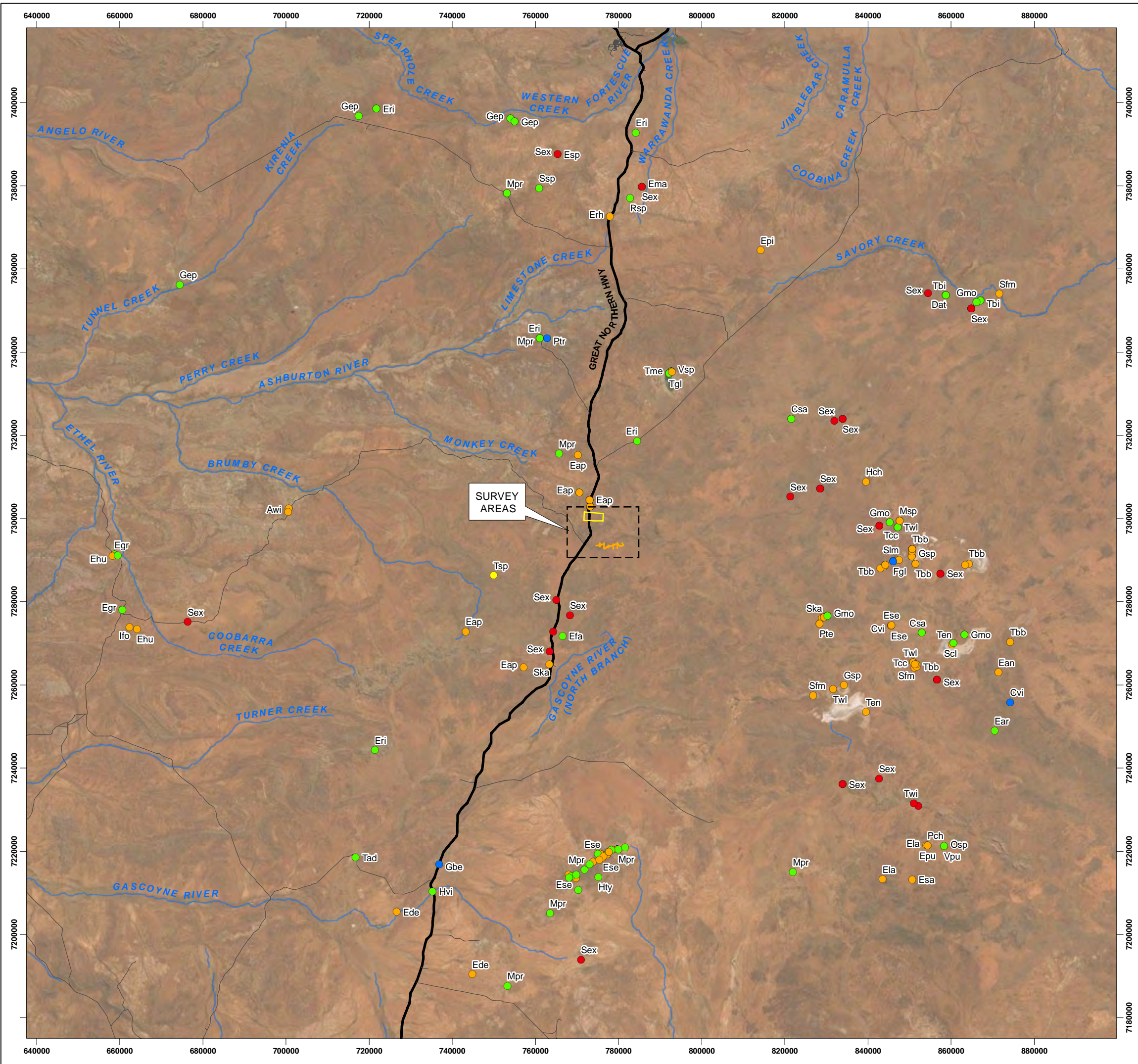
Based on the precautionary principle, the parts of the southern borefield extension area with *Eucalyptus victrix*, as indicated on **Map 2**, are potentially representative of a GDV.

REFERENCES

- Astron Environmental Services 2009, *Sino Iron Project - Cape Preston. Mapping and Surveying of Groundwater Dependent Ecosystems. September / October 2008*, Unpublished report prepared for CITIC Pacific Mining Management Pty Ltd.
- Astron Environmental Services 2016, *Iron Valley Groundwater Dependent Ecosystems Investigation December 2015*, Report prepared for BC Iron Limited.
- Atlas of Living Australia 2021, *Atlas of Living Australia website*. Available from: <https://www.ala.org.au/australias-species/>.
- Barron, O, Emelyanova, I, Van Niel, T, Pollock, D & Hodgeson, G 2012, 'Mapping groundwater-dependent ecosystems using remote sensing measures of vegetation and moisture dynamics', *Hydrological Processes* Available from: <https://onlinelibrary.wiley.com/doi/abs/10.1002/hyp.9609>.
- Batini, F 2009, *Eucalyptus victrix, Karijini National Park*, report to EPA.
- Brown, A & Buirchell, B 2011, *A Field Guide to the Eremophilas of Western Australia*, Simon Neville Publications.
- Bureau of Meteorology 2021, *Recent and historical rainfall maps: rainfall deciles*. Available from: <http://www.bom.gov.au/climate/maps/rainfall/?variable=rainfall&map=decile&period=month®ion=wa&year=2021&month=05&day=31>.
- Commonwealth of Australia (1999), *Environment Protection and Biodiversity Conservation Act 1999*. Available from: http://www.austlii.edu.au/au/legis/cth/consol_act/epabca1999588/.
- Department of Biodiversity Conservation and Attractions 2007, *NatureMap: Mapping Western Australia's Biodiversity*. Available from: <https://naturemap.dbca.wa.gov.au/>.
- Department of Biodiversity Conservation and Attractions 2019, *Conservation codes for Western Australian Flora and Fauna (3 January 2019)*. Available from: [https://www.dpaw.wa.gov.au/images/documents/plants-animals/threatened-species/Listings/Conservation code definitions.pdf](https://www.dpaw.wa.gov.au/images/documents/plants-animals/threatened-species/Listings/Conservation%20code%20definitions.pdf).
- Department of the Environment 2021, 'SPRAT EPBC Migratory List in Species Profile and Threats Database' *Department of Agriculture Water and the Environment*. Available from: <http://www.environment.gov.au/cgi-bin/sprat/public/publicshowmigratory.pl>.
- Department of the Environment Water Heritage and the Arts; Commonwealth of Australia 2009, *Matters of National Environmental Significance. Significant impact guidelines 1.1 - Environment Protection and Biodiversity Conservation Act 1999*.
- Eamus, D 2009, *Identifying groundwater dependent ecosystems: a guide for land and water managers*, Land & Water Australia. Available from: http://lwa.gov.au/files/products/innovation/pn30129/pn30129_1.pdf.
- Eamus, D, Froend, R, Loomes, R, Hose, G & Murray, B 2006, 'A functional methodology for determining the groundwater regime needed to maintain the health of groundwater-dependent vegetation', *Australian Journal of Botany*, vol. 54, pp.97–114.
- Ecoscope (Australia) Pty Ltd 2019, *Butcherbird Manganese Project Flora and Vegetation Assessment*, report prepared for Element 25.
- Ecoscope (Australia) Pty Ltd 2020, *Butcherbird Manganese Project: Eastern Borefield Biological Risk Assessment*, Prepared for Element 25.
- Environmental Protection Authority 2016, *Technical Guidance - Flora and Vegetation Surveys for Environmental Impact Assessment*, EPA, Western Australia. Available from: <http://www.epa.wa.gov.au/policies-guidance/technical-guidance-flora-and-vegetation-surveys-environmental-impact-assessment>.
- Environmental Protection Authority 2020, *Statement of Environmental Principles, Factors and Objectives*. Available from: [https://epa.wa.gov.au/sites/default/files/Policies_and_Guidance/Statement of Environmental Principles - 03.04.2020_0.pdf](https://epa.wa.gov.au/sites/default/files/Policies_and_Guidance/Statement_of_Environmental_Principles_-_03.04.2020_0.pdf).
- EnviroWorks Consulting 2011, *Flora, Vegetation and Fauna Habitat Survey Butcher Bird Exploration Area*, unpublished report for Montezuma Mining Company Ltd.
- EnviroWorks Consulting 2012, *Level 2 Flora and Vegetation Surveys: Illgararie*, unpublished report for Montezuma Mining Company Ltd.
- Government of Western Australia (1986), *Environmental Protection Act 1986*. Available from: http://www.slp.wa.gov.au/legislation/statutes.nsf/main_mrtitle_1384_homepage.html.

- Government of Western Australia (2016), *Biodiversity Conservation Act 2016*. Available from: https://www.legislation.wa.gov.au/legislation/statutes.nsf/main_mrtitle_13811_homepage.html.
- Government of Western Australia (2018), *Biodiversity Conservation Regulations 2018*. Available from: https://www.legislation.wa.gov.au/legislation/statutes.nsf/law_s50938.html.
- Government of Western Australia 2018, *Government Gazette No. 135, 11 September 2018*. Available from: [https://www.slp.wa.gov.au/gazette/gazette.nsf/searchgazette/EF556EEFA23C70FA482583040013E0FC/\\$file/Gg135.pdf](https://www.slp.wa.gov.au/gazette/gazette.nsf/searchgazette/EF556EEFA23C70FA482583040013E0FC/$file/Gg135.pdf).
- Maunsell Australia Pty Ltd 2006, *Pit Dewatering and Vegetation Monitoring Plan - Iron Ore Mine and Downstream Processing, Cape Preston, Western Australia*, Unpublished report prepared for Mineralogy Pty Ltd.
- MWES Consulting 2020, *Element 25 Butcherbird Mn Project Hydrogeology Report Southern Silcrete Aquifer*.
- Resource and Environmental Management Pty Ltd 2007, *Pirraburdoo Creek Groundwater Dependent Ecosystems study*, Unpublished report for Pilbara Iron.
- Rio Tinto 2018, *Assessment of Groundwater Dependent Vegetation distribution on the Robe River - Targeted Riparian Vegetation Survey - Stage 1*. Available from: https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwjPovepzNjzAhUVyZgGHUc5CycQFnoECAkQAw&url=https%3A%2F%2Fwww.epa.wa.gov.au%2Fsites%2Fdefault%2Ffiles%2FPER_documentation%2FA5%2520Assessment%2520of%2520Groundwater%252.
- Western Australian Herbarium 1998, *FloraBase - the Western Australian Flora. Department of Biodiversity, Conservation and Attractions*. Available from: <https://florabase.dpaw.wa.gov.au/>.
- Western Australian Herbarium & Department of Biodiversity Conservation and Attractions 2021, *FloraBase: descriptions by the Western Australian Herbarium, Department of Biodiversity, Conservation and Attractions*. Available from: <https://florabase.dpaw.wa.gov.au/help/copyright>.
- Western Australian Herbarium, Department of Biodiversity Conservation and Attractions & Shire of Dalwallinu 2020, *World Wide Wattle ver. 2*. Available from: <http://worldwidewattle.com/about.php>.
- Wilkins, CF & Whitlock, BA 2016, 'Seringia revised to include Keraudrenia (Lasiopetaleae: Malvaceae s.l.)', *Australian Systematic Botany*, vol. 28, no. 6, pp.265–325.
- Woodman Environmental Consulting 2019, *McPhee Creek Iron Ore Project Detailed Flora and Vegetation Assessment*, Unpublished report for Atlas Iron Pty Ltd.

MAPS



LEGEND

- Borefield Extension Area
- Non-Impact Area North of M52/1074

DBCA Search Results

- Threatened
- Priority 1
- Priority 2
- Priority 3
- Priority 4

TAXON	STATUS	LABEL
<i>Acacia wilcoxii</i>	1	Awl
<i>Comesperma sabulosum</i>	3	Csa
<i>Comesperma viscidulum</i>	4	Cvl
<i>Dampiera atriplicina</i>	3	Dat
<i>Eremophila anomala</i>	1	Ean
<i>Eremophila appressa</i>	1	Eap
<i>Eremophila arachnoides</i> subsp. <i>arachnoides</i>	3	Ear
<i>Eremophila demissa</i>	1	Ede
<i>Eremophila fasciata</i>	3	Efa
<i>Eremophila gracillima</i>	3	Egr
<i>Eremophila humilis</i>	1	Ehu
<i>Eremophila laccata</i>	1	Ela
<i>Eremophila magnifica</i> subsp. <i>velutina</i>	3	Ema
<i>Eremophila pilosa</i>	1	Epi
<i>Eremophila pusilliflora</i>	2	Epu
<i>Eremophila rhexos</i>	1	Erh
<i>Eremophila rigida</i>	3	Eri
<i>Eremophila</i> s.p. <i>Hammersley Range</i> (K. Walker KW 136)	3	Esp
<i>Eucalyptus semota</i>	1	Ese
<i>Euphorbia sarcostemmoides</i>	1	Esa
<i>Frankenia glomerata</i>	4	Fgl
<i>Goodenia beringbinensis</i>	4	Gbe
<i>Goodenia modesta</i>	3	Gmo
<i>Goodenia</i> sp. <i>Beyondie</i> (L.W. Sage & S. van Leeuwen LWS 2518)	1	Gsp
<i>Goodenia</i> sp. <i>East Pilbara</i> (A.A. Mitchell PRP 727)	3	Gep
<i>Hemigenia tysonii</i>	3	Hty
<i>Hemigenia virescens</i>	3	Hvi
<i>Hibiscus chrysinocolla</i>	1	Hch
<i>Isotropis forestii</i>	1	Ifo
<i>Maireana prosthocochaeta</i>	3	Mpr
<i>Micromyrtus mucronulata</i>	1	Mmu
<i>Minuria</i> sp. <i>Little Sandy Desert</i> (S. van Leeuwen 4919)	1	Msp
<i>Oxalis</i> sp. <i>Pilbara</i> (M.E. Trudgen 12725)	2	Osp
<i>Ptilotus chrysocomus</i>	1	Pch
<i>Ptilotus tetrandrus</i>	1	Pte
<i>Ptilotus trichocephalus</i>	4	Ptr
<i>Rhagodia</i> sp. <i>Hammersley</i> (M. Trudgen 17794)	3	Rsp
<i>Samolus</i> sp. <i>Fortescue Marsh</i> (A. Markey & R. Coppen FM 9702)	1	Sfm
<i>Sauropus</i> sp. <i>Woolprong</i> (M. Officer s.n. 10/8/94)	3	Saw
<i>Seringia exaltata</i>	T	Ser
<i>Stackhousia clementii</i>	3	Scl
<i>Stackhousia</i> sp. <i>Lake Mackay</i> (P.K. Latz 12870)	1	Sim
<i>Streptoglossa</i> sp. <i>Cracking clays</i> (S. van Leeuwen et al. PBS 7353)	3	Ssp
<i>Swainsona kajiana</i>	1	Ska
<i>Tecticornia bibenda</i>	1	Tbb
<i>Tecticornia enodis</i>	1	Ten
<i>Tecticornia globulifera</i>	1	Tgl
<i>Tecticornia medusa</i>	3	Tme
<i>Tecticornia</i> sp. <i>Christmas Creek</i> (K.A. Shepherd & T. Colmer et al. KS 1068)	T	Tcc
<i>Tecticornia willisii</i>	1	Twi
<i>Thryptomene wittweri</i>	T	Twi
<i>Thysanotus</i> sp. <i>Desert East of Newman</i> (R.P. Hart 964)	2	Tsp
<i>Tribulus adalcanthus</i>	3	Tad
<i>Triodia bimbilburu</i>	3	Tbi
<i>Vallisneria</i> sp. <i>Weelarrana</i> (M.N. Lyons & S.D. Lyons 3050)	1	Vsp
<i>Vittadinia pustulata</i>	3	Vpu



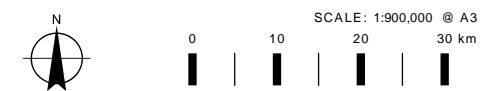
FLORA DATABASE SEARCH RESULTS

BUTCHERBIRD 2021 SURVEYS

DATASOURCES :
 SOURCE DATA:
 AERIAL:
 BASEMAP: GEOSCIENCE AUSTRALIA
 SERVICE LAYERS: SOURCE: ESRI, MAXAR, GEOEYE,
 EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS,
 USDA, USGS, AEROGRID, IGN, AND THE GIS USER
 COMMUNITY



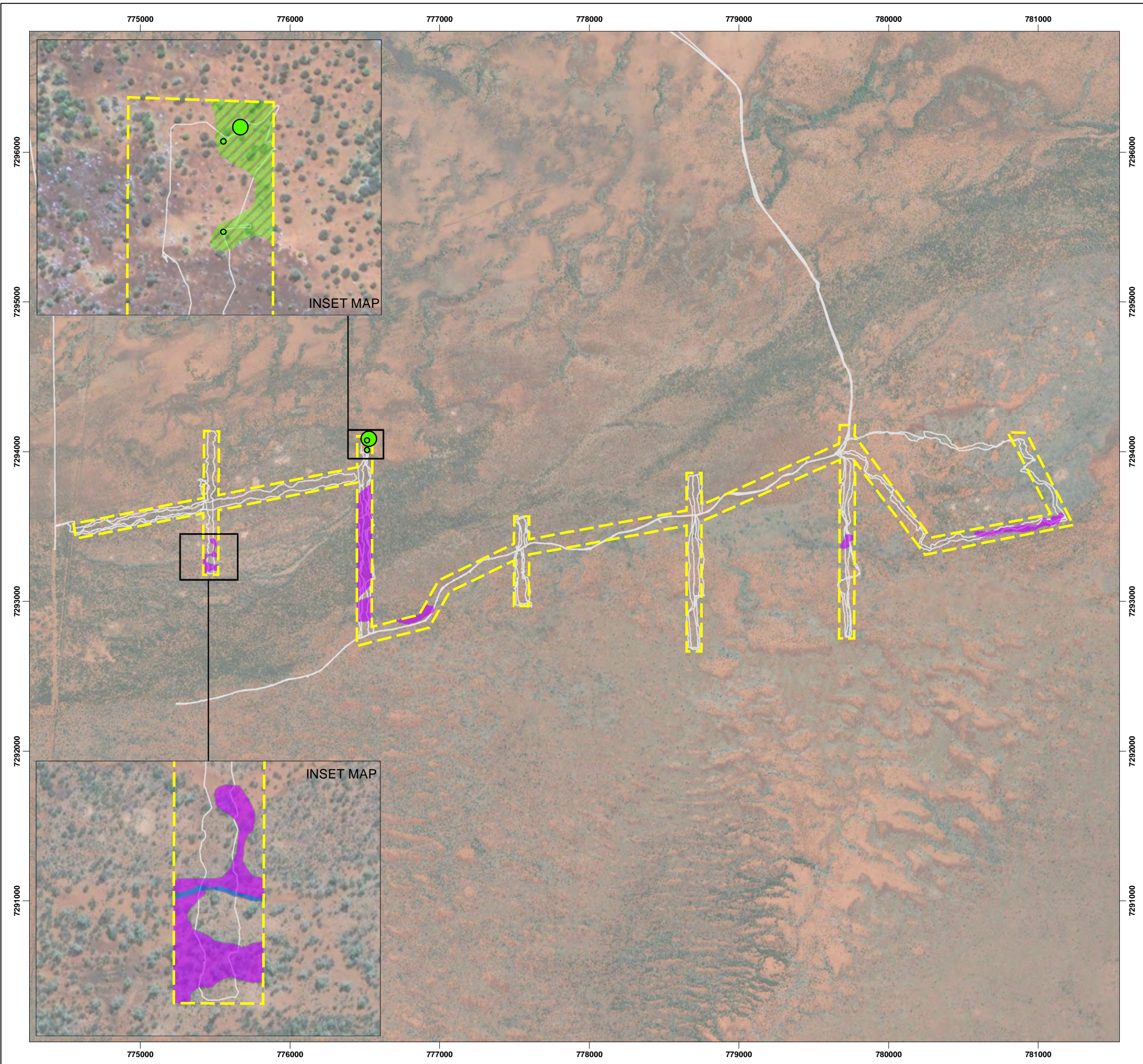
COORDINATE SYSTEM: GDA 1994 MGA ZONE 50
 PROJECTION: TRANSVERSE MERCATOR
 DATUM: GDA 1994
 UNITS: METER










PROJECT NO: 4671-21

REV	AUTHOR	APPROVED	DATE
00	AHC	LA	30/09/2021

MAP
01



LEGEND

-  Borefield Extension Area L52/255
-  Survey Tracks
- Eremophila rigida* Population**
- Count**
-  1
-  5
-  *Eremophila rigida* extent
- Vegetation**
-  Groundwater Dependent Vegetation
-  Riparian



BOREFIELD EXTENSION AREA
BUTCHERBIRD 2021 SURVEYS

DATASOURCES :
SOURCE DATA:
AERIAL:
BASEMAP: GEOSCIENCE AUSTRALIA
SERVICE LAYERS: SOURCE: ESRI, MAXAR, GEOEYE,
EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS,
USDA, USGS, AEROGRIID, IGN, AND THE GIS USER
COMMUNITY



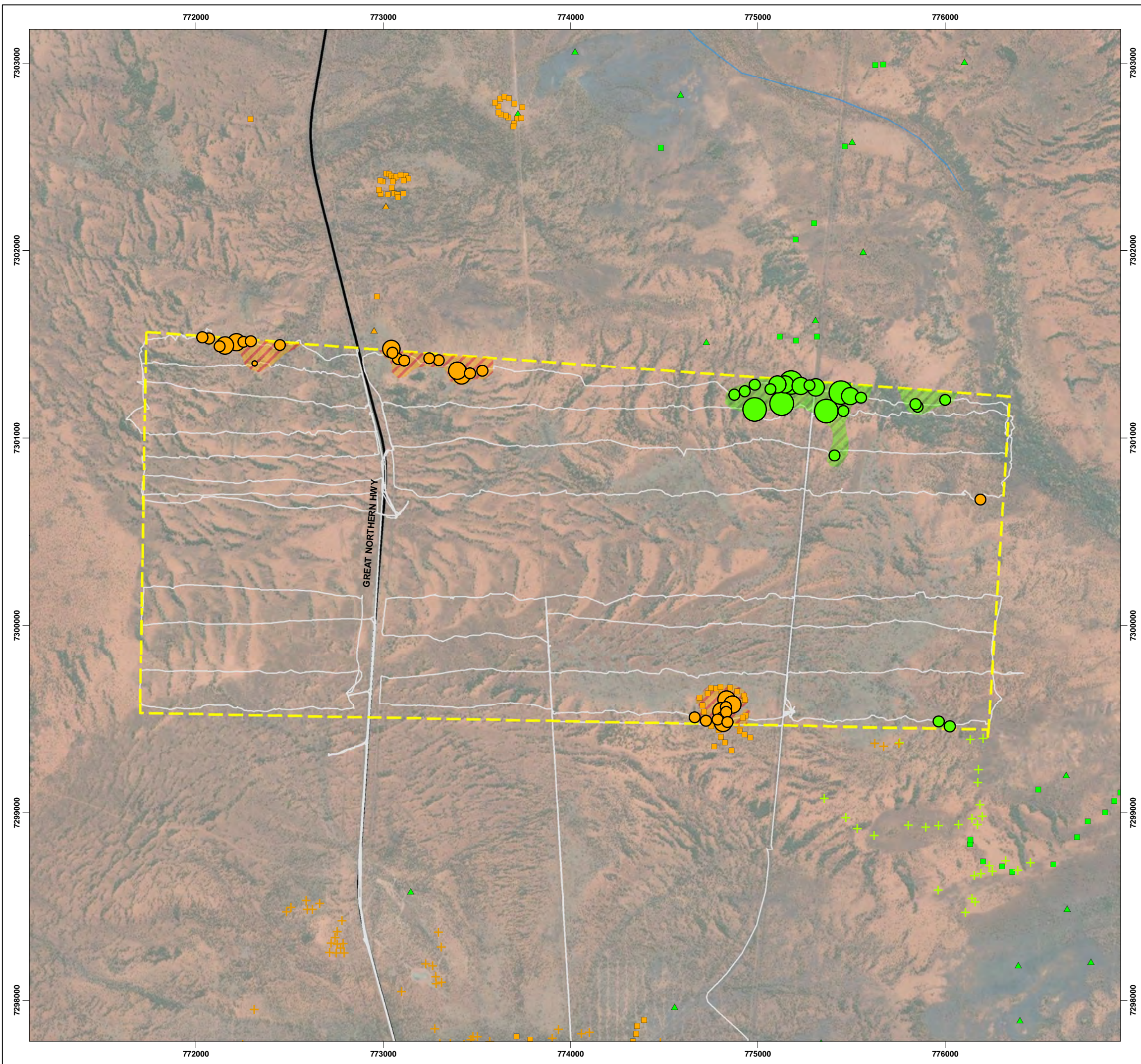
COORDINATE SYSTEM: GDA 1994 MGA ZONE 50
PROJECTION: TRANSVERSE MERCATOR
DATUM: GDA 1994
UNITS: METER



PROJECT NO: 4671-21

REV	AUTHOR	APPROVED	DATE
00	AHC	LA	27/10/2021

MAP
02



LEGEND

- Non-Impact Area North of M52/1074
- Survey Tracks

***Eremophila rigida* Population (2021)**

COUNT

- 2 - 10
- 11 - 20
- 21 - 50

***Eremophila appressa* Population (2021)**

COUNT

- 1
- 2 - 10
- 11 - 20

- Eremophila rigida* extent
- Eremophila appressa* extent

Previous Surveys

- Eremophila appressa* (2019 Survey)
- Eremophila rigida* (2019 Survey)
- Eremophila appressa* (2012 Survey)
- Eremophila rigida* (2012 Survey)
- Eremophila appressa* (2010/2012 Survey)
- Eremophila rigida* (2010/2012 Survey)



**NON-IMPACT AREA
NORTH OF M52/1074
BUTCHERBIRD 2021 SURVEYS**

DATASOURCES :
SOURCE DATA:
AERIAL:
BASEMAP: GEOSCIENCE AUSTRALIA
SERVICE LAYERS: SOURCE: ESRI, MAXAR, GEOEYE,
EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS,
USDA, USGS, AEROGRIID, IGN, AND THE GIS USER
COMMUNITY



COORDINATE SYSTEM: GDA 1994 MGA ZONE 50
PROJECTION: TRANSVERSE MERCATOR
DATUM: GDA 1994
UNITS: METER



PROJECT NO: 4671-21			
REV	AUTHOR	APPROVED	DATE
00	AHC	LA	01/10/2021

**MAP
03**

APPENDIX ONE LEGISLATIVE CONTEXT, DEFINITIONS AND CRITERIA

COMMONWEALTH ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999

The EPBC Act is a legal framework to protect and manage matters of national environmental significance (MNES) including important flora, fauna, ecological communities and heritage areas listed under the Act.

Threatened taxa (flora and fauna) are protected under the EPBC Act, which lists species and ecological communities that have been assessed as meeting the criteria to be listed as Critically Endangered, Endangered, Vulnerable, Conservation Dependant, Extinct, or Extinct in the Wild, as detailed in **Table 6**.

Threatened Ecological Communities protected under the EPBC Act are categorised as Critically Endangered, Endangered or Vulnerable, also detailed in this table.

Migratory species subject to international agreements are also protected under the EPBC Act. The definition of a migratory species under the Act follows that prescribed by the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention) (Department of the Environment 2021):

Migratory species are the entire population or any geographically separate part of the population of any species or lower taxon of wild animals, a significant proportion of whose members cyclically and predictably cross one or more national jurisdictional boundaries.

Species listed by the following international agreements are currently protected under the EPBC Act:

- Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention)
- China-Australia Migratory Bird Agreement (CAMBA)
- Japan-Australia Migratory Bird Agreement (JAMBA)
- Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA).

Table 6: EPBC Act categories for flora, fauna and ecological communities

Category	Threatened species	Threatened Ecological Communities
Extinct	A native species is eligible to be included in the extinct category at a particular time if, at that time, there is no reasonable doubt that the last member of the species has died.	n/a
Extinct in the wild	A native species is eligible to be included in the extinct in the wild category at a particular time if, at that time: (a) it is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or (b) 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.	n/a
Critically Endangered (CE)	A native species is eligible to be included in the <i>critically endangered</i> category at a particular time if, at that 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.	An ecological community is eligible to be included in the <i>critically endangered</i> category at a particular time if, at that 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

Category	Threatened species	Threatened Ecological Communities
Endangered (EN)	A native species is eligible to be included in the <i>endangered</i> category at a particular time if, at that time: (a) it is not critically endangered; and (b) it is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria.	An ecological community is eligible to be included in the <i>endangered</i> category at a particular time if, at that time: (a) it is not critically endangered; and (b) it is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria.
Vulnerable (VU)	A native species is eligible to be included in the <i>vulnerable</i> category at a particular time if, at that time: (a) it is not critically endangered or endangered; and (b) it is facing a high risk of extinction in the wild in the medium term future, as determined in accordance with the prescribed criteria.	An ecological community is eligible to be included in the <i>vulnerable</i> category at a particular time if, at that time: (a) it is not critically endangered or endangered; and (b) it is facing a high risk of extinction in the wild in the medium term future, as determined in accordance with the prescribed criteria.
Conservation Dependent	A native species is eligible to be included in the conservation dependent category at a particular time if, at that time: (a) the species is the focus of a specific conservation program the cessation of which would result in the species becoming vulnerable, endangered or critically endangered; or (b) the following subparagraphs are satisfied: (i) the species is a species of fish; (ii) the species is the focus of a plan of management that provides for management actions necessary to stop the decline of, and support the recovery of, the species so that its chances of long-term survival in nature are maximised; (iii) the plan of management is in force under a law of the Commonwealth or of a State or Territory; (iv) cessation of the plan of management would adversely affect the conservation status of the species.	n/a

WESTERN AUSTRALIAN ENVIRONMENTAL PROTECTION ACT 1986

The Western Australian EP Act 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 provided by the proponent), initiates measures to protect the environment and provides advice to the Minister responsible for environmental matters.

WESTERN AUSTRALIAN BIODIVERSITY CONSERVATION ACT 2016

The Western Australian BC Act provides for the conservation, protection and ecologically sustainable use of biodiversity and biodiversity components in Western Australia.

Threatened species (both flora and fauna) and ecological communities that meet the categories listed within the BC Act are protected under this legislation and require authorisation by the Minister to take or disturb. These are known as Threatened Flora, Threatened Fauna and Threatened Ecological Communities. The conservation categories of Critically Endangered, Endangered and Vulnerable are detailed in **Table 7**; these categories align with those of the EPBC Act. Some State-listed threatened species and ecological communities are provided with additional protection as they are also listed under the Commonwealth EPBC Act (see **Table 6** for conservation status category descriptions).

The most recent Western Australian flora and fauna listings were published in the Government Gazette on 11 September 2018 (Government of Western Australia 2018).

PRIORITY-LISTED FLORA AND FAUNA

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 thereby have a greater level of protection than unlisted species.

There are three categories covering Western Australian-listed TF and four categories covering PF species which are outlined in **Table 7**. PF for Western Australia are regularly reviewed by the DBCA whenever new information becomes available, with species status altered or removed from the list when data indicates that they no longer meet these requirements.

Conservation significant fauna species are listed by the DBCA as Priority Fauna where populations are geographically restricted or threatened by local processes, or where there is insufficient information to formally assign them to threatened fauna categories. Whilst Priority Fauna are not specifically listed in the BC Act, these have a greater level of significance than other native species. The categories covering Priority Fauna species are outlined in **Table 7**.

Flora and fauna species may be listed as being of special conservation interest if they have a naturally low population, have a 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 BC Act.

Table 7: Conservation codes for Western Australian flora and fauna (DBCA 2019)

Conservation Codes for Western Australian Flora and Fauna	
Threatened, Extinct and Specially Protected fauna or flora ¹ are species ² 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	<p>Threatened species</p> <p>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 <i>Biodiversity Conservation Act 2016</i> (BC Act).</p> <p>Threatened fauna is that subset of ‘Specially Protected Fauna’ listed under schedules 1 to 3of the <i>Wildlife Conservation (Specially Protected Fauna) Notice 2018</i> for Threatened Fauna.</p> <p>Threatened flora is that subset of ‘Rare Flora’ listed under schedules 1 to 3of the <i>Wildlife Conservation (Rare Flora) Notice 2018</i> for Threatened Flora.</p> <p>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.</p>

Conservation Codes for Western Australian Flora and Fauna	
CR	<p>Critically endangered species</p> <p>Threatened species considered to be “<i>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</i>”.</p> <p>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 <i>Wildlife Conservation (Specially Protected Fauna) Notice 2018</i> for critically endangered fauna or the <i>Wildlife Conservation (Rare Flora) Notice 2018</i> for critically endangered flora.</p>
EN	<p>Endangered species</p> <p>Threatened species considered to be “<i>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</i>”.</p> <p>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 <i>Wildlife Conservation (Specially Protected Fauna) Notice 2018</i> for endangered fauna or the <i>Wildlife Conservation (Rare Flora) Notice 2018</i> for endangered flora.</p>
VU	<p>Vulnerable species</p> <p>Threatened species considered to be “<i>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</i>”.</p> <p>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 <i>Wildlife Conservation (Specially Protected Fauna) Notice 2018</i> for vulnerable fauna or the <i>Wildlife Conservation (Rare Flora) Notice 2018</i> for vulnerable flora.</p>
<p>Extinct species</p> <p>Listed by order of the Minister as extinct under section 23(1) of the BC Act as extinct or extinct in the wild.</p>	
EX	<p>Extinct species</p> <p>Species where “<i>there is no reasonable doubt that the last member of the species has died</i>”, and listing is otherwise in accordance with the ministerial guidelines (section 24 of the BC Act).</p> <p>Published as presumed extinct under schedule 4 of the <i>Wildlife Conservation (Specially Protected Fauna) Notice 2018</i> for extinct fauna or the <i>Wildlife Conservation (Rare Flora) Notice 2018</i> for extinct flora.</p>
EW	<p>Extinct in the wild species</p> <p>Species that “<i>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</i>”, and listing is otherwise in accordance with the ministerial guidelines (section 25 of the BC Act).</p> <p>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.</p>
<p>Specially protected species</p> <p>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.</p> <p>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.</p>	
MI	<p>Migratory species</p> <p>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).</p> <p>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 <i>Convention on the Conservation of Migratory Species of Wild Animals</i> (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.</p> <p>Published as migratory birds protected under an international agreement under schedule 5 of the <i>Wildlife Conservation (Specially Protected Fauna) Notice 2018</i>.</p>
CD	<p>Species of special conservation interest (conservation dependent fauna)</p> <p>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).</p> <p>Published as conservation dependent fauna under schedule 6 of the <i>Wildlife Conservation (Specially Protected Fauna) Notice 2018</i>.</p>
OS	<p>Other specially protected species</p> <p>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).</p> <p>Published as other specially protected fauna under schedule 7 of the <i>Wildlife Conservation (Specially Protected Fauna) Notice 2018</i>.</p>

Conservation Codes for Western Australian Flora and Fauna	
P	<p>Priority species</p> <p>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.</p> <p>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.</p> <p>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.</p>
1	<p>Priority 1: Poorly-known species</p> <p>Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.</p>
2	<p>Priority 2: Poorly-known species</p> <p>Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well 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.</p>
3	<p>Priority 3: Poorly-known species</p> <p>Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species are in need of further survey.</p>
4	<p>Priority 4: Rare, Near Threatened and other species in need of monitoring</p> <p>(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.</p> <p>(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.</p> <p>(c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.</p>
<p>¹ The definition of flora includes algae, fungi and lichens.</p> <p>² 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).</p>	

APPENDIX TWO

DESKTOP ASSESSMENT RESULTS AND LIKELIHOOD ASSESSMENTS

Table 8: Flora database search results, habitat and likelihood assessment

Blue shading indicates high likelihood; dark blue indicates species is known (recorded) from the survey area

WAH	TPFL	Species name	Habitat from: <i>FloraBase</i> (WAH 1998-2021) (for <i>Acacia</i> species) <i>World Wide Wattle</i> (WAH <i>et al.</i> 2020)	Flowering	Distance from survey area (DBCA)	Likelihood of occurrence	
						Desktop	Post-survey
		Threatened Flora**					
x		<i>Seringia exastia</i> (EPBC – CR; BC – CR)	Undefined	Apr-Dec	<20 km	Likely	May occur
x		<i>Thryptomene wittweri</i> (EPBC – VU; BC – VU)	Skeletal red stony soils. Breakaways, stony creek beds.	Apr-Aug	>60 km	Very Unlikely	Very Unlikely
		DBCA Priority 1					
x	x	<i>Acacia wilcoxii</i>	Granitic soils. Along creeks & adjacent stony plains & granite outcrops.	Unlisted	>60 km	Very Unlikely	Very Unlikely
	x	<i>Eremophila anomala</i>	Basalt outcrop.	Aug-Sep	>60 km	Very Unlikely	Very Unlikely
x	x	<i>Eremophila appressa</i>	Ironstone gravel. Ridge slopes.		<20 km	Known	Known
x		<i>Eremophila demissa</i>	Silcrete plain.	Mar	>60 km	Very Unlikely	Very Unlikely
x		<i>Eremophila humilis</i>	Stony clay, loam. Rocky ridges.	Sep	>60 km	Very Unlikely	Very Unlikely
x		<i>Eremophila laccata</i>	Shallow red-brown loam.	Unlisted	>60 km	Very Unlikely	Very Unlikely
x		<i>Eremophila pilosa</i>	Undefined	Sep	>60 km	Very Unlikely	Very Unlikely
x		<i>Eremophila rhegos</i>	Skeletal stony loam over granite.	Sep	>60 km	Very Unlikely	Very Unlikely
x	x	<i>Eucalyptus semota</i>	Clay. Quartz outcrops.	Unlisted	>60 km	Very Unlikely	Very Unlikely
x		<i>Euphorbia sarcostemmoides</i>	Sandstone ridges, quartzite hills.	Unlisted	>60 km	Very Unlikely	Very Unlikely
x		<i>Goodenia</i> sp. Beyondie (L.W. Sage & S. van Leeuwen LWS 2518)	Dry, bare, clayey sand, saline soils. Near salt lake.	Unlisted	>60 km	Very Unlikely	Very Unlikely
x		<i>Hibiscus chrysinocolla</i>	Red-brown sand over sandstone, near creeks.	Unlisted	>60 km	Very Unlikely	Very Unlikely
x		<i>Isotropis forrestii</i>	Stony clay loam, sandy alluvium. Along drainage lines.	Apr-Dec	>60 km	Very Unlikely	Very Unlikely
	x	<i>Micromyrtus mucronulata</i>	Low hills.	Unlisted	>60 km	Very Unlikely	Very Unlikely
x	x	<i>Minuria</i> sp. Little Sandy Desert (S. van Leeuwen 4919)	Undefined	Unlisted	>60 km	Very Unlikely	Very Unlikely
x		<i>Ptilotus chrysocomus</i>	Brown sandy clays. Bases of breakaways, rocky scree slopes.	Aug-Sep	>60 km	Very Unlikely	Very Unlikely
x	x	<i>Ptilotus tetrandrus</i>	Loamy sands.	Oct	40-60 km	Very Unlikely	Very Unlikely
x		<i>Samolus</i> sp. Fortescue Marsh (A. Markey & R. Coppen FM 9702)	Undefined	Unlisted	40-60 km	Very Unlikely	Very Unlikely
x		<i>Stackhousia</i> sp. Lake Mackay (P.K. Latz 12870)	Undefined	Unlisted	>60 km	Very Unlikely	Very Unlikely
x		<i>Swainsona katjarra</i>	Undefined	Unlisted	20-40 km	May occur	May occur
x		<i>Tecticornia bibenda</i>	Red-brown saline sand with some clay over calcrete and gypsum. Near the edges of gypsiferous playas and salt lakes on flat to gently undulating terrain.	Aug-Oct	>60 km	Very Unlikely	Very Unlikely

DESKTOP ASSESSMENT RESULTS AND LIKELIHOOD ASSESSMENTS

WAH	TPFL	Species name	Habitat from: <i>FloraBase</i> (WAH 1998-2021) (for <i>Acacia</i> species) <i>World Wide Wattle</i> (WAH et al. 2020)	Flowering	Distance from survey area (DBCA)	Likelihood of occurrence	
						Desktop	Post-survey
x		<i>Tecticornia enodis</i>	Margins of salt lakes, lake beds.	Unlisted	>60 km	Very Unlikely	Very Unlikely
x		<i>Tecticornia globulifera</i>	Undefined	Unlisted	20-40 km	Very Unlikely	Very Unlikely
x		<i>Tecticornia</i> sp. Christmas Creek (K.A. Shepherd & T. Colmer et al. KS 1063)	Undefined	Unlisted	40-60 km	Very Unlikely	Very Unlikely
x		<i>Tecticornia willisii</i>	Undefined	Unlisted	40-60 km	Very Unlikely	Very Unlikely
x		<i>Vallisneria</i> sp. Weelarrana (M.N. Lyons & S.D. Lyons 3050)	Aquatic.	Unlisted	20-40 km	Very Unlikely	Very Unlikely
		DBCA Priority 2					
x		<i>Eremophila pusilliflora</i>	Seasonally inundated alluvial plains	Unlisted	>60 km	Very Unlikely	Very Unlikely
x		<i>Oxalis</i> sp. Pilbara (M.E. Trudgen 12725)	Undefined	Unlisted	>60 km	Very Unlikely	Very Unlikely
x		<i>Thysanotus</i> sp. Desert East of Newman (R.P. Hart 964)	Red-brown loamy sand or red sand, sometimes silty. Sand plain, pisolitic buckshot plain.	Aug-Oct	20-40 km	May occur	May occur
		DBCA Priority 3					
x	x	<i>Comesperma sabulosum</i>	Undefined	Unlisted	40-60 km	Unlikely	Unlikely
x	x	<i>Dampiera atriplicina</i>	Red sand. Sand ridges.	May-Jul	>60 km	Very Unlikely	Very Unlikely
x		<i>Eremophila arachnoides</i> subsp. <i>arachnoides</i>	Shallow loam over limestone.	Sep	>60 km	Very Unlikely	Very Unlikely
x		<i>Eremophila fasciata</i>	Undefined	Aug	<20 km	May occur	May occur
x	x	<i>Eremophila gracillima</i>	Stony flats.	Sep	>60 km	Very Unlikely	Very Unlikely
x		<i>Eremophila magnifica</i> subsp. <i>velutina</i>	Skeletal soils over ironstone. Summits.	Aug-Sep	>60 km	Very Unlikely	Very Unlikely
x	x	<i>Eremophila rigida</i>	Red sand alluvium. Hardpan plains, stony clay depressions.	Sep	<20 km	Known	Known
x		<i>Eremophila</i> sp. Hamersley Range (K. Walker KW 136)	Undefined	Unlisted	>60 km	Very Unlikely	Very Unlikely
x	x	<i>Goodenia modesta</i>	Red loam, sand.	Jan-Dec	40-60 km	Unlikely	Unlikely
x	x	<i>Goodenia</i> sp. East Pilbara (A.A. Mitchell PRP 727)	Red-brown clay soil, calcrete pebbles. Low undulating plain, swampy plains.	Unlisted	>60 km	Very Unlikely	Very Unlikely
x		<i>Hemigenia tysonii</i>	Red sand, sandy clay, lateritic sand. Flats, sand dunes, hills.	May-Dec	>60 km	Very Unlikely	Very Unlikely
x		<i>Hemigenia virescens</i>	Undefined	Jul-Dec	>60 km	Very Unlikely	Very Unlikely
x	x	<i>Maireana prosthochaeta</i>	Laterite. Hills, salty places.	Unlisted	<20 km	Unlikely	Unlikely
x		<i>Rhagodia</i> sp. Hamersley (M. Trudgen 17794)	Undefined	Unlisted	>60 km	Likely	Likely
x		<i>Sauropus</i> sp. Woolgorong (M. Officer s.n. 10/8/94)	Red sand. Plains.	Jun	>60 km	Very Unlikely	Very Unlikely
	x	<i>Stackhousia clementii</i>	Skeletal soils. Sandstone hills.	Unlisted	>60 km	Very Unlikely	Very Unlikely
x		<i>Streptoglossa</i> sp. Cracking clays (S. van Leeuwen et al. PBS 7353)	Undefined	Unlisted	>60 km	Very Unlikely	Very Unlikely
x		<i>Tecticornia medusa</i>	Undefined	Unlisted	20-40 km	Very Unlikely	Very Unlikely
x		<i>Tribulus adelacanthus</i>	Undefined	Unlisted	>60 km	Very Unlikely	Very Unlikely
x		<i>Triodia birriliburu</i>	Red sand; dunes	Unlisted	>60 km	Very Unlikely	Very Unlikely

DESKTOP ASSESSMENT RESULTS AND LIKELIHOOD ASSESSMENTS

WAH	TPFL	Species name	Habitat from: <i>FloraBase</i> (WAH 1998-2021) (for <i>Acacia</i> species) <i>World Wide Wattle</i> (WAH et al. 2020)	Flowering	Distance from survey area (DBCA)	Likelihood of occurrence	
						Desktop	Post-survey
		DBCA Priority 4					
x		<i>Comesperma viscidulum</i>	Undefined	Unlisted	>60 km	Very Unlikely	Very Unlikely
x	x	<i>Frankenia glomerata</i>	White sand.	Nov	>60 km	Very Unlikely	Very Unlikely
x		<i>Goodenia berringbinensis</i>	Red sandy loam. Along watercourses.	Oct	>60 km	Very Unlikely	Very Unlikely
		<i>Goodenia nuda</i>	Alluvium	Apr-Aug	n/a	Likely	Unlikely
x		<i>Ptilotus trichocephalus</i>	Sandy soils. Colluvial plains.	Sep	40-60 km	Unlikely	Unlikely

* *Seringia exastia* is currently awaiting de-listing (see **Section 2.1.1**)

TP = Threatened and Priority Flora Report Form record; may be unconfirmed i.e. without vouchered specimen

** Commonwealth EPBC Act and Western Australian BC Act conservation status

APPENDIX THREE DBCA REPORT FORMS



Threatened and Priority Flora Report Form

Version 1.4 March 2021

Please complete as much of the form as possible, with emphasis on those sections bordered in black. For information on how to complete the form please refer to the Threatened & Priority Flora Report Form (TPRF) manual on the DBCA website at www.dpaw.wa.gov.au/plants-and-animals/threatened-species-and-communities/threatened-plants

TAXON: <u>Eremophila appressa</u>		TPFL Pop. No.: _____
OBSERVATION DATE: <u>31/08/2021</u>	CONSERVATION STATUS: <u>P1</u>	New population <input type="checkbox"/>
OBSERVER/S: <u>Lyn Atkins and Terri Jones</u>		PHONE <u>9430 8955</u>
ROLE: <u>Botanist</u>	ORGANISATION: <u>Ecoscape</u>	
EMAIL: <u>lyna@ecoscape.com.au</u>		

DESCRIPTION OF LOCATION (Provide at least nearest town/named locality, and the distance and direction to that place):
North of Element 25's Butcherbird Manganese Mine, approximately 30 km north of Kumarina and 100 km south of Newman

Reserve No.: _____

DBC DISTRICT: <u>Pilbara</u>	LGA: <u>Meekatharra</u>	Land manager present: <input type="checkbox"/>
DATUM: GDA94 / MGA94 x AGD84 / AMG84 <input type="checkbox"/> WGS84 <input type="checkbox"/> Unknown <input type="checkbox"/>	COORDINATES: (If UTM coords provided, Zone is also required) DecDegrees <input type="checkbox"/> DegMinSec <input type="checkbox"/> UTM's <input type="checkbox"/> Lat / Northing: <u>See table at end of document</u> Long / Easting: <u>See table at end of document</u> ZONE: <u>50</u>	METHOD USED: GPS x Differential GPS <input type="checkbox"/> Map <input type="checkbox"/> No. satellites: _____ Map used: _____ Boundary polygon captured: <input type="checkbox"/> Map scale: _____
LAND TENURE:		
Nature reserve <input type="checkbox"/>	Timber reserve <input type="checkbox"/>	Private property <input type="checkbox"/>
National park <input type="checkbox"/>	State forest <input type="checkbox"/>	Pastoral lease <input type="checkbox"/>
Conservation park <input type="checkbox"/>	Water reserve <input type="checkbox"/>	UCL <input type="checkbox"/> SLK/Pole _____ to _____
		Rail reserve <input type="checkbox"/> Shire road reserve <input type="checkbox"/>
		MRWA road reserve <input type="checkbox"/> Other Crown reserve <input type="checkbox"/>
		Specify other: _____

AREA ASSESSMENT: Edge survey <input type="checkbox"/> Partial survey x Full survey <input type="checkbox"/> Area observed (m ²): _____															
EFFORT: Time spent surveying (minutes): <u>1,800</u> No. of minutes spent / 100 m ² : _____															
POP'N COUNT ACCURACY: Actual <input type="checkbox"/> Extrapolation <input type="checkbox"/> Estimate <input type="checkbox"/> Count method: _____ (Refer to field manual for list)															
WHAT COUNTED: Plants <input type="checkbox"/> Clumps <input type="checkbox"/> Clonal stems <input type="checkbox"/> see table at end of document (all plants mature)															
TOTAL POP'N STRUCTURE:															
<table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th>Mature:</th> <th>Juveniles:</th> <th>Seedlings:</th> <th>Totals:</th> </tr> </thead> <tbody> <tr> <td>Alive</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Dead</td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>		Mature:	Juveniles:	Seedlings:	Totals:	Alive					Dead				
	Mature:	Juveniles:	Seedlings:	Totals:											
Alive															
Dead															
Area of pop (m ²): _____ Note: Pls record count as numbers (not percentages) for database.															
QUADRATS PRESENT: No. _____ Size _____ Data attached <input type="checkbox"/> Total area of quadrats (m ²): _____															
Summary Quad. Totals: Alive															
REPRODUCTIVE STATE: Clonal <input type="checkbox"/> Vegetative <input type="checkbox"/> Flowerbud <input type="checkbox"/> Flower <input type="checkbox"/> Immature fruit <input type="checkbox"/> Fruit <input type="checkbox"/> Dehisced fruit <input type="checkbox"/> Percentage in flower: _____%															

CONDITION OF PLANTS: Healthy Moderate Poor x Senescent

COMMENT: _____

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



Threatened and Priority Flora Report Form

HABITAT INFORMATION:

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

Specific **Landform** Element:
(Refer to field manual for additional values)

CONDITION OF SOIL: Dry x Moist Waterlogged Inundated

VEGETATION CLASSIFICATION*:

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

1. Not recorded _____

2. _____

3. _____

4. _____

ASSOCIATED SPECIES:

Other (non-dominant) spp _____

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

CONDITION OF HABITAT: Pristine Excellent Very good Good x Degraded Completely degraded

COMMENT: Heavily grazed; drought affected

FIRE HISTORY: Last Fire: Season/Month: _____ Year: _____ Fire Intensity: High Medium Low No signs of fire x

FENCING: Not required x Present Replace / repair Required Length req'd: _____

ROADSIDE MARKERS: Not required x Present Replace / reposition Required Quantity req'd: _____

OTHER COMMENTS: (Please include recommended management actions and/or implemented actions - include date. Also include details of additional data available, and how to locate it.)

FLORA AUTHORISATION / LICENCE No: _____ Note if only observing plants (i.e. no specimens or plant material is taken) then no authorisation/licence is required. For further information on authorisation and licensing requirements see the Threatened Flora and Wildlife Licensing pages on DBCA's website. Any actions carried out under authorisations/licences should be recorded above in the OTHER COMMENTS section.

SPECIMEN: Collectors No: _____ WA Herb. Regional Herb. District Herb. Other: _____

LODGE MENT: WA Herb Lodgement No: _____

ATTACHED: Map Mudmap Photo GIS data Field notes Other: _____

COPY SENT TO: Regional Office District Office Other: _____

Submitter of Record: Lyn Atkins Role: Principal Ecologist Signed: _____ Date: 29/10/2021

Please return completed form to **Species And Communities Program DBCA**,
Locked Bag 104, BENTLEY DELIVERY CENTRE WA 6983 OR email to: flora.data@dbca.wa.gov.au

RECORDS: Please forward to **Flora Administrative Officer**, Species and Communities Program.

Record entered by: _____ Sheet No.: _____ Record Entered in Database



Threatened and Priority Flora Report Form

EAST	NORTH	DATE_OBS	NOTES	COUNT	HEIGHT
772314.6	7301396	31/08/2021		1	1.4
773045.1	7301474	1/09/2021	Just outside survey area; continues sparsely north	17	1.2
773051.4	7301454	1/09/2021		3	1.3
773079.8	7301421	1/09/2021		6	1.3
773114.6	7301411	1/09/2021	Occurs sparsely in open area north of mulga grove	2	1
773246.7	7301424	1/09/2021		2	1.3
773297.6	7301414	1/09/2021		6	1
773396.4	7301357	1/09/2021	In open areas, not with significant Triodia or mulga cover	12	1
773420.3	7301334	1/09/2021		20	1.2
773464.8	7301344	1/09/2021		10	1.3
773530.2	7301358	1/09/2021		3	1.5
774665.6	7299509	1/09/2021		2	1.3
774723.8	7299490	1/09/2021		3	1.2
774786.1	7299496	1/09/2021		6	1.5
774807.5	7299540	1/09/2021		12	1.2
774830.4	7299563	1/09/2021		9	1.3
774834.7	7299602	1/09/2021	Population in open area, doesn't continue much further north	16	1
774867.1	7299576	1/09/2021		14	1.3
774833.1	7299537	1/09/2021		8	1
774812.1	7299508	1/09/2021		10	1.3
774815.6	7299479	1/09/2021	Population extends to south over the fence	12	1.5
774840.1	7299483	1/09/2021		5	1.3
772035.5	7301537	31/08/2021	Plus three possible dead and three to north of boundary.	3	0.6
772071	7301530	31/08/2021	Within boundary	8	0.6
772128.3	7301488	31/08/2021		3	0.6
772157.3	7301492	31/08/2021		14	0.6
772217.3	7301510	31/08/2021		16	0.6
772255.8	7301511	31/08/2021		7	0.6
772293.6	7301515	31/08/2021		4	0.6
772449.2	7301495	31/08/2021	Stressed or dying, leaves all brown but attached on all five	5	0.6
776190.5	7300670	1/09/2021		3	1.2

Please return completed form to **Species And Communities Program DBCA**,
Locked Bag 104, BENTLEY DELIVERY CENTRE WA 6983 **OR** email to: flora.data@dbca.wa.gov.au

RECORDS: Please forward to **Flora Administrative Officer**, Species and Communities Program.

Record entered by: _____ Sheet No.: _____ Record Entered in Database



Threatened and Priority Flora Report Form

Version 1.4 March 2021

Please complete as much of the form as possible, with emphasis on those sections bordered in black. For information on how to complete the form please refer to the Threatened & Priority Flora Report Form (TPRF) manual on the DBCA website at www.dpaw.wa.gov.au/plants-and-animals/threatened-species-and-communities/threatened-plants

TAXON: <u>Eremophila rigida</u>		TPFL Pop. No.: _____	
OBSERVATION DATE: <u>31/08/2021</u>		CONSERVATION STATUS: <u>P3</u>	
OBSERVER/S: <u>Lyn Atkins and Terri Jones</u>		PHONE <u>9430 8955</u>	
ROLE: <u>Botanist</u>		ORGANISATION: <u>Ecoscape</u>	
EMAIL: <u>lyna@ecoscape.com.au</u>			

DESCRIPTION OF LOCATION (Provide at least nearest town/named locality, and the distance and direction to that place):
North of Element 25's Butcherbird Manganese Mine, approximately 30 km north of Kumarina and 100 km south of Newman

DBC DISTRICT: <u>Pilbara</u>		LGA: <u>Meekatharra</u>		Land manager present: <input type="checkbox"/>	
DATUM:		COORDINATES: (If UTM coords provided, Zone is also required)		METHOD USED:	
GDA94 / MGA94 x		DecDegrees <input type="checkbox"/> DegMinSec <input type="checkbox"/> UTM's <input type="checkbox"/>		GPS x Differential GPS <input type="checkbox"/> Map <input type="checkbox"/>	
AGD84 / AMG84 <input type="checkbox"/>		Lat / Northing: <u>See table at end of document</u>		No. satellites: _____ Map used: _____	
WGS84 <input type="checkbox"/>		Long / Easting: <u>See table at end of document</u>		Boundary polygon captured: <input type="checkbox"/> Map scale: _____	
Unknown <input type="checkbox"/>		ZONE: <u>50</u>			
LAND TENURE:					
Nature reserve <input type="checkbox"/>		Timber reserve <input type="checkbox"/>		Private property <input type="checkbox"/>	
National park <input type="checkbox"/>		State forest <input type="checkbox"/>		Pastoral lease <input type="checkbox"/>	
Conservation park <input type="checkbox"/>		Water reserve <input type="checkbox"/>		UCL <input type="checkbox"/> SLK/Pole _____ to _____	
				Rail reserve <input type="checkbox"/> Shire road reserve <input type="checkbox"/>	
				MRWA road reserve <input type="checkbox"/> Other Crown reserve <input type="checkbox"/>	
				Specify other: _____	

AREA ASSESSMENT: Edge survey Partial survey x Full survey Area observed (m²): _____

EFFORT: Time spent surveying (minutes): 1,800 No. of minutes spent / 100 m²: _____

POP'N COUNT ACCURACY: Actual Extrapolation Estimate Count method: _____
(Refer to field manual for list)

WHAT COUNTED: Plants Clumps Clonal stems **see table at end of document (all plants mature)**

TOTAL POP'N STRUCTURE:	Mature:	Juveniles:	Seedlings:	Totals:	Area of pop (m ²): _____ Note: Pls record count as numbers (not percentages) for database.
Alive					
Dead					

QUADRATS PRESENT: No. _____ Size _____ Data attached Total area of quadrats (m²): _____

Summary Quad. Totals: Alive

REPRODUCTIVE STATE:	Clonal <input type="checkbox"/>	Vegetative <input type="checkbox"/>	Flowerbud <input type="checkbox"/>	Flower <input type="checkbox"/>
	Immature fruit <input type="checkbox"/>	Fruit <input type="checkbox"/>	Dehisced fruit <input type="checkbox"/>	Percentage in flower: _____ %

CONDITION OF PLANTS: Healthy Moderate Poor x Senescent

COMMENT: _____

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



Threatened and Priority Flora Report Form

HABITAT INFORMATION:

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

Specific Landform Element: _____
(Refer to field manual for additional values)

CONDITION OF SOIL: Dry x Moist Waterlogged Inundated

VEGETATION CLASSIFICATION*:

1. Not recorded _____

2. _____

3. _____

4. _____

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

ASSOCIATED SPECIES:

Other (non-dominant) spp _____

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

CONDITION OF HABITAT: Pristine Excellent Very good Good x Degraded Completely degraded

COMMENT: Heavily grazed; drought affected _____

FIRE HISTORY: Last Fire: Season/Month: _____ Year: _____ Fire Intensity: High Medium Low No signs of fire x

FENCING: Not required x Present Replace / repair Required Length req'd: _____

ROADSIDE MARKERS: Not required x Present Replace / reposition Required Quantity req'd: _____

OTHER COMMENTS: (Please include recommended management actions and/or implemented actions - include date. Also include details of additional data available, and how to locate it.)

FLORA AUTHORISATION / LICENCE No: _____ Note if only observing plants (i.e. no specimens or plant material is taken) then no authorisation/licence is required. For further information on authorisation and licensing requirements see the Threatened Flora and Wildlife Licensing pages on DBCA's website. Any actions carried out under authorisations/licences should be recorded above in the OTHER COMMENTS section.

SPECIMEN:	Collectors No: _____	WA Herb. <input type="checkbox"/>	Regional Herb. <input type="checkbox"/>	District Herb. <input type="checkbox"/>	Other: _____	
LODGEMENT:	WA Herb Lodgement No: _____					
ATTACHED:	Map <input type="checkbox"/>	Mudmap <input type="checkbox"/>	Photo <input type="checkbox"/>	GIS data <input type="checkbox"/>	Field notes <input type="checkbox"/>	Other: _____
COPY SENT TO:	Regional Office <input type="checkbox"/>	District Office <input type="checkbox"/>	Other: _____			

Submitter of Record: Lyn Atkins Role: Principal Ecologist Signed: _____ Date: 29/10/2021



Threatened and Priority Flora Report Form

EAST	NORTH	DATE_OBS	NOTES	COUNT	HEIGHT
776516.1	7294073	31/08/2021		1	0.7
776527.8	7294083	31/08/2021	Approx 10-20 plants to east and north of survey area	5	0.5
776516.1	7294010	31/08/2021		1	0.5
775310.9	7301269	1/09/2021		15	1
775445.6	7301240	1/09/2021		50	1
775495.1	7301222	1/09/2021		20	0.8
775551.5	7301214	1/09/2021		8	1
775842.9	7301180	1/09/2021		2	0.8
776001.9	7301201	1/09/2021	Pop extends sparsely to north in open area	6	1
775410.9	7300906	1/09/2021		2	0.8
774877.2	7301230	1/09/2021		5	0.6
774933	7301249	1/09/2021		5	0.7
774984.8	7301283	1/09/2021	Population continues sparsely north and south	7	0.6
775068.9	7301259	1/09/2021	Population continues to south, north and east	7	0.7
775106.5	7301285	1/09/2021		13	0.7
775145.3	7301285	1/09/2021	Population continues largely to the north	20	0.6
775179.1	7301294	1/09/2021		30	0.7
775231.3	7301276	1/09/2021	Population continues mostly northwards	20	0.7
775278.5	7301279	1/09/2021		5	0.6
775967.3	7299486	1/09/2021	Isolated group	4	1
776027.1	7299461	1/09/2021	Isolated group	5	0.6
775367.2	7301142	1/09/2021		35	1.2
775458.6	7301142	1/09/2021		10	1.2
775855.5	7301166	1/09/2021		6	1.2
774985.7	7301151	1/09/2021	Plants east of point extending north and south.	40	1
775128.5	7301182	1/09/2021	Plants west of point extending north and south	40	1.2
775231.3	7301168	1/09/2021	Plants extending north and south on pebbly plain	100	1.2

Please return completed form to **Species And Communities Program DBCA**,
Locked Bag 104, BENTLEY DELIVERY CENTRE WA 6983 **OR** email to: flora.data@dbca.wa.gov.au

RECORDS: Please forward to **Flora Administrative Officer**, Species and Communities Program.

Record entered by: _____ Sheet No.: _____ Record Entered in Database