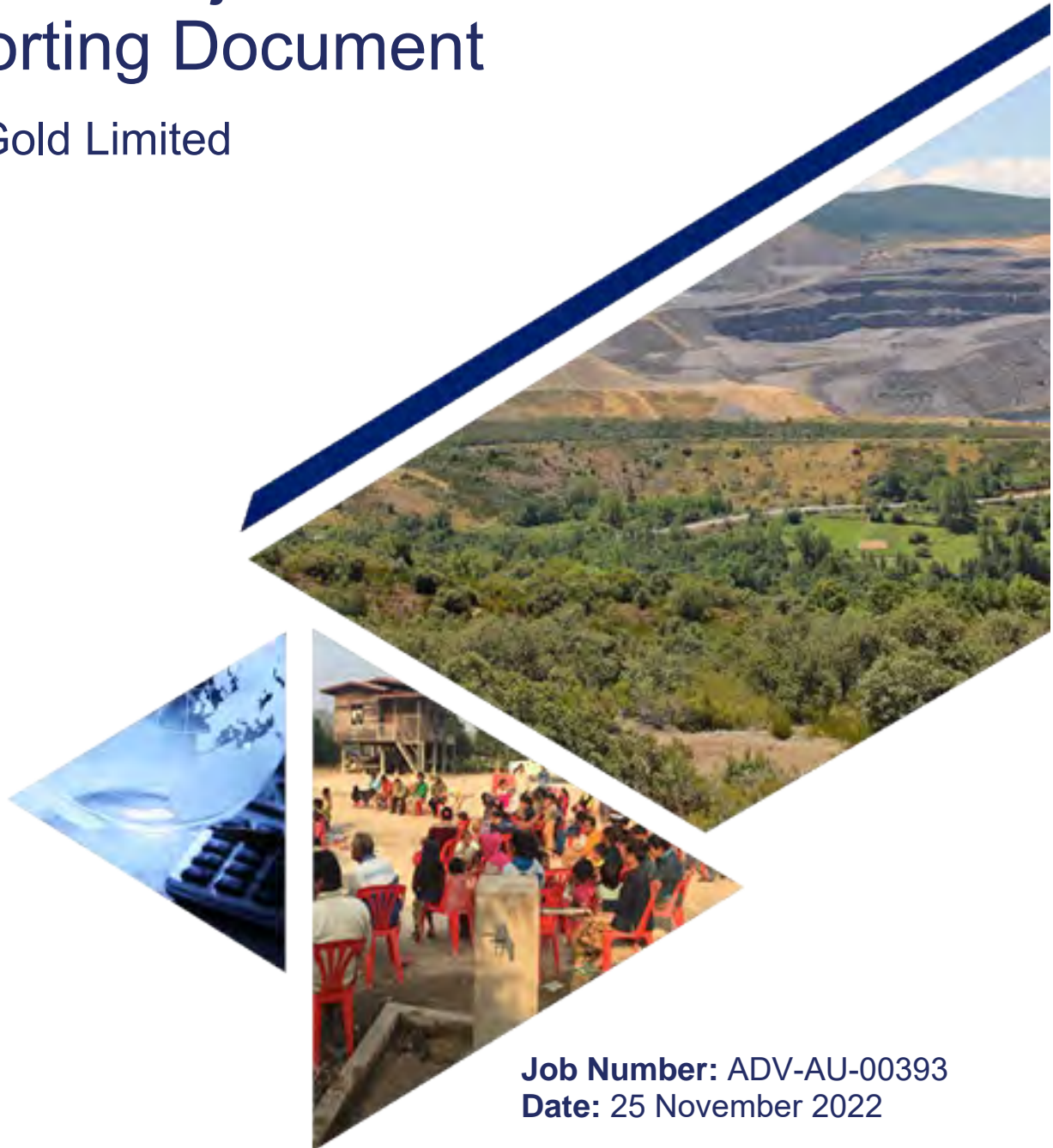


# RPMGLOBAL

## Redcliffe Project EPBC Act Referral Supporting Document

Dacian Gold Limited



**Job Number:** ADV-AU-00393  
**Date:** 25 November 2022

**DOCUMENT CONTROL SHEET**

<b>Client</b>	
Dacian Gold Limited	
<b>Report Name</b>	<b>Date</b>
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## 1. Introduction

### 1.1 Overview

RPM Advisory Services Pty Ltd (“RPM”) was commissioned by Dacian Gold Limited (“Dacian” or the “Client”) to complete an assessment of environmental impacts of the Redcliffe Gold Project (the “Project” or “RGP”) using the Significant Impact Guidelines 1.2 (Commonwealth of Australia, 2013). The purpose of this document is to provide relevant information for the referral of the RGP under the *Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)* (EPBC Act).

Part of the RGP is located on the Mertondale Station Pastoral Lease, which is held by the Commonwealth Government Department of Defence (DoD). Under the EPBC Act, approval is required for any action taken by any person on Commonwealth land that is likely to have a ‘significant impact’ on the environment. This assessment has focused on the proposed mining area of the RGP located on Mertondale Station Pastoral Lease, being on Commonwealth land.

Dacian commenced consulting with the DoD in 2021. An access agreement for mining activities was granted in October 2021, which expires upon execution of the Deed of Access. A draft Deed of Access was provided to Dacian on 30 June 2022.

### 1.2 Purpose

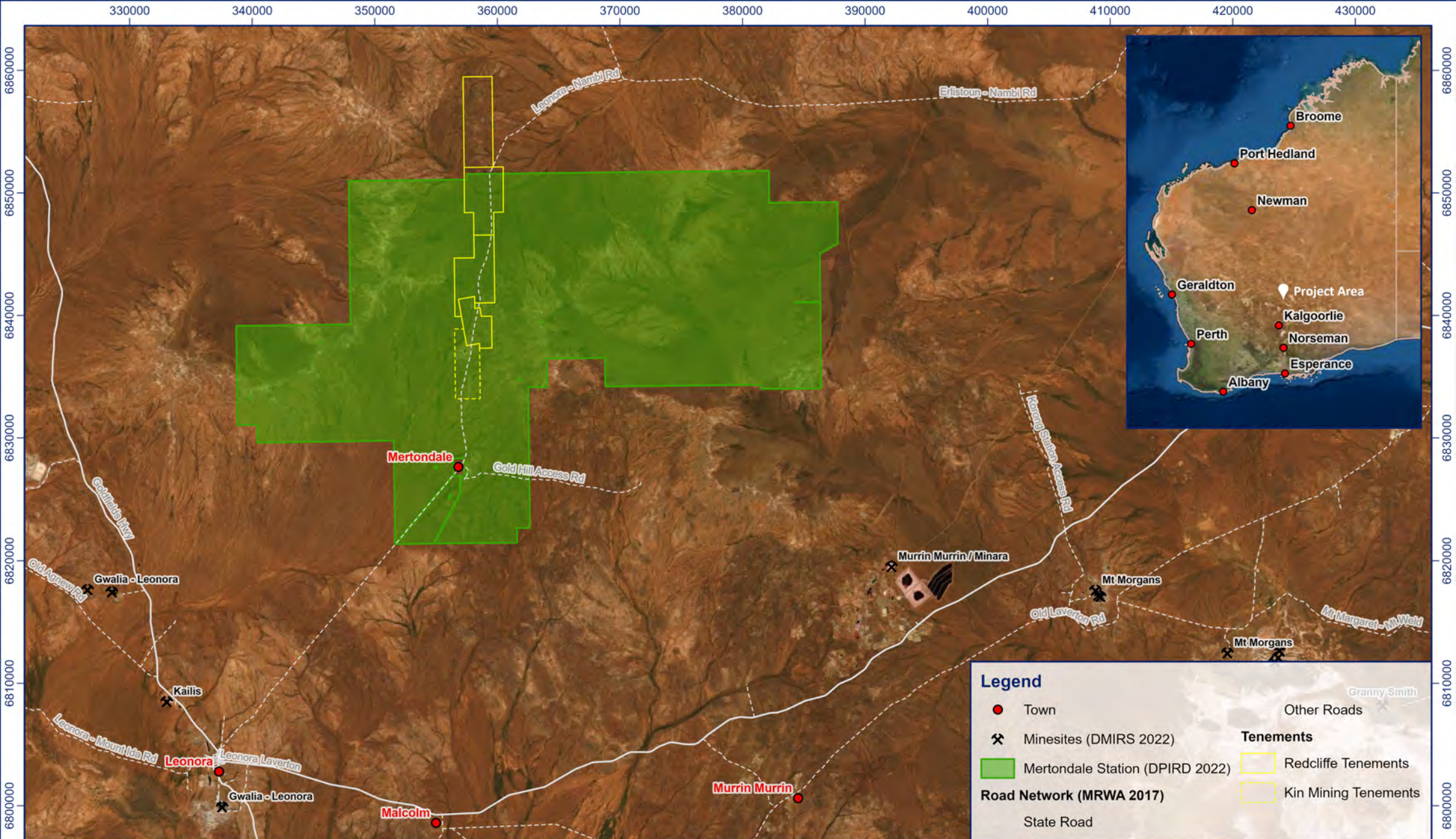
The purpose of this assessment is to determine whether the RGP area located on Mertondale Station (the proposed “Action”) is likely to have a significant impact on the environment on Commonwealth land, per subsection 26(2) of the EPBC Act. This assessment has been undertaken in accordance with referral guidance published by the administering authority for the EPBC Act. These include:

- *Matters of National Environmental Significance Significant impact guidelines 1.1* (Environment Protection and Biodiversity Act 1999), Commonwealth of Australia (2013), available at [https://www.agriculture.gov.au/sites/default/files/documents/nes-guidelines\\_1.pdf](https://www.agriculture.gov.au/sites/default/files/documents/nes-guidelines_1.pdf)
- *Actions on, or impacting upon, Commonwealth land Significant impact guidelines 1.2* (Environment Protection and Biodiversity Act 1999), Commonwealth of Australia (2013), available at [https://www.dccew.gov.au/sites/default/files/documents/commonwealth-guidelines\\_1.pdf](https://www.dccew.gov.au/sites/default/files/documents/commonwealth-guidelines_1.pdf)

### 1.3 Location

The RGP is located approximately 50 km north-east of Leonora, within the local government shires of Leonora and Laverton, in the North-Eastern Goldfields Region of Western Australia (**Figure 1-1**). It is accessed via the main public Leonora-Nambi Road. The RGP is owned and being developed by Redcliffe Project Pty Ltd (Redcliffe), a wholly owned subsidiary of Dacian. The area has a history of mining, prospecting, and pastoral land uses.





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PROJECT		CLIENT
October 2022	Dacian - Redcliffe - ESG - EPBC Assessment	
Figure 1-1		
ADV-AU-00393	Location Plan	

**RPMGLOBAL**



## 2. Project Description

The Project is a small gold mining operation, with an estimated life of mine of approximately two years and an expected total 82 koz pit inventory. In the context of mining in Western Australia, the Project is considered comparatively small scale, involving only two open pit operations with a combined area of 40.9 ha and maximum depth of 115 m below surface. No major infrastructure such as processing plants or power stations are required. Whilst the Project involves excavation of minerals, the scale of the operation is considered relatively small in terms of size and duration.

The mining activities that will be located on Mertondale Station include:

- Two open cut pit operations with combined area of 40.9 ha that will remain after closure. One open cut pit operation will include a small satellite pit.
- Two waste rock dumps (WRD) with a combined area of 86.3 ha that will be rehabilitated to blend with the natural environment after closure.
- Other mine components including run of mine (ROM) pads, abandonment bunds, flood bunds, topsoil stockpiles, access tracks, washdown pad, mine roads, flood protection and drainage diversion features.
- Dewatering infrastructure - including pipelines, bores and tanks, surface infrastructure pad, water transfer station, pipelines, water clarifier tank, transfer tank and pump set, with water from the pits discharged to the historic Redcliffe, Mesa and Mertondale 5 open pits.
- Supporting infrastructure - including a wastewater treatment plant, administration offices, workshop and other buildings with communication and ablution facilities reporting to in-ground septic tanks and leach drain systems, power supply for offices and workshop, fuel facilities and bioremediation pad, laydown area, explosives storage facility, accommodation camp, Class II landfill and access roads.

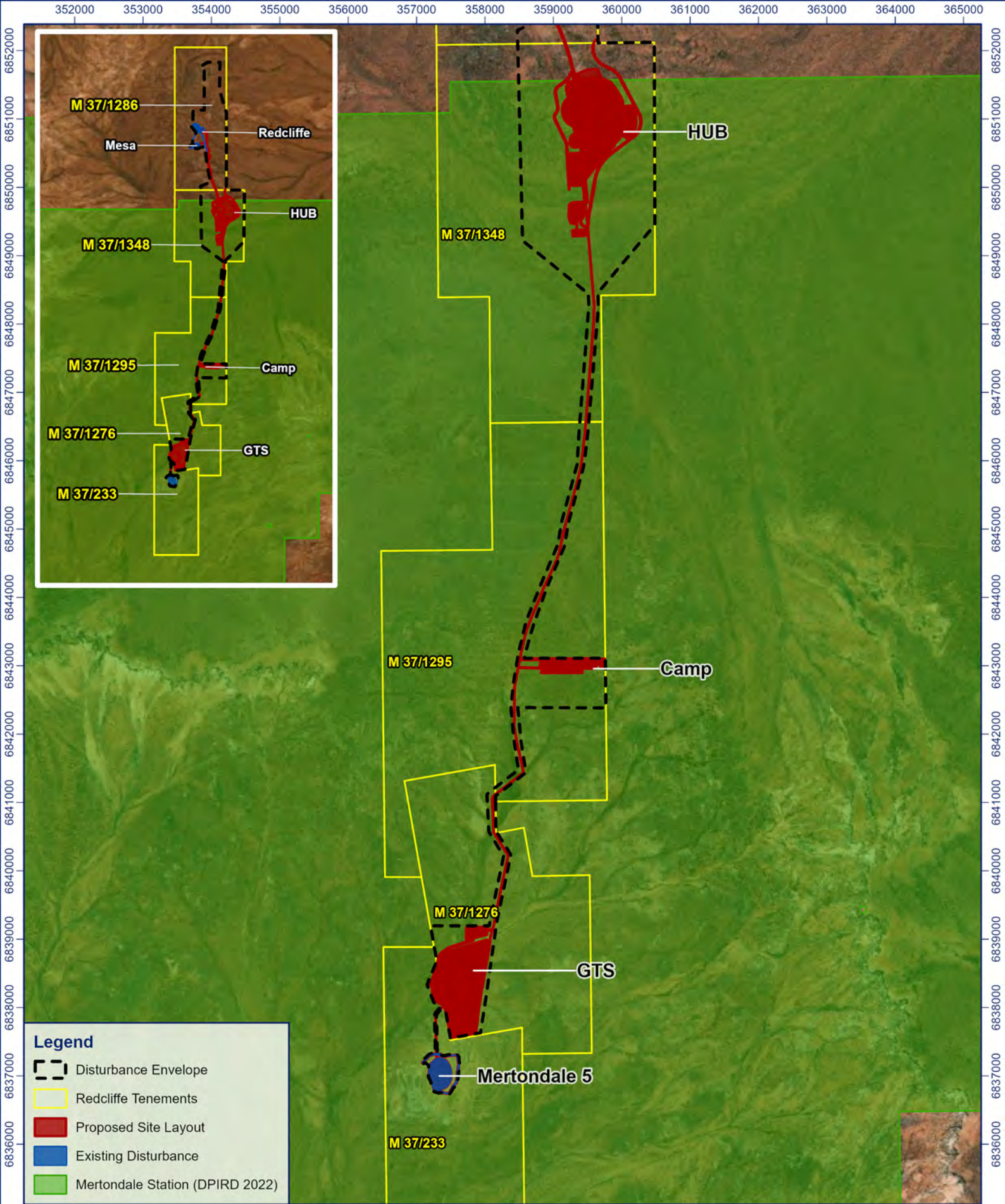
Processing plant infrastructure is not planned for the Project. The Project plans to send the ore to the Mt Morgans Processing Plant, located approximately 30 km south-west of Laverton to process and recover the gold.

Within Mertondale Pastoral Lease, the project will require 239.97 ha of new disturbance (clearing), of which 184.6 ha (77%) will be rehabilitated to native vegetation. Mining activities located within Mertondale Pastoral Lease are outlined in **Table 2-1** and **Figure 2-1**.

**Table 2-1 RGP Infrastructure and Disturbance to Mertondale Station**

Tenement	Mine Activity Type	Area (Ha)
M 37/1276	Diversion channel or drain	1.34
	Laydown or hardstand area	3.34
	Mining void (with a depth of at least 5 metres) - below ground water level	11.23
	Other Cleared Land - Land (other than land under rehabilitation or rehabilitated land) that is cleared of vegetation and is not otherwise described in this Table	2.80
	Run-of-mine pad	2.70
	Topsoil stockpile	11.24
	Transport or service infrastructure corridor	6.23
	Waste dump or overburden stockpile (class 1)	44.41

Tenement	Mine Activity Type	Area (Ha)
M 37/1295	Building (other than workshop) or camp site	7.09
	Sewage pond	2.84
	Topsoil stockpile	4.99
	Transport or service infrastructure corridor	8.64
M 37/1348	Dam - saline water or process liquor	1.31
	Diversion channel or drain	3.25
	Landfill site	0.59
	Laydown or hardstand area	14.46
	Mining void (with a depth of at least 5 metres) - below ground water level	16.71
	Other Cleared Land - Land (other than land under rehabilitation or rehabilitated land) that is cleared of vegetation and is not otherwise described in this Table	8.19
	Run-of-mine pad	3.34
	Topsoil stockpile	15.95
	Transport or service infrastructure corridor	20.87
Waste dump or overburden stockpile (class 1)	41.93	
M 37/233	Diversion channel or drain	1.29
	Mining void (with a depth of at least 5 metres) - below ground water level	0.59
	Other Cleared Land - Land (other than land under rehabilitation or rehabilitated land) that is cleared of vegetation and is not otherwise described in this Table	1.53
	Topsoil stockpile	2.44
	Transport or service infrastructure corridor	0.66



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 Projection: GDA2020 MGA Zone 51  
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**PROJECT**

**Dacian - Redcliffe - ESG - EPBC Assessment**

**Project Overview and Tenure**

**CLIENT**





## 2.1 Open Pits

The site layouts for proposed development of the Hub and GTS open pits are shown in **Figure 2-2** and **Figure 2-3**.

The Hub (M37/1348) will have an initial starter open pit stage of 55 m depth mined over a six month period, and the final open pit (Hub North) is proposed to be mined to a depth of 95 m, with a small separate southern pit to a depth of 35 m (**Table 2-2**). The Hub pits are estimated to be an area of approximately 16.8 ha. These pits are estimated to produce 265,690 tonnes of ore and 8.3 Mt of waste rock, over a mine life of 12 to 16 months.

The orebody at the Hub runs vertically from north to south. There will be a single ramp which decreases from a maximum dual lane width of 24 m in the upper benches of the pit, to a minimum lane width of 14 m at the base of the pit.

The final southern Hub pit is proposed to be 160 m by 120 m, extending to the 460 metres Australian Height Datum (mAHD), approximately 35 m below the surface. There is a single lane 14 m wide ramp proposed from surface for the southern pit.

The GTS (M37/1276) open pit will mine to a depth of 115 m over an area of 11.3 ha. It will produce 600,000 t of ore and 8.3 Mt of waste rock over a mine life of 8 to 12 months.

The GTS is proposed to be a single open pit, 441 m by 235 to 350 m wide extending to 370 mAHD, and approximately 115 m below surface (**Table 2-3**). The pit will be the deepest in the centre of the pit, with the ramp switching back in the South part of the pit. The orebody at GTS is vertical and runs north to south through the centre of the pit. There will be a single ramp which decreases from a maximum dual lane width of 24 m in the upper benches, to a minimum lane width of 14 m at the base of the pit.

Redcliffe applied the recommended geotechnical parameters to the RGP pit designs and the designed overall slope angles for each pit are:

- Hub North Open Pit – 32°
- Hub South Open Pit – 28° (East Wall), 35° (West Wall).
- GTS Open Pit – 34° (East Wall), 38° (West Wall).

**Table 2-2 Hub Open Pit Design Parameters**

Level (mAHD)	Bench Height (m)	Face Angle (degrees)	Berm Width (m)
<b>Most Likely Case (Final Pit)</b>			
Surface – 5 metres below surface (mbs)	5	50	4
5mbs – 95mbs (highly weathered material)	10	50	4
<b>Best Case</b>			
Surface - 5mbs	5	55	4
5mbs – 95mbs (highly weathered material)	10	55	4

Source: Dacian 2022

**Table 2-3 GTS Open Pit Design Parameters**

Level (mAHD)	Bench Height (m)	Face Angle (degrees)	Berm Width (m)
Surface – 30mbs	5	60	3
30mbs – 60mbs	10	60	5
Below 60mbs	20	60	7

Source: Dacian 2022

All potential RGP open pit mine developments will use conventional surface mining methods to extract the resource, with drill and blast employed to break the ground, and hydraulic excavator and truck load and haul methods engaged to selectively mine the pit.

Ore will be stockpiled in each mine area at a designated road ROM pad, then loaded and transported to the Dacian Mt Morgans Processing plant by road train via Leonora approximately 120 km away. There will be no tailings generated at the RGP.

The proposed operations will run 24 hours per day, 7 days per week, 365 days per year with two shifts (day and night shift) per day.

## 2.2 Waste Rock Dumps

Waste rock from each pit will be stockpiled within a WRD dump located adjacent to each pit.

### 2.2.1 Hub Waste Rock Dump

The Hub WRD will be located approximately 90 m to the east of the Hub open pit (**Figure 2-2**). The proposed Hub WRD design was developed with consideration to visual amenity and long-term stability. The location has been selected based on surface water assessment; that it does not impact on any natural surface water drainage channel; it is low in height; and has low angle slopes. These criteria are expected to produce a safe, stable and non-polluting landform that blends in with the surrounds. The Hub WRD design parameters are presented in **Table 2-4**.

The primary objective for the Hub WRD is to provide a safe, stable and non-polluting landform that blends with the surrounding topography as far as practicable. The secondary objective is to establish a self-sustaining vegetated ecosystem on the Hub WRD landform. The batter angles and the overall slope angle of the Hub WRD will create a safe, stable landform (PBA, 2021). Appropriate fresh waste will be stockpiled during mining and will be placed around the toe of the Hub WRD to form a sediment bund and for surface water erosion protection.

**Table 2-4 Hub Waste Rock Dump Design Parameters**

Parameter	Value
Volume	6,921,836 m <sup>3</sup>
Type	Dual lift
Batter Height	20 m First Lift 10 m Second Lift.
Batter Angles	14°
Berm	20 m berm at 20 m height.
Surface water management	Located away from the surface water drainage channel of Dillion Creek. Crest bunding and internal windrows will be constructed on the Hub WRD to compartmentalise and keep runoff on the dump top where it will soak in and/or evaporate.

Parameter	Value
	The WRD toe will be armoured with an additional layer of non-acid generating waste rock stockpiled during mining to minimise potential erosion and sedimentation.
Minimum volume of competent sheeting material	Not applicable as slope angles of 14 degrees allows for competent slope and will minimise erosion.

## 2.2.2 GTS Waste Rock Dump

The GTS WRD will be located approximately 90 m to the east of the GTS open pit (**Figure 2-3**). The proposed GTS WRD design was developed with consideration to visual amenity and long-term stability. The location has been selected based on, the surface water assessment; being designed to be low in height; and has low angle slopes. These specifications are expected to produce a safe, stable, and non-polluting landform that adequately blends in with the surrounding environment. The GTS WRD design parameters are presented in **Table 2-5**.

The primary objective for the GTS WRD is to provide a safe, stable and non-polluting landform that blends with the surrounding topography as far as practicable. The secondary objective is to establish a self-sustaining vegetated ecosystem on the GTS WRD landform. The batter angles and the overall slope angle of the GTS WRD will create a safe, stable landform. Fresh waste will be placed around the toe of the GTS WRD to form a sediment bund as erosion protection.

**Table 2-5 GTS Waste Rock Dump Design Parameters**

Parameter	Value
Volume	6,327,594 m <sup>3</sup>
Type	Dual lift.
Batter Height	20 m First Lift and 11 m Second Lift.
Batter Angles	14° First Lift and 16° Second Lift.
Berm	20 m berm at 20 m height.
Surface water management	A 987 m long creek diversion will be constructed along the north-west edge of the WRD to divert surface water from the creek to the North of the dump area and direct it back to the creek line situated to the West of the proposed pit development via a rock armoured apron. This will remain at closure and is not anticipated to require any maintenance in the long-term.  Crest bunding and internal windrows will be constructed on the GTS WRD to compartmentalise and keep runoff on the dump top where it will soak in and/or evaporate. The WRD toe will be armoured with an additional layer of fresh non-acid generating waste rock to minimise potential erosion and sedimentation.
Competent second lift material	The second lift will be predominantly fresh and transitional rock and the dumping strategy will be implemented to ensure that suitably competent material is placed on the outside of the dump with any oxide material placed in the middle to ensure a stable landform.

## 2.3 Run of Mine Pads

Two Run of Mine (ROM) pads are proposed for each open pit for stockpiling mined ore, prior to loading into road train for processing at the Mt Morgans processing plant (**Figure 2-2** and **Figure 2-3**).

The GTS ROM Pad will be located 300 m south-east of the GTS pit, and the Hub ROM Pad will be located to the 400 m south-east of the Hub pit. Dimensions of the ROM Pads will be approximately 166 m x 166 m and will occupy an area of approximately 3 ha. Ore will be stockpiled at the Road Train ROM Pads, blended as required, loaded into road trains, and delivered to the Mt Morgans Processing Plant for processing.



## 2.4 Dewatering and Discharge to Redcliffe

Monitoring bores, production bores and vibrating wire piezometer (VWP) holes will be installed at suitable locations around the GTS and Hub pits to determine the most suitable dewatering/depressurisation technique to ensure the pit floor is dewatered ahead of mining. Dacian will consider all methods to best achieve depressurisation of the pit walls, including sub horizontal drain holes if other conventional methods are not successful.

The Hub and GTS open pits are expected to experience groundwater infiltration during mining. Dewatering bores will be the initial method used to pump mine water, manage the groundwater table and rainwater ingress into the open pits. In pit sumps may be used after the initial mine dewatering. Mine water will be transferred directly via the proposed dewatering pipeline, along the dewatering route. The dewatering pipeline corridors will be approximately 2 to 5 m wide within existing tracks, with no clearing of native vegetation required.

The Hub mine water will be discharged into the existing Redcliffe and Mesa open pits. The GTS mine water will be discharged into the existing Mertondale 5 open pit. Mine dewatering infrastructure will include bores, surface infrastructure pad, water transfer station, pipelines, water clarifier tank, transfer tank and pump set.

## 2.5 Surface Water Management

Given that the upstream catchment areas are relatively modest, and all the watercourses in the vicinity of the RGP are ephemeral, only relatively minor surface water management measures will be required at each of the proposed RGP mining areas. These minor surface water management measures are designed to address the general surface water conditions and the potential site flooding conditions.

### 2.5.1 Hub Mining Area

A 1,575 m long southern flood bund and a 320 m northern flood bund will be constructed along the western (upstream) side of the Hub North and South Pits. The minimum height of the flood protection bund has been set at 2 m above existing ground level and will have a minimum crest width of 3 m, and a minimum base width of 11 m. The flood protection bund will be constructed by clearing the bund footprint, with the surficial material removed to a suitable formation depth (i.e. 0.5 m minimum). The bund will be built from select waste material placed and compacted in controlled layers. The upstream face of the flood bund will be armoured with suitable, graded broken rock (riprap). The flood protection bund has been placed outside the zones of influence and set back from the proposed pit crests, so that it may also serve as an abandonment bund at the end of operations. At site closure, the Hub flood bund will be breached at relevant sections to reinstate surface water flows.

Four floodways with low-flow culverts will also be constructed across the existing and diverted Leonora-Nambi Roads.

### 2.5.2 GTS Mining Area

An approximately 1,000 m long diversion channel will be constructed from about 300 m west (downstream) of the existing Leonora-Nambi Road floodway and aligned around the northern side of the WRD and proposed GTS Pit (outside the zone of exclusion), terminating at the existing watercourse on the western side of the site. This diversion channel will have a maximum depth of 2 m.

An approximately 725 m long flood protection bund will be constructed along the western sides of the GTS Pit. This flood protection bund will be constructed to the same general specifications and construction method as that proposed for the flood protection bund at the Hub. At site closure, the GTS flood bund will be breached at relevant sections to reinstate surface water flows.

### 2.5.3 General Stormwater, Sediment and Oily Water Management (all Mining Areas)

Stormwater, sediment and oily water management will be managed on site using the following methods:

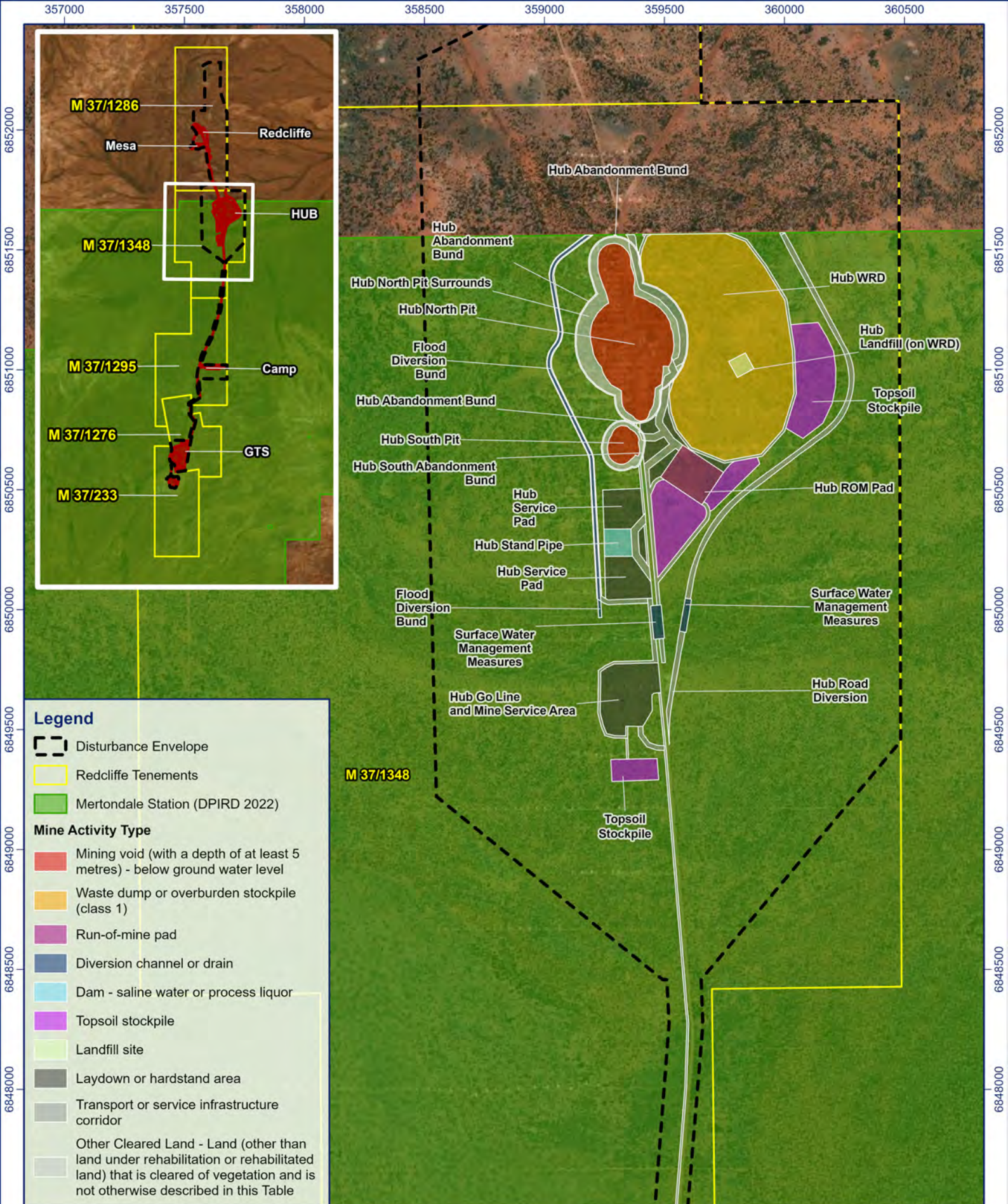
- Mine Service/Workshops Areas – Rainfall runoff from roads, building roofs, laydown yards etc. will be captured in open drains that report to Water Management/Sedimentation Ponds where water should be temporarily stored prior to reuse. Rainfall runoff and washdown water that are likely to be impacted by hydrocarbons will be directed to an Oily Water Separator prior to collecting in the Water Management/Sedimentation Ponds and then being re-used for dust suppression. Waste product collected from the oily water separator will be removed from site by licensed contractors.
- Hydrocarbons/Hazardous Materials Storage Areas – All chemical, fuel, oil and other hazardous material storage areas will either be stored in double lined tanks or enclosed within secondary containment bunds that meet the requirements of AS1940. All hazardous materials handling areas will also be within secondary containment bunds. Water collected within the bunds will be assessed and, if suitable, discharged to the proposed Water Management/Sedimentation Pond. If water collected within the bund is found to be impacted by hydrocarbons, then this will be directed to an Oily Water Separator prior to collection in the Water Management/Sedimentation Ponds and then re-used for dust suppression.
- Disturbed Areas – Where possible rainfall runoff from general mining disturbed areas will be directed to Water Management/Sedimentation Ponds. For runoff within the proposed pits, in-pit sumps will be used to settle out sediment prior to pumping to surface and then re-used in dust suppression.
- Undisturbed Areas – Rainfall runoff from undisturbed areas within the project boundaries will be diverted around proposed project facilities into existing natural watercourses or drainage lines.

## 2.6 Supporting Infrastructure

The following supporting infrastructure will be within the Project area:

- Access Road and Dewatering Pipeline Corridor – An access road and dewatering pipeline corridor will be constructed between the two mining areas and to the existing Redcliffe and Mesa open pits. The access road and pipeline corridor are approximately 30 m wide between Mesa/Redcliffe and Hub, narrowing to approximately 20 m wide north of Hub. The Nambi-Leonora Road upgrade and diversion around the Hub mining area is approximately 16 m wide. The dewatering pipeline corridors will be approximately 2 m to 5 m wide.
- Topsoil Stockpiles – It is expected that topsoil will be removed from the Hub and GTS mining areas, and the workshop, administration buildings and Accommodation Camp areas at Hub. They will be located adjacent to areas of significant clearing within each mine area. Topsoil stockpiles will be no greater than 2 m in height.
- Laydown Area – A laydown area will be located at Hub mine site, west of the dewatering pipeline and south of the Hub South Pit.
- Power Supply – Power for the RGP power will be supplied onsite via portable gensets located at each mining area, and the accommodation camp.
- Fuel Facility – Mobile plant will be refuelled as required via portable self-bunded diesel fuel facilities at each mining area, and the accommodation camp site. Spill kits will be located at the fuel facility.
- Bioremediation Pad – Bioremediation pads will be utilised for treatment of hydrocarbon contaminated soil that may occur during the Life of Mine (LOM). A bioremediation pad will be constructed at the Redcliffe WRD and will have earthen bunds to control potential runoff.
- Landfill – Solid waste that cannot be reused or recycled will be placed in new Class II onsite landfills constructed on the Redcliffe and Hub waste rock dumps. Class II landfills refer to unlined landfill designed to accept putrescible and inert wastes for burial (DWER, 2019). New landfills will be constructed to accept Type I waste and Type II waste. The landfills will accept 2,500 m<sup>3</sup> or 750 tonnes per year and will have trenches of 55 m in length, 2.6 m in depth and 26 m in width and will be fenced to prevent windblown waste leaving the landfill and fauna entering the area. It is expected that the overall RGP operations will produce about 750 tonnes of waste per annum including 600 tonnes per annum of inert waste and 150 tonnes per annum of putrescible waste. Tyres will be buried within Hub and GTS waste rock dumps, with approximately 150 tonnes of tyre waste to be buried within these dumps. Tyres will be covered in batches separated from each other by at least 100 mm of waste rock and with a final waste rock cover of not less than 500 mm of waste rock. Tyres will not be placed within 10 m of the edges of the waste rock stockpiles.





Scale: 1:20,000  
 Projection: GDA2020 MGA Zone 51  
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 Aerial: Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

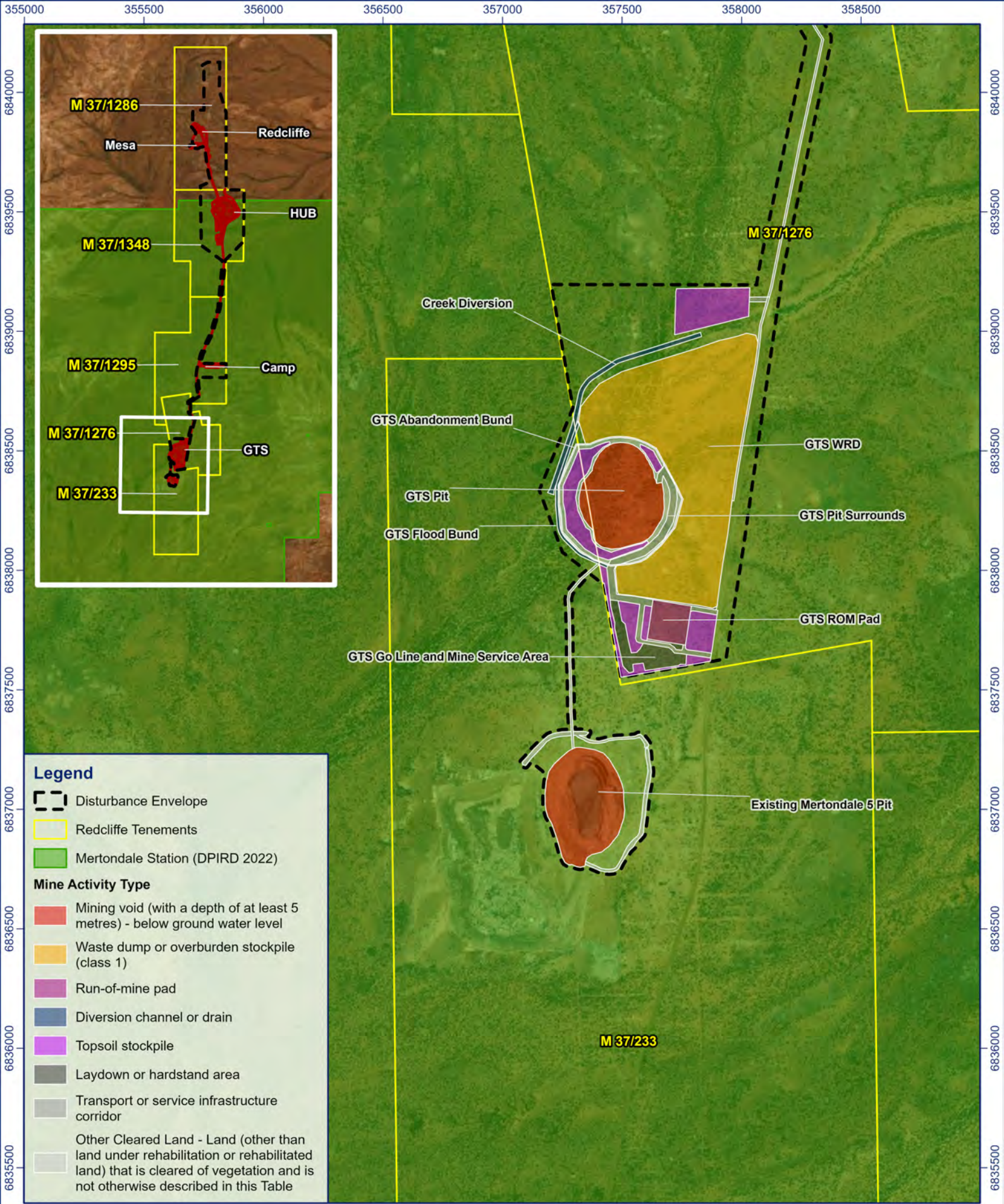
PROJECT		CLIENT
<b>Dacian - Redcliffe - ESG - EPBC Assessment</b>		
<b>Site Layout- Hub</b>		





- Water Supply – Project water will be supplied via the mine dewatering bore at Hub. There will be two general bore water storage tanks, one at the Hub Mine Services Area (MSA), and one at the accommodation camp. The water storage tank at the Hub MSA will supply the non-potable project water. A Reverse Osmosis (RO) Plant at the accommodation camp will treat the mine water from the bore water storage tank in the camp to provide the potable water supply for the project. The brine wastewater from the RO plant will be disposed into the mine dewatering discharge into the Mesa/Redcliffe Pits.
- Workshop and Administration Buildings – Transportable modular administration offices will be constructed at the Hub MSA. Portable ablution facilities will be located at Hub and GTS. Wastewater from these facilities will report to in-ground septic tanks and leach drain systems. A workshop will also be located within the Hub MSA area. Maintenance of mobile equipment will occur at the workshop within bunded areas. A mobile plant washdown pad and an associated oil water separator will also be constructed at the Hub MSA. The treated oily wastewater will be disposed into the mine dewatering discharge into the Mesa/Redcliffe Pits (along with the brine wastewater). However, this wash down and RO brine water can also be used for dust suppression if it is blended (diluted) sufficiently with water from the Hub dewatering to achieve a water quality of less than 15 mg/L concentration of hydrocarbons. Blending will potentially occur within a Turkey's nest or dam. Spill kits will be located at all hydrocarbon and chemical storages and will be carried on workshop service truck to ensure immediate clean-up of any spills of contaminants such as oil or fuel.
- Workforce and Accommodation – A workforce of up to 100 employees will be required to meet operational demands of the RGP Project. The workforce and site visitors will be accommodated in a single accommodation camp. Personnel may be sourced locally/regionally where suitably skilled persons are available.
- Wastewater Treatment Plant – Will be installed at the accommodation camp to process wastewater streams from ablutions and other facilities. The proposed Wastewater Treatment Plant will be able to treat 45 kL per day to cater for up to a 100-person camp. The treatment process is standard wastewater treatment processes and comprises sequential batch reacting configuration which involves coagulation and sedimentation, anoxic and aerobic degradation/digestion. Soil assessment confirmed the chosen site's suitability for the wastewater spray field. Surface soil samples were collected for laboratory analysis to assess their nutrient assimilation capacity. The analysis classified these soils as having a high phosphate adsorption capacity. On this basis, the eutrophication risk is classified as Category D according to DoW guidelines (DoW, 2008).





Scale: 1:20,000  
 Projection: GDA2020 MGA Zone 51  
 Created/Reviewed By: AW/CR  
 Aerial: Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

0 100 200 400 600 m

PROJECT		CLIENT
<b>Dacian - Redcliffe - ESG - EPBC Assessment</b>		
<b>Site Layout- GTS</b>		
Figure 2-3	ADV-AU-00393	



## 3. Legislative Framework

In addition to the Project being considered under the EPBC Act, the Project has been assessed under Western Australian legislation.

Other key environmental approvals and statutory requirements relevant to the Project are outlined in **Table 3-1**. The approvals, licences and permits described are in various stages of development, however, will be obtained prior to commencing the proposed action.

**Table 3-1 Environmental Legislative Framework**

Legislation	Environmental Factor	Relevant Approval/Requirement and Status of Relevant Approval
<b>Commonwealth</b>		
<i>Native Title Act 1993</i> (Cth) Provides a national system for the recognition and protection of native title and for its co-existence with the national land management system.	Recognition of pre-existing Indigenous rights and interests.	The Darlot Native Title Claim Group and the Harris Family claimant group are the Traditional Owners (TO's) for the project area.
<i>National Greenhouse Gas and Energy Reporting Act 2007</i> (Cth) (NGER Act) Provides a national framework for reporting of greenhouse gas emissions and energy production and consumption.	Greenhouse gas emissions.	Dacian Gold Ltd is required to report emissions under the National Greenhouse and Energy Reporting Scheme (NGERS). Dacian Gold Ltd will report greenhouse gas emissions via NGERS throughout mining operations and closure activities until greenhouse gas emissions as a result of their operations are below the specified reporting thresholds.
<b>Western Australia</b>		
<i>Environmental Protection Act 1986</i> (EP Act) (WA) Part IV: Projects with the potential to have significant impacts on the environment require referral.	Key environmental factors assessed via Environmental Protection Authority (EPA) assessment under Part IV: <ul style="list-style-type: none"> <li>▪ Flora and Vegetation.</li> <li>▪ Landforms.</li> <li>▪ Subterranean Fauna.</li> <li>▪ Terrestrial Environmental Quality.</li> <li>▪ Terrestrial Fauna.</li> <li>▪ Terrestrial Environmental Quality.</li> <li>▪ Inland Waters.</li> <li>▪ Hydrogeology</li> <li>▪ Air Quality.</li> <li>▪ Greenhouse Gas Emissions.</li> <li>▪ Social Surroundings.</li> <li>▪ Human Health.</li> <li>▪ Benthic Communities and Habitats.</li> <li>▪ Coastal Processes.</li> <li>▪ Marine Environmental Quality.</li> <li>▪ Marine Fauna.</li> </ul>	It should be noted that the Project did not trigger referral or assessment under Part IV of the EP Act, which is Western Australia's primary mechanism for assessment of proposals that potentially have significant impacts on the environment.

Legislation	Environmental Factor	Relevant Approval/Requirement and Status of Relevant Approval
EP Act (WA) Part V (Section 51): Clearing of Native Vegetation Part V of the EP Act specifies that clearing of native vegetation in Western Australia needs a permit.	Assessment against the ten clearing principles (biological diversity, significant fauna habitat, rare flora, threatened ecological community, remnant vegetation, association with watercourse or wetland, land degradation, impact on a conservation area, impact surface or underground water quality, cause or exacerbate flooding).	A Native Vegetation Clearing Permit (NVCP) (9608/1) comprising an assessment against the ten clearing principles, was approved on 11 June 2022. Native vegetation clearing processes under Part V Division 2 of the EP Act have been accredited under the Commonwealth's EPBC Act.
EP Act (WA) Part V (Section 52): Establishes a range of statutory instruments to permit the assessment and management of environmental outcomes arising from emissions from industry by Department of Water and Environmental Regulation (DWER).	A Works Approval authorises work to be undertaken on Prescribed Premises that is likely to cause, increase, alter or result in a discharge of waste, emissions or noise, odour or electromagnetic radiation to the environment.	A Works Approval Application was prepared and submitted, and a Draft Works Approval (W6650/2022/1) has been issued by the Department of Water and Environmental Regulation (DWER).
<i>Mining Act 1978</i> (Mining Act) (WA) Projects involving mining, processing and associated compliance with conditions of approved mining tenements. A Mining Proposal and Mine Closure Plan must be completed under this environmental legislation that factors relevant approval/requirement and status of relevant approval activities that require regulation under the Mining Act (WA).	Compliance with conditions of approved mining tenements.	A Mining Proposal and Mine closure Plan are required prior to the construction and operation of the Project commencing. The Mining Proposal and Mine Closure plan (Registration ID 102646) were approved on 13 June 2022.
<i>Aboriginal Heritage Act 1972</i> (AH Act) (WA) The AH Act provides protection to places and objects important to Aboriginal people of Western Australia.	Protection of Aboriginal heritage sites and matters.	No Aboriginal heritage sites occur within the Project Area ( <b>Section 6.7.2</b> ). The Darlot Native Title Claim Group and the Harris Family claimant group are the Traditional Owners (TO's) for the project area.
<i>Aboriginal Cultural Heritage Act 2021</i> (ACH Act) (WA) The ACH Act provides recognition, protection, conservation, and preservation of Aboriginal cultural heritage in Western Australia.	Protection of Aboriginal heritage sites and matters.	This approval is planned to replace the AH Act and uses a tiered approvals approach. No Aboriginal heritage sites occur within the Project Area. The Darlot Native Title Claim Group and the Harris Family claimant group are the Traditional Owners (TO's) for the project area.
<i>Rights in Water and Irrigation Act 1914</i> (WA) (RIWI Act) The RIWI Act provides the Governor of WA with the power to proclaim or prescribe a groundwater or surface water area through regulation.	Allows for the comprehensive management of water uses in a proclaimed or prescribed area.	The RGP holds two Groundwater Licences (GWL): 172143 – Expires 6th November 2022 (a renewal has been submitted), and 207510 – Approved 16th June 2022 (expires 15th June 2032).

Legislation	Environmental Factor	Relevant Approval/Requirement and Status of Relevant Approval
<p><i>Contaminated Sites Act 2003 (WA)</i> Requires that known or suspected contamination is reported to DWER where the substance is present at above background concentrations in the land or waters of a site that presents or potentially presents a risk of harm to human health</p>	<p>Contaminated waters.</p>	<p>A search of the DWER Contaminated Sites Database was undertaken on 1 December 2021 for any contaminated sites within the RGP area. No contaminated sites are recorded within the project area as of the above date.</p>



## 4. Stakeholder Engagement

Stakeholder engagement is an important process for the Project and is intended to ensure that key stakeholders impacted by the proposed mining activities have been consulted, are informed and have an opportunity to provide feedback. Engaging with stakeholders builds awareness and understanding of their needs and objectives, while managing expectations of how the Project will operate.

### 4.1 Principles of Stakeholder Engagement

Redcliffe are committed to engaging with the community and aims to uphold the following principles of stakeholder engagement (MCMPR, 2005):

- **Communication:** Communication must be open, accessible, clearly defined, two-way and appropriate.
- **Transparency:** The process and outcomes of community and stakeholder engagement should, wherever possible, be made open and transparent, agreed upon and documented.
- **Collaboration:** A cooperative and collaborative approach to seek mutually beneficial outcomes is considered key to effective engagement.
- **Inclusiveness:** Inclusiveness involves identifying and involving communities and stakeholders early and throughout the process, in an appropriate manner.
- **Integrity:** Community and stakeholder engagement should establish and foster mutual trust and respect.

### 4.2 Stakeholder Engagement

Dacian has engaged with relevant stakeholders to ensure they are kept informed and have the opportunity to provide input into aspects of the Project. The proponent also aims to minimise the potential impact of the RGP on both workers and the local community. The proponent has engaged with various stakeholder groups, including:

- The Chief Executive Officer's (CEO) of the Shires of Laverton and Leonora.
- The Australian Government Department of Defence, being the Mertondale Pastoral Lease holder.
- Minara Resources, the Nambi Pastoral Lease holder.
- The Tjupan People – the Harris Family.
- The Darlot Native Title Group.
- Kin Mining, holder of neighbouring tenement M37/233, and the location of Mertondale 5 Pit.
- Western Australian Department of Water and Environmental Regulation (DWER).
- Western Australian Department of Mines, Industry Regulation and Safety (DMIRS).

The existing targeted stakeholder engagement strategy for the RGP is provided in **Table 4-1**.

**Table 4-1 RGP Stakeholder Engagement for the Project**

Stakeholder Group	Consultation Timing	Consultation Methods	Topics Addressed
<b>State Government</b>			
DMIRS	As required	<ul style="list-style-type: none"> <li>▪ Pre-approval meetings.</li> <li>▪ Review of Mine Closure Plan (timing as agreed with DMIRS).</li> <li>▪ Annual Environmental Report (AER).</li> <li>▪ Mining Rehabilitation Fund (MRF).</li> <li>▪ Site inspections.</li> <li>▪ Incident reporting.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Materials characterisation.</li> <li>▪ Decommissioning and closure aspects.</li> <li>▪ Safety.</li> <li>▪ Rehabilitation progress.</li> <li>▪ Landform stability.</li> <li>▪ Final land use.</li> <li>▪ Consultation strategy.</li> </ul>
Other Departments e.g. DWER, Department of Biodiversity, Conservation and Attractions (DBCA), Department of Planning, Lands and Heritage (DPLH)	As required	<ul style="list-style-type: none"> <li>▪ Pre-approval meetings.</li> <li>▪ AER and Annual Audit Compliance Report (AACR).</li> <li>▪ Site inspections.</li> <li>▪ Incident reporting.</li> <li>▪ Annual groundwater reviews.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Pollution control.</li> <li>▪ Contaminated sites.</li> <li>▪ Impacts on beneficial users of groundwater.</li> <li>▪ Recovery of aquifers.</li> <li>▪ Post closure surface water management.</li> <li>▪ Long-term protection of heritage sites.</li> </ul>
<b>Local Council</b>			
Shires of Laverton and Leonora	As required	<ul style="list-style-type: none"> <li>▪ Shire CEO's meetings.</li> <li>▪ Shire council meetings.</li> <li>▪ Correspondence.</li> </ul>	<ul style="list-style-type: none"> <li>▪ End land use.</li> <li>▪ Haulage route from RGP to Mt Morgans Processing Plant.</li> </ul>
<b>Local Community/Land Users</b>			
Pastoral Lease leaseholders: Department of Defence, the Mertondale Pastoral Lease leaseholder. Minara Resources, the Nambi Pastoral Lease leaseholder.	Annually	<ul style="list-style-type: none"> <li>▪ Annual meeting with Pastoral Lease leaseholders or as required to provide an update on operations.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Feral animal and weed management.</li> <li>▪ Restriction of livestock access in Project areas.</li> <li>▪ Final land use and rehabilitation.</li> </ul>
Aboriginal Peoples / Parties/ Representatives: Tjupan People – Harris Family. Darlot Native Title Group.	As required	<ul style="list-style-type: none"> <li>▪ Meetings.</li> <li>▪ Correspondence.</li> <li>▪ Surveys.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Protection of heritage sites.</li> <li>▪ Native title.</li> <li>▪ Future mining development.</li> <li>▪ Final land use and rehabilitation.</li> </ul>
Kin Mining, holder of tenement M 37/233 the location of Mertondale 5 Pit.	As required	<ul style="list-style-type: none"> <li>▪ Meetings.</li> <li>▪ Correspondence.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Management of GTS pit dewatering discharge into of Mertondale 5 Pit.</li> <li>▪ Management of portions of GTS pit and flood/abandonment bund on M 37/233.</li> <li>▪ Liaison on regulatory reporting for M 37/233.</li> </ul>

## 5. Matters of National Environmental Significance

To determine whether any Matters of National Environmental Significance (MNES) that may be impacted by the Project, a search of the EPBC Act Protected Matters Database was undertaken (**Appendix B**). Impacts to all MNES have been considered using *Matters of National Environmental Significance Significant impact guidelines 1.1* (Commonwealth of Australia 2013). Impacts to Commonwealth Land have been considered using *Actions on, or impacting upon, Commonwealth land Significant impact guidelines 1.2* (Commonwealth of Australia 2013). The results are discussed in **Table 5-1**.

**Table 5-1 Matters of National Environmental Significance**

EPBC Act Section	Controlling Provision	Likelihood to impact the Matter of National Environmental Significance?
S12	World Heritage	None. No World Heritage areas are located in or near the Project area.
S15B	National Heritage	None. No National Heritage sites are located in or near the Project area.
S16	Ramsar Wetland	None. No RAMSAR wetlands are located in the Project area. The nearest wetland is located approximately 90km from the Project.
S18	Threatened Species and Ecological Communities	None. A detailed flora and vegetation survey of the area was completed in July 2021 in compliance with the WA Environmental Protection Authority (EPA) Technical Guidance for flora and vegetation surveys (EPA 2016). Forty-four quadrats were installed and surveyed, plus opportunistic observations (Botanica, 2021). The survey identified no Threatened Ecological Communities (TECs) listed under the EPBC Act.  Yes. Targeted fauna and habitat surveys were completed in November and December 2021. It was found that Malleefowl ( <i>Leipoa ocellata</i> ) use the study area intermittently for dispersal and foraging, but the evidence does not indicate resident or breeding populations. A total of 12.3 ha of potential Malleefowl habitat will be cleared, of which 100% will be rehabilitated to native vegetation. A significant impact assessment was completed for Malleefowl ( <b>Section 7.1.3</b> ) that concluded that the RGP will not significantly impact the threatened species.
S20	Migratory Species	Yes. A likelihood of occurrence assessment found that six Migratory bird species may occur as occasional visitors. Some Migratory species may occasionally occur in the study area as part of much wider ranges, however it does not represent important or restricted habitat values for the species (Refer to <b>Section 6.5.6.</b> )
S21	Nuclear	None. The Project does not involve mining or processing of uranium ore or the storage of radioactive wastes.
S23	Commonwealth Marine Area	None. The Project is located on land and will not impact Commonwealth Marine Areas.
S24B	Great Barrier Reef	None.

EPBC Act Section	Controlling Provision	Likelihood to impact the Matter of National Environmental Significance?
		The Project is located in Western Australia, and unlikely to impact the Great Barrier Reef.
S24D	Water Resource in relation to a large coal mining development or coal seam gas	None. The Project is not a coal mining development.
S26	Commonwealth Land	Yes, refer to <b>section 5.1</b> for further discussion.
S27B	Commonwealth heritage place overseas	None. The project is located in Australia
S28	Commonwealth or Commonwealth Agency	None.

## 5.1 Commonwealth Land

The project is likely to impact Commonwealth land. Approximately 240 ha of disturbance or 70% of the RGP is located on Commonwealth land. This area is likely to be impacted through mining activities, however the impacts are not considered significant. No existing environmental values or Matters of National Environmental Significance are expected to be significantly impacted.

All relevant state approvals have been completed. The RGP did not trigger referral for assessment under the EP Act, which is Western Australia's primary mechanism for assessment of proposals which potentially have significant impacts on the environment. A NVCP (9608/1) that comprises assessment against ten clearing principles, was approved in June 2022. Native vegetation clearing processes under Part V Division 2 of the EP Act have been accredited under the Commonwealth's EPBC Act.

## 6. Existing Environment

The following section aims to identify the environmental context of the RGP in accordance with step 1 of the referral process outlined in *Actions on, or impacting upon, Commonwealth land Significant impact guidelines 1.2* (Commonwealth of Australia 2013).

These sections are presented as summaries of information based on environmental assessments completed for the RGP. The complete environmental assessment reports are attached as appendices to this document.

### 6.1 Landscape and Landforms

The project is located in the east of the Murchison bioregion of Western Australia (DoEE, 2012). The Eastern Murchison area is typically large areas of red desert sandplains, red brown soils and breakaway complexes. Undulating sandplains and granite outcrops with northerly trending ridges are controlled by the strike of greenstone belts and broad valleys containing playa lakes. The topography gradually rises in elevation towards the north (MBS, 2021).

Geologically, the RGP is situated over a large portion of the Mertondale Shear Zone (MSZ). The MSZ trends north to south between the Keith-Kilkenny and Celia tectonic zones. The MSZ is the major source of gold within the RGP area. The MSZ is bound by strongly altered and mineralised fault systems with the Mertondale fault to the east and the Great Western fault system to the west. An Archaean felsic volcanoclastic and sedimentary sequence is located to the west of the shear zone and Archaean predominantly mafic volcanics comprising basalt and dolerite are located to the east. The MSZ includes intrusions of felsic porphyries and Proterozoic dolerite dykes (MBS, 2021).

Gold mineralisation is associated with the Archaean greenstones that generally occur in a north to south orientation in the Murchison and Eastern Goldfields (MBS, 2021).

The local and Project area geology is illustrated in **Figure 6-1** and the descriptions of the Hub and GTS deposits are provided in the following sub sections.

The following landforms were identified in the RGP and were also common throughout the larger region:

- Irregular low ironstone hills with stony lower slopes supporting mulga shrublands.
- Extensive sandplains supporting spinifex hummock grasslands.
- Extensive plains with deep sandy or loamy soils, supporting mulga and wanderrie grasses.
- Hardpan plains with ironstone gravel mantles, supporting mulga shrublands.
- Hardpan plains with occasional sandy banks, supporting mulga tall shrublands and wanderrie grasses.
- Undulating stony and gravelly plains and low rises, supporting mulga shrublands.
- Granite domes, hills and tors with gritty-surfaced plains supporting mulga and granite wattle shrublands.
- Granite breakaways and extensive granitic plains, with mulga shrublands and minor halophytic shrublands.

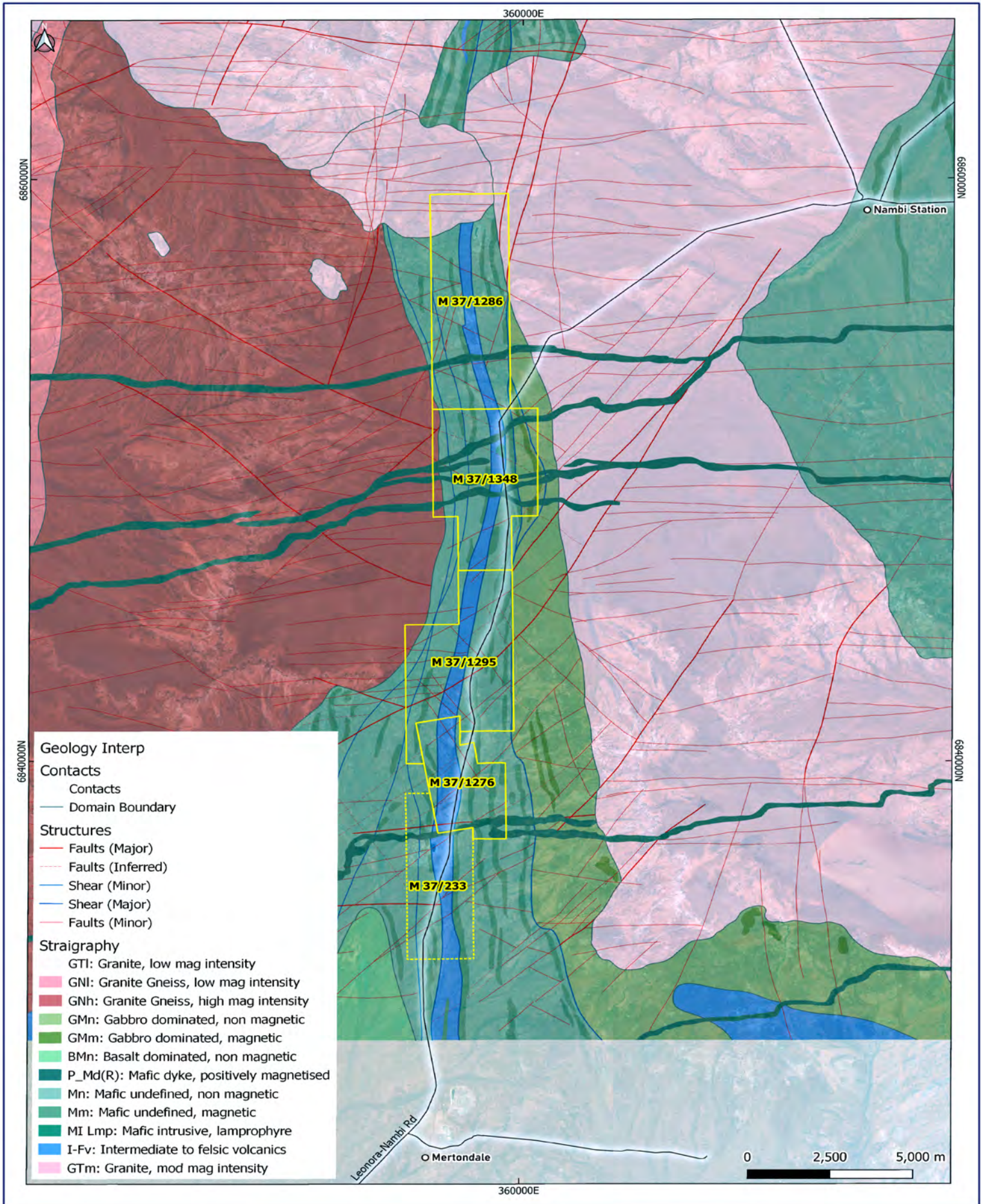
In addition, the following landmarks were identified within the project area:



- Dillon Creek runs through tenement M37/1348, whilst creeks associated with this drainage system run through M37/1286.
- Mt Redcliffe (553 mAHD) is within tenement M37/1286.

There are no known scientific or evolutionary values associated with the landforms within the project area.

- The closest geoheritage site to the project area, the Lake Teague (Shoemaker Impact Structure) – Lies approximately 289 km to the north of the RGP.
- The closest nature reserves to the RGP are the Wanjarri, De La Poer Range and Yeo Lake reserves which are all between 130-246 km from the project boundaries.





Scale: 1:168,300 Projection: GDA2020 Created/Reviewed By: AW/CR Aerial: Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community	PROJECT		CLIENT
	<b>Dacian - Redcliffe - ESG - EPBC Assessment</b>		
	<b>Local Geology</b>		
<b>RPMGLOBAL</b>	Figure 6-1	ADV-AU-00393	October 2022



## 6.2 Soil

The dominant soil types within the project area are red loamy earths, red shallow loams and red-brown hardpan shallow loams (**Figure 6-2**). Salinity of surface soils are generally non-saline, however, subsoils, particularly at GTS contain pockets of extremely saline material. The pH at GTS is alkaline to neutral but surface soils in the Hub area are highly acidic. However, given the subsoils are more alkaline, material blending during excavation and stockpiling is proposed to ensure its ability to support vegetative growth during rehabilitation. Sodicity and aluminium/manganese toxicity are rated as low in all areas (MBS 2021).

### 6.2.1 Physical Properties

The distribution of Redcliffe soil types is shown in **Figure 6-2** and the key physical properties are described below:

- The dominant soil types within the project area were red loamy earths (DAFWA Soil Group 544), red shallow loams (DAFWA Soil Group 522) and red-brown hardpan shallow loams (DAFWA Soil Group 523).
- Red loamy earths were the dominant soils in the Hub development area, whilst red-brown hardpan shallow loams were most common in the GTS area.
- The red loamy earths from the Hub development area contained lower gravel contents (14% - 45%), higher fines contents (23% clay, 13% silt in the <2 mm fraction) and were spontaneously dispersive (Emerson Class 1-2).
- The red-brown hardpan shallow loams from the GTS area contained similar gravel contents (14% - 47%) to soils in the Hub area. These soils contained limited fines contents (13% clay, 11% silt in the <2 mm fraction) and were generally considered to be spontaneously dispersive (Emerson Class 1-2).
- Soils from the Hub development area, appear the most prone to erosion on sloping surfaces due to the combination of relatively abundant dispersive clay/silt materials and relatively low gravel contents.

### 6.2.2 Geochemistry

The red loamy earths from the Hub area were:

- Generally acidic (pH 4.3 – 7.4), with samples becoming more alkaline with depth.
- Non-saline (<11 mS/m).
- Low to moderately sodicity (Exchangeable Sodium Percentage (ESP) 2 – 10%) and also contained low to moderate exchangeable cation concentrations.
- Unlikely to express aluminium or manganese toxicity due to high base saturation percentages of >87%.
- Very low concentrations of extractable micronutrients such as boron, cobalt, molybdenum, or nickel plus soils contained low organic carbon and total nitrogen concentrations.
- Unlikely to contain elevated concentrations of metals and/or metalloids considered to be environmental contaminants.

The red-brown hardpan shallow loams from the GTS area were:

- Slightly acidic to slightly alkaline (pH 5.5 - 8.7) with soils becoming more alkaline with depth and likely underlain by calcrete.
- Extremely saline in subsoils (<420 mS/m) and non-saline in surface soils (<23 mS/m).
- Unlikely to be either sodic (ESP <9%) or express aluminium/manganese toxicity (base saturation >99%) and contained moderate to high exchangeable cation concentrations.
- Very low concentrations of extractable micronutrients such as boron, cobalt, molybdenum, and nickel plus soils contained low organic carbon and total nitrogen concentrations.
- Unlikely to contain elevated concentrations of metals and/or metalloids considered to be environmental contaminants.

Overall, the majority of surface soils assessed here will be largely suitable for rehabilitative purposes. Major findings in the context of soil chemistry include:

- The pH at GTS being of no concern. Surface soils (0-10 cm) in the Hub area are highly acidic, however, given the subsoils (>10 cm) are more alkaline, the blending of material during excavation and stockpiling should alleviate any concerns regarding its ability to support vegetative growth.
- Surface soils (0-10 cm) are generally non-saline, however, subsoils, particularly in the GTS areas contain pockets of extremely saline material which may be hostile to vegetation.
- The risks of sodicity and aluminium/manganese toxicity are rated as low in all areas.
- Most surface soils contain low concentrations of extractable micronutrients such as boron, cobalt, molybdenum, and nickel plus contain low organic carbon and total nitrogen concentrations. It is uncertain whether these concentrations indicate deficiencies that may limit the potential for vegetation to recolonise and thus rehabilitate the landscape, although the use of fertilisers should eliminate any nutrient deficiencies. Excessive fertiliser use may, however, encourage weed growth and also lead to plant densities that are not sustainable during periods of drought.
- No soils contained total or bioavailable concentrations of metals and/or metalloids that are considered possible environmental contaminants.

In addition, soils from the area designated to be the camp area (within the Sherwood land system) contained Phosphorus Retention Index (PRI) values between 39-54 mL/g. PRI is a measure of the ability of soils to adsorb soluble phosphate on surfaces, which in a practical sense details the extent to which soluble phosphate is likely to move within soils. This measurement is often taken for soils in areas designated to become accommodation camps as a result of wastewater disposal requirements. The PRI values for the camp soils are considered high which supports the placement of the camp within this area. This classifies the area for the proposed wastewater irrigation field as Category D according to DOW guidelines (DOW, 2008).

### 6.2.3 Summary of Material Properties and Harvestable Volumes

A summary of key soil characteristics is provided in **Table 6-1**. This includes typical depths of each soil type as well as the expected volumes of material that can be harvested from within the proposed disturbance footprint for use in construction or closure and rehabilitation (MBS 2021).

**Table 6-1 Summary of Key Soil Properties and Harvestable Volumes**


Characteristic	Hub		GTS	
	Surface	Subsoil	Surface	Subsoil
Dominant Type	Red Loamy Earths		Red-Brown Hardpan Shallow Loams	
Texture	Sand clay loams/loams	Sandy clay loams/sandy loams	Sandy clay loams/sandy loams	Sandy Loams
Maximum Harvestable Depth (cm)	10	50	10	50
Physical Status	High erosion risk - abundant 'fines', high dispersivity, low gravel.		Moderate erosion risk - low 'fines', high dispersivity, low gravel.	
pH Status	Strongly acidic	Acidic	Circum neutral	Alkaline
Salinity Status	Non-saline	Non-saline	Non-saline	High salinity
Suitable for use in:	Vegetative rehabilitation Flat surfaces	Vegetative rehabilitation Flat surfaces	Vegetative rehabilitation Flat surfaces	Laterite/hardpan source
Unsuitable for use in:	Sloping surfaces - erosion prone. Areas with acid-susceptible vegetation.		Sloping surfaces - erosion prone	Sloping surfaces - erosion prone Vegetative rehabilitation - Extreme salinity




Characteristic	Hub		GTS	
	Surface	Subsoil	Surface	Subsoil
Estimated Harvestable Volume (m <sup>3</sup> )	98,400	393,600	42,700	170,800



Scale: 1:150,000  
 Projection: GDA2020  
 Created/Reviewed By: AW/CR  
 Aerial: Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



**RPMGLOBAL**

PROJECT		CLIENT
<b>Dacian - Redcliffe - ESG - EPBC Assessment</b>		
<b>Soil Landscape System</b>		
Figure 6-2	ADV-AU-00393	

## 6.3 Materials Characterisation

Geotechnical assessments have been undertaken to guide design criteria for the open pits and WRDs. The current proposed Hub and GTS WRD slopes are of modest height and profile, and as such are assessed to be sufficiently shallow to preclude development of significant rotational sliding instability over the very long term. Stockpiled vegetation and topsoil will be deployed onto recontoured surfaces at the completion of operations to mitigate any long-term erosion issues. The Project does not require substantial alteration of natural landscape features.

A Soils and Landform Assessment did not identify any contaminated or Acid Sulphate Soils (MBS 2021). The waste volumes and materials classification determined from this assessment are identified in **Table 6-2**.

All oxide and transitional waste rock, accounting for approximately 97% of Hub open pit waste rock, is classified as Non-Acid Forming (NAF). As the material is overall considered NAF and unlikely to be subjected to acidic conditions, it is unlikely aluminium and iron will leach from the material at concentrations exceeding livestock drinking water guideline values.

Shale (logged as black shale or graphitic shale) within the GTS deposit has either existing/residual or potential for acid generation and metals release, regardless of degree of weathering. While indicated volumes of shale (Potentially Acid Forming) (PAF) are low and approximately 1.3% within the GTS deposit, management of PAF shales (where identified in any weathering zone) is indicated. The remaining 98.7% of waste rock is classified as NAF including fresh and transitional felsic schist. Ore excavated from the GTS pit will be stored on the ROM pad for a maximum of 30 days. The short-term storage is reliant on availability of haul trucks transporting the material to the Mt Morgans Processing Plant. It is not expected Acid Mine Drainage (AMD) will occur during this short-term storage of shale material mixed with the ore excavated from the GTS pit.

**Table 6-2 RGP Waste Volumes and Materials Classification**

Open Pit	Waste Type	Volume (BCM)	% of Total	Number of Samples	% of Samples	ARD Classification	Erosion Potential
Hub	Oxide	2,957,610	71	9	50	NAF	High
	Laterite	730,944	17			NAF	Low
	Transitional	356,734	9	6	33	NAF	Low
	Fresh (Dolerite)	83,647	2	3	17	NAF	Low
	Fresh (Sedimentary Schist)	61,332	1			Uncertain	Low
	<b>Hub Total</b>	<b>4,160,859</b>	<b>100</b>	<b>18</b>	<b>100</b>		
GTS	Oxide	4,238,438	91	9	53	NAF (Including some Shale as PAF)	High
	Transitional	335,250	7	7	41	NAF (Including some Shale as PAF)	Low
	Fresh (Felsic)	79,375	1.5	1	6	NAF	Low
	Fresh (Shale)	11,438	0.5	0	0	PAF	Low
	<b>GTS Total</b>	<b>4,724,651</b>	<b>100</b>	<b>17</b>	<b>100</b>		

## 6.4 Flora and Vegetation Communities

Botanica Consulting Pty Ltd (Botanica) completed a detailed flora and vegetation survey of the area in July 2021 (Botanica, 2021). The assessment was conducted to comply with the WA Environmental Protection Authority (EPA) Technical Guidance for flora and vegetation surveys (EPA 2016). Forty-four quadrats were installed and surveyed, and opportunistic observations were also undertaken.



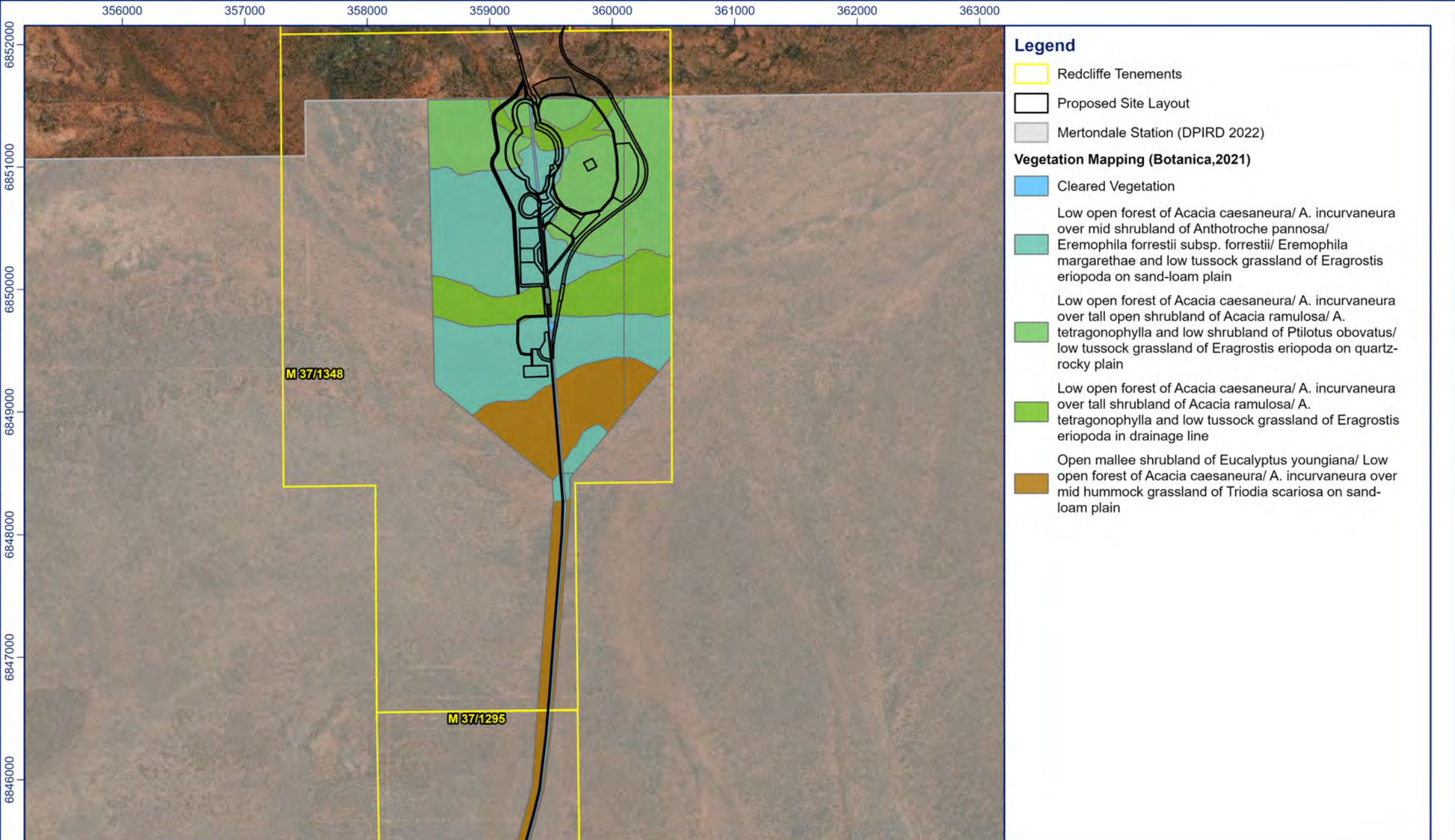
Desktop searches conducted with a 40 km buffer of the survey area identified:

- 90 vascular flora species as occurring with 40 km, representing 50 genera from 25 families. The most diverse families were *Scrophulariaceae* (16 species), *Fabaceae* (13 species) and *Asteraceae* (10 species).
- Eight introduced flora (weed) species as potentially occurring in the vicinity of the survey area, representing six families. One species, *Cylindropuntia* spp. (Prickly Pear) is listed under the *Biosecurity and Agriculture Management* (BAM) Act 2007 and as a Weeds of National Significance (WONS). In addition, *Tamarix aphylla* (Athel Tamarisk) is also listed as a WONS.
- The Protected Matters search did not identify any Threatened Ecological Communities as potentially occurring within the survey area. Analysis of the Priority Ecological Communities within the Midwest region did not identify any significant communities as likely or possibly occurring within the survey area.

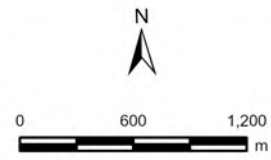
The detailed flora and vegetation field survey identified the following within the survey area:

- 122 vascular flora taxa. These taxa represented 62 genera across 31 families, with the most diverse families being *Fabaceae* (19 species), *Scrophulariaceae* (17 species) and *Asteraceae* (14 species).
- Eight broad-scale vegetation communities were identified., Seven of the communities were considered to be under the broad floristic formation 'Acacia forests and Woodlands', and one community was considered a 'Mallee Woodlands and Shrublands'.
- Native vegetation was rated as 'good to 'very good', as defined by Keighery (1994).
- No Threatened flora species listed under the EPBC Act were found to occur.
- No Threatened Ecological Communities (TECs) listed under the EPBC Act were found to occur.
- No declared weed species as regulated under the) (BAM Act).
- No Weeds of National Significance (WoNS).

The full vegetation community type descriptions and vegetation mapping can be seen in the attached Flora and Vegetation Survey of the Project (**Appendix C**) and **Figure 6-3** and **Figure 6-4**.

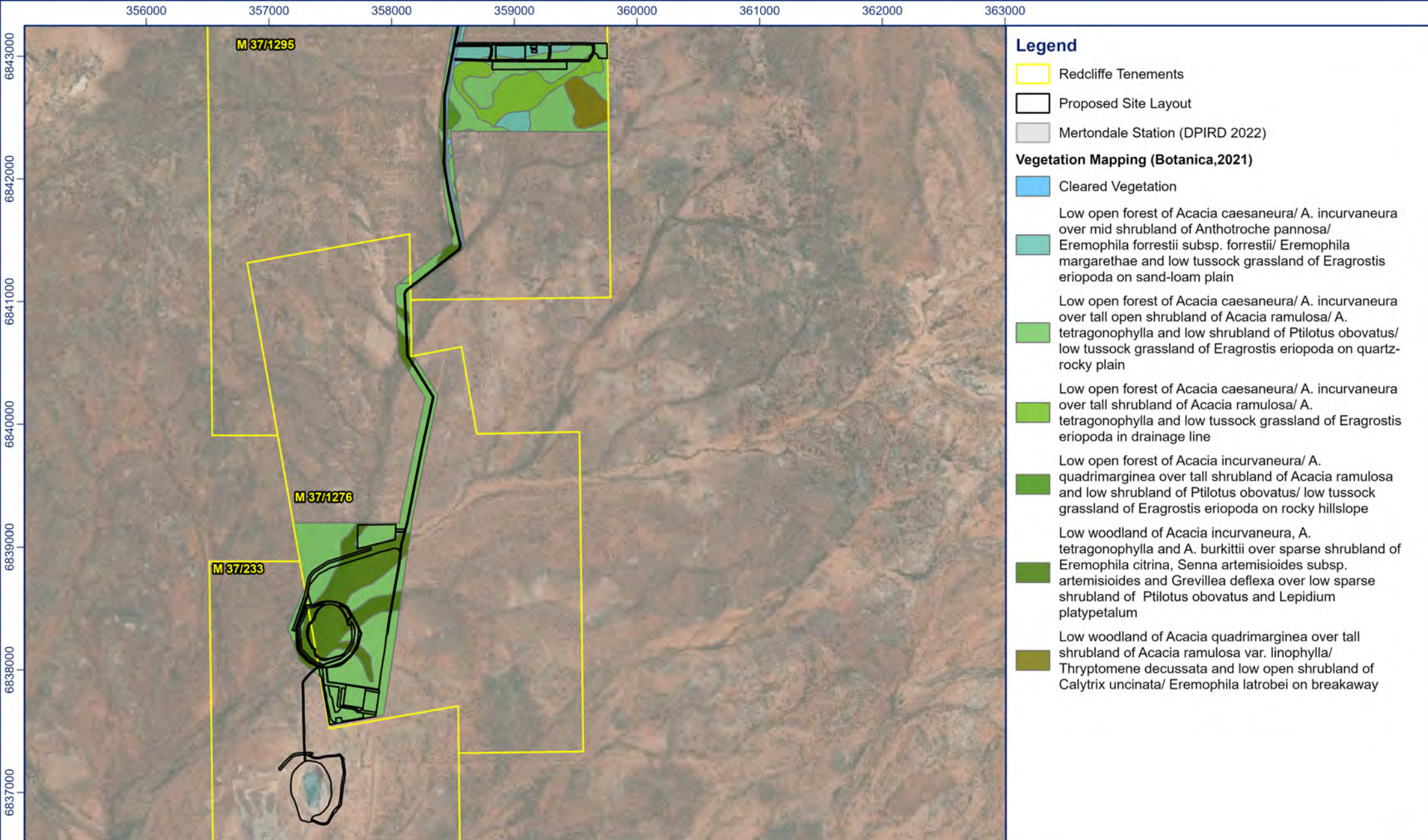


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 Projection: GDA2020 MGA Zone 51  
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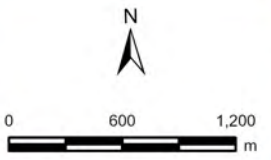


PROJECT		CLIENT
October 2022	Dacian - Redcliffe - ESG - EPBC Assessment	
Figure 6-3		
ADV-AU-00393		
Vegetation Mapping (North)		





Scale: 1:40,000  
 Projection: GDA2020 MGA Zone 51  
 Created/Reviewed By: AW/CR  
 Aerial: Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



PROJECT		CLIENT
October 2022	Dacian - Redcliffe - ESG - EPBC Assessment	
Figure 6-4		
ADV-AU-00393	Vegetation Mapping (South)	

## 6.5 Terrestrial Fauna

The Fauna and Habitat Survey for the RGP was completed by suitably qualified and experienced Ecologists from Phoenix Environmental Sciences Pty Ltd (Phoenix) in December 2021 (Phoenix 2021, **Appendix D**). This process consisted of a desktop review, basic vertebrate fauna surveys (September 2021) and additional targeted searches for conservation significant vertebrates (November 2021).

### 6.5.1 Desktop Survey

A search of relevant databases combined with information from reports of other surveys in the Eastern Murchison bioregion were used to determine the significant fauna potentially occurring in the study area, and to subsequently design the field survey for species verification.

The desktop review identified records of 277 vertebrate taxa within the desktop search extent, and a further six species where potential presence is predicted based on habitat models. Twenty-seven conservation significant vertebrate species were identified in the desktop review, comprising nine species listed as Threatened, Conservation Dependent or Specially Protected under the EPBC Act and/or BC Act. Fifteen bird species are listed as Migratory under the EPBC Act and BC Act, and a further two species are listed as Priority by DBCA.

The desktop assessment identified the potential for two EPBC species to occur in the project area:

- Malleefowl (*Leipoa ocellata*).
- Chuditch (*Dasyurus geoffroii*).

Sixteen migratory bird species under the EPBC Act and BC Act were also identified as potentially occurring.

A full list of fauna species identified in the desktop review is outlined in *Fauna and habitat survey for the Redcliffe Gold Project* (Phoenix, 2021) (**Appendix D**).

### 6.5.2 Field Survey Methods

The field fauna and habitat survey completed by Phoenix in 2021, in accordance with:

- EPA Environmental Factor Guideline: Terrestrial fauna (EPA 2016b)
- EPA Technical Guidance: Terrestrial vertebrate fauna surveys for environmental impact assessment (EPA 2020)
- EPA Technical Guidance: Sampling of short-range endemic invertebrate fauna (EPA 2016c)

The objectives of the initial field fauna surveys were to undertake:

- Fauna habitat mapping.
- Broad-scale surveys for vertebrate fauna and Short-Range Endemic (SRE) invertebrates.

A further targeted Malleefowl (*Leipoa ocellata*) and Chuditch (*Dasyurus geoffroii*) field survey was undertaken by Phoenix in 2021. The objectives for those surveys were to complete targeted searches for Malleefowl and Chuditch in suitable habitat within potential project disturbance areas. The targeted surveys were undertaken using methods consistent with the Survey guidelines for Australia's threatened mammals (Commonwealth of Australia, 2011) and the Survey guidelines for Australia's threatened birds (Commonwealth of Australia, 2011).



### 6.5.3 Field Survey Results

The key findings of the vertebrate and short-ranged endemic (SRE) invertebrate fauna survey (Phoenix 2021 (**Appendix D**)) are summarised in the following sections, and the significant records and habitat types shown in **Figure 6-5** and **Figure 6-6**. A total of nine habitat types were delineated and mapped in the Project area:

1. Breakaway and upper slope with open shrubland.
2. Groved mulga on lower slopes, minor drainages.
3. Mallee over mulga shrubland with hummock grass on sandplain.
4. Mulga tall shrubland on sandplain.
5. Mulga woodland/tall shrubland on drainage.
6. Open pit with pool.
7. Open shrubland on lower slopes/plains
8. Open/sparse shrubland on slopes and stony plains.
9. Other cleared/disturbed.

### 6.5.4 Targeted Survey Results - Malleefowl (*Leipoa ocellata*)

Malleefowl (*Leipoa ocellata*) is listed as Vulnerable (VU) under the EPBC Act and the *Biodiversity and Conservation Act 2016* (Western Australia) (BC Act).

Malleefowl is found in semi-arid to arid shrublands and low woodlands, especially those dominated by mallee and/or *Acacias*. A sandy substrate and abundance of leaf litter are required for breeding. Densities of the birds are generally greatest in areas of higher rainfall and on more fertile soils where habitats tend to be thicker and there is an abundance of food plants (Benshemesh, 2007).

No populations or general areas can be described as being of greater importance for the long-term survival of Malleefowl than any other at this stage. Malleefowl still occur over most of their range, and although populations tend to be sparser in areas with low or highly variable winter rainfall, this is compensated by these areas being extensive (Benshemesh, 2007).

During the field surveys, Malleefowl was recorded from a fresh track in the study area, and signs of foraging activity in leaf litter, but no direct sightings or nest mounds.

Two habitat types, occurring in the survey area, were assessed as highly suitable foraging and potential breeding habitat for Malleefowl. They were Mallee over mulga shrubland with hummock grass on sandplain, and Mulga tall shrubland on sandplain. These two habitat types occur in the northern half of the project area within M37/1286, M37/1348 and M37/1295. The predicted disturbance of these habitat types is 12.3 ha.

Evidence of Malleefowl (tracks and foraging signs) was recorded in both habitat types during the initial field surveys. Additional high intensity targeted searches along transects were conducted in 'High' and 'Medium' suitability habitats in November 2021. No evidence of either active or inactive Malleefowl nest mounds was found.

The study concluded that Malleefowl use the study area intermittently for dispersal and foraging, but the evidence did not indicate resident or breeding populations.



## 6.5.5 Targeted Survey Results – Chuditch (*Dasyurus geoffroi*)

Chuditch (*Dasyurus geoffroi*) is listed as Vulnerable (VU) under the EPBC Act and the BC Act.

The study results for the Chuditch indicated that potential habitat for the species existed in area that is not on the Mertondale Station Pastoral Lease.

Chuditch were recorded from diagnostic skeletal remains (that may be very old) and also two scats that appeared to be recent but did not retain identifiable DNA sequences. All three records were associated with the breakaway habitat type at the periphery of the study area, which may represent a significant (if intermittent) dispersal corridor for this species, and it also contains foraging and potential denning habitat.

The Chuditch was assessed to utilise the Breakaway and upper slope with open shrubland habitat type that was considered highly suitable for foraging, dispersal and possible denning; and habitat types 7, 8 and 9 were considered as medium suitability.

The results of the study concluded that the evidence did not indicate a current resident population, but it is consistent with a sporadic presence of dispersing individuals. Apart from the breakaway habitat, other rocky areas and mallee woodlands in the study area may be suitable for foraging and dispersal. It is concluded that Chuditch use the study area intermittently for dispersal and foraging, but the evidence does not indicate resident or breeding populations. The preferred habitat types for this species are unlikely to be impacted by the Project, especially within the Mertondale Station Pastoral Lease.

## 6.5.6 EPBC Migratory Species

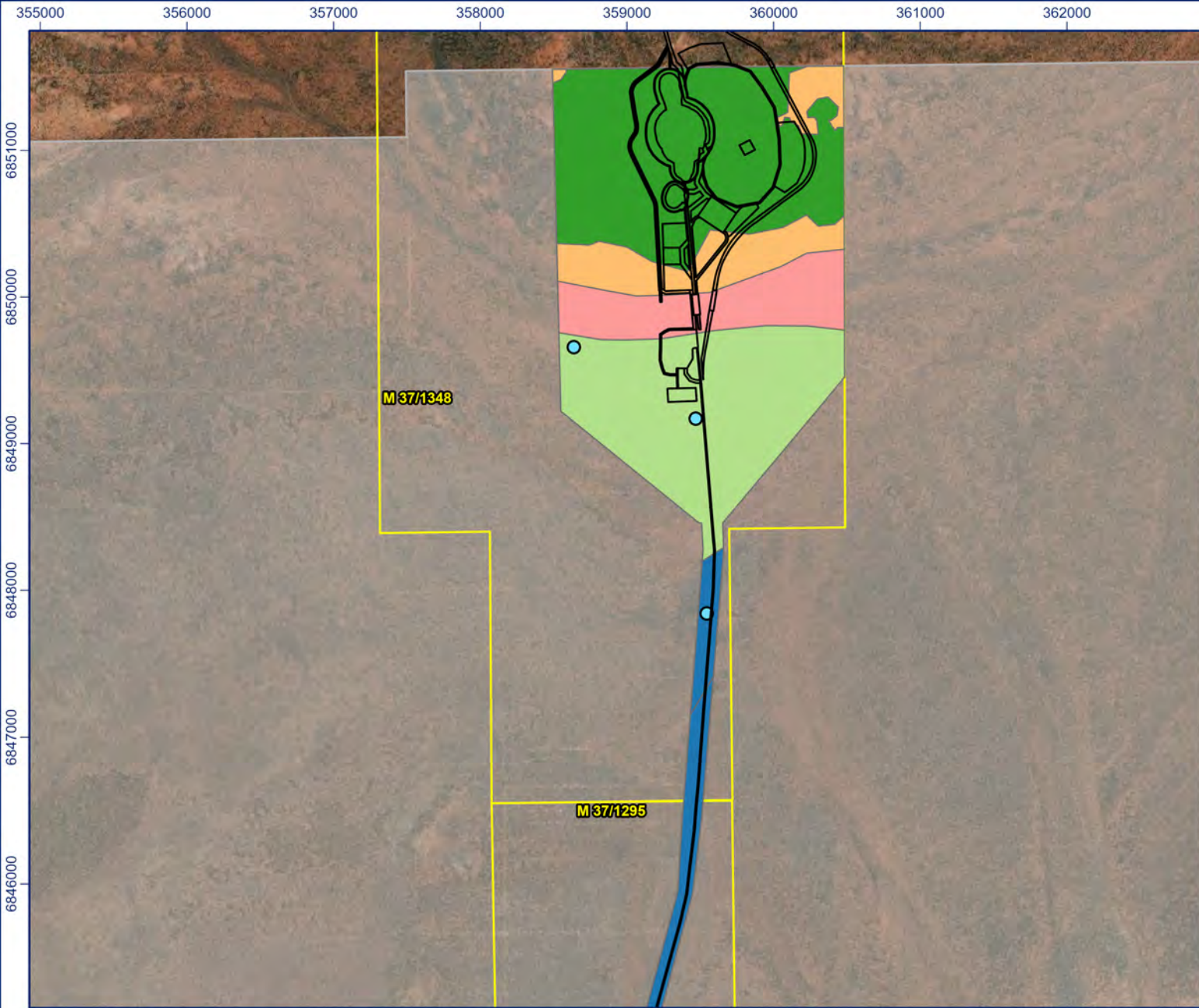
The desktop review identified sixteen bird species listed as migratory under the EPBC Act (**Table 6-3**). Previous studies had recorded the Migratory Rainbow Bee-eater (*Merops ornatus*).

The field survey results found that sixteen migratory species may occur as occasional visitors. Some migratory species may occasionally occur in the study area as part of much wider ranges, and it does not represent important or restricted habitat values for such species. A significant impact is considered unlikely for any migratory species from the project. Further information is provided in **Appendix D**.

**Table 6-3 EPBC Migratory species likelihood of occurrence (from Phoenix, 2021)**

Species	Status	Habitat
<i>Apus pacificus</i> (Fork tailed Swift)	Migratory	Widespread migratory species that does not breed in Australia, typically present from October to April. It occurs in a wide range of dry or open habitats across most of WA.
<i>Plegadis falcinellus</i> (Glossy Ibis)	Migratory	The bird as a nearly global distribution, and in Australia mostly occurs in eastern and northeastern areas, but also patchily in most of WA. It usually occurs in freshwater marshes, floodplains and artificial wetlands, but also uses coastal wetlands including saltmarsh and estuary habitats.
<i>Charadrius veredus</i> (Oriental Plover)	Migratory	Non-breeding migrant (Sep-Mar) in northern Australia, uses inland habitats including flat, open, semi-arid or arid grasslands, particularly locations with short, sparse grass interspersed with hard, bare ground, such as claypans, dry paddocks, lawns, cattle camps, or recently burnt grasslands.
<i>Pluvialis fulva</i> (Pacific Golden Plover)	Migratory	Most Australian sightings are on coastal beaches and rocky shorelines, but also inland on major river systems and lakes; occasionally forages on low saltmarsh vegetation.
<i>Actitis hypoleucos</i> (Common sandpiper)	Migratory	Breeds in Eurasia, a small population winters in Australia. Found across all Australian states, they never occur in large flocks, mostly singly. In WA the species is mostly coastal with some inland records. They are found across a wide range of wetlands: small ponds, large inlets and mudflats where they forage on the shore usually close to the vegetation.

Species	Status	Habitat
<i>Calidris acuminata</i> (Sharp-tailed Sandpiper)	Migratory	One of the most common Australian shorebirds. They breed in Arctic north-east Siberia and a large population winter in Australia. The distribution of the species in Australia depends on water quantity conditions; some large wetlands may be available inland after important rainfall, but only occasionally. The distribution on the coast is more regular, the conditions being more consistent. The species is semi gregarious and occurs in scattered flocks, mainly on non-tidal flats, often inland.
<i>Calidris canutus</i> (Red Knot)	Endangered/ Migratory	Non-breeding visitor along coast, adults mostly Aug-Apr; only occasionally recorded inland.
<i>Calidris melanotos</i> (Pectoral Sandpiper)	Migratory	Uncommon solitary shorebird that breeds in the Arctic tundra of North America and eastern Siberia. Only a fractional part of the population winters in Australia. Found in wetlands, inland as well as on the coast. The species typically uses shallow fresh to saline wetlands such as coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands.
<i>Calidris ruficollis</i> (Red-necked Stint)	Migratory	Non-breeding migrant present on Australian coasts from August to April, first-year birds also present in winter; recorded inland where they may forage in samphire or around pools on salt flats.
<i>Limosa lapponica</i> (Bar-tailed Godwit)	Migratory	Non-breeding migrant, in Australia found mainly in coastal habitats including intertidal sand and mudflats, estuaries, saltmarshes etc.
<i>Tringa glareola</i> (Wood Sandpiper)	Migratory	Non-breeding migrant, only a small proportion of the global population reaching Australia; typically uses well-vegetated, shallow freshwater wetlands, rarely in brackish wetlands or saltmarsh.
<i>Tringa nebularia</i> (Common Greenshank)	Migratory	The species is present in summer across all Australian states, mostly on the coast but sometimes inland. The species is not gregarious. Small groups can sometimes be seen when roosting at high tide. They prefer coastal open mudflats.
<i>Tringa stagnatilis</i> (Marsh Sandpiper)	Migratory	Non-breeding migrant, found on coastal and inland wetlands throughout Australia; usually forages in shallow water at the edge of wetlands, and recorded roosting around low saltmarsh vegetation and swamps.
<i>Gelochelidon nilotica</i> (Gull-billed Tern)	Migratory	This taxon comprises non-breeding migrants of an Asian subspecies ( <i>G. nilotica affinis</i> ) on the northwestern coasts, and a larger-bodied Australian resident population now considered a distinct species <i>G. macrotarsa</i> . Nomadic inland distribution, foraging and breeding around temporary water on mudflats, claypans, salt marsh etc.
<i>Motacilla cinera</i> (Grey Wagtail)	Migratory	A vagrant visitor to Australia that inhabits fast flowing streams and rivers.
<i>Motacilla flava</i> (Yellow Wagtail)	Migratory	Migratory species that breeds in northeastern Asia and Alaska; non-breeding range in South-East Asia extends regularly to northwestern Australia and occasionally to other parts of the continent. Australian records are mostly now referred to <i>M. tschutschensis similima</i> . Occurs in open country near swamps, saltmarshes, and occasionally dry inland plains.



### Legend

#### Conservation Significant Fauna (Phoenix Environmental Services 2021)

*Leipoa ocellata* (VU)

Proposed Site Layout

Redcliffe Tenements

Mertondale Station (DPIRD 2022)

#### Fauna Habitat (Phoenix Environmental Services 2021)

groved mulga on lower slopes, minor drainages etc

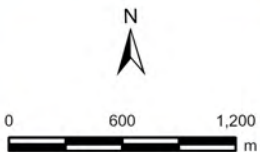
mallee - mulga - triodia on sandplain

mulga tall shrubland on sandplain

mulga woodland/tall shrubland on drainage

open shrubland on lower slopes/plains

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 Projection: GDA2020 MGA Zone 51  
 Created/Reviewed By: AW/CR  
 Aerial: Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



### PROJECT

October 2022

Figure 6-5

ADV-AU-00393

### CLIENT

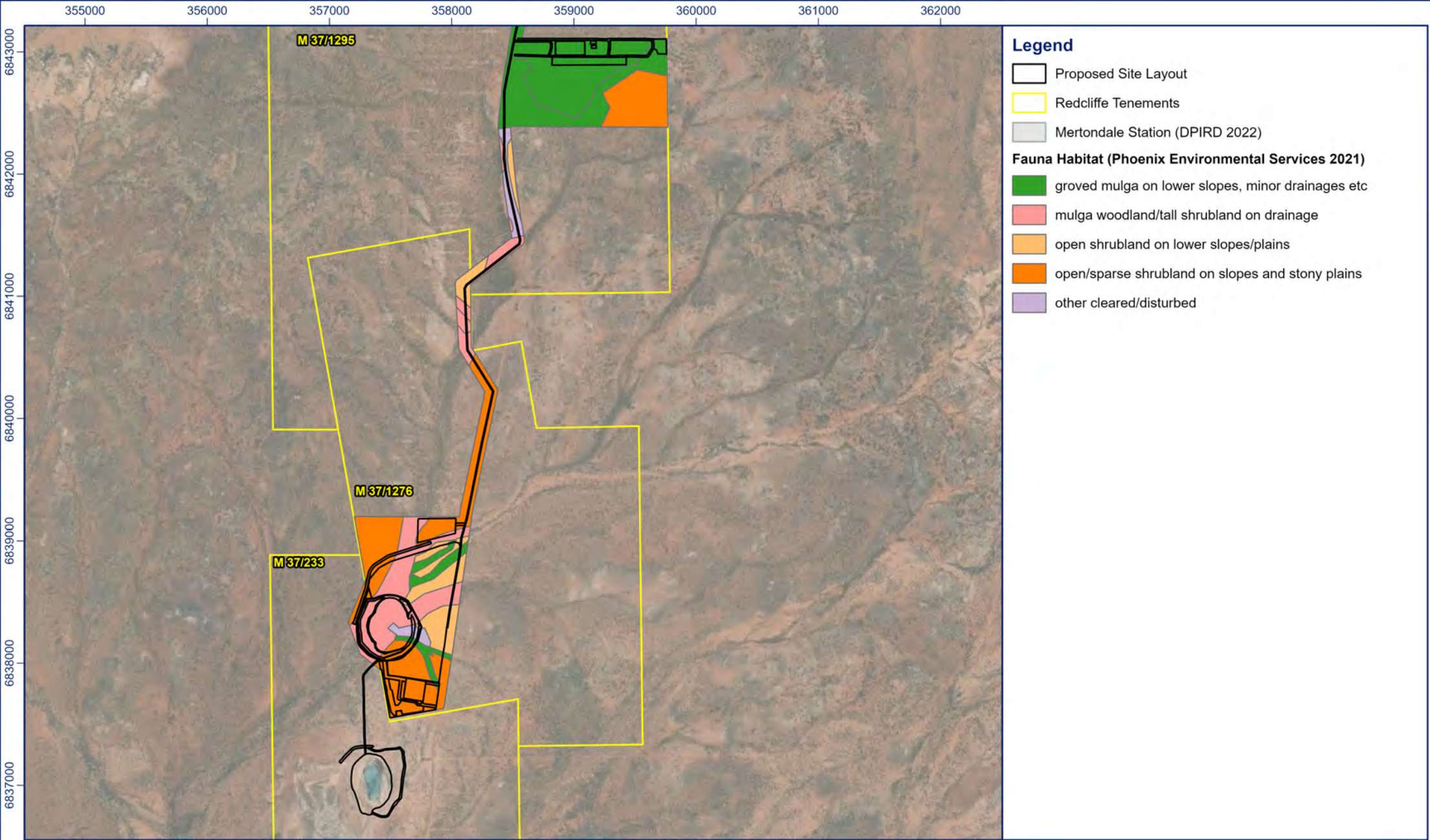
**Dacian - Redcliffe - ESG - EPBC Assessment**

**Fauna Habitat (North)**

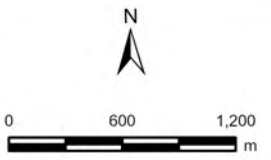


**RPMGLOBAL**





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PROJECT		CLIENT
October 2022	Dacian - Redcliffe - ESG - EPBC Assessment	
Figure 6-6		
ADV-AU-00393	Fauna Habitat (South)	

## 6.6 Hydrology

### 6.6.1 Surface Water

A Project Baseline Hydro-Meteorological & Surface Water Management Study (GRM, 2021) showed all proposed mining areas are located within DWER's vast, internally draining Salt Lake Basin (area of 441,000 km<sup>2</sup>), which extends across much of central WA. The Hub mining area is located in the upper headwaters of the Lake Carey Catchment (area of 113,780 km<sup>2</sup>) and the GTS mining area is located immediately to the south of the regional watershed divide with the Lake Raeside-Ponton Catchment (area of 115,965 km<sup>2</sup>). The GTS mining area contains several unnamed ephemeral drainages that cross the proposed mining area northeast to southwest before terminating in a number of poorly defined soaks and claypans about 10 km to the southwest.

Upstream catchment areas are relatively modest, and all the watercourses in the vicinity of the Project are ephemeral. Minor flood diversions are incorporated into the project design (Dacian 2022). The Project will not result in creek diversions, but bunds to prevent flooding will be installed around key infrastructure to provide flood protection associated with overland flow.

Although significant rainfall-runoff events in the project area do not occur cyclically, their probability of occurrence within any given period can be estimated. For the RGP it is recommended that a 1% Annual Exceedance Probability (AEP) (1 in 100) design criterion be applied to the pit flood protection measures during operations, while it has been assumed that a 10% AEP criterion is suitable for the design of all other on-site drainage measures. It should be noted that the probabilities of occurrence of the 1% or 10% events occurring during the envisaged two-year operational life of each of the RGP mining areas are roughly 2% and 19% respectively (GRM, 2021a).

### 6.6.2 Hydrogeology

A Project Baseline Hydro-Meteorological & Surface Water Management Study (GRM, 2021a) was conducted on the local hydrogeology in the Redcliffe project area. This local hydrogeology is dominated by fractured rock aquifers, hosted within a north trending sequence of mafic and ultramafic rocks. However, the basement rocks have undergone a significant degree of metamorphism, up to around greenschist facies. In the Hub and GTS areas, deep weathering profiles have developed adjacent to ancient and modern drainages and overlie the fractured bedrock. The near surface is dominated by laterite and lateritic clays to a few metres below surface, with a thick sequence of saprolite clay extending below this horizon up to around 60 m below surface. The saprolite transitions to fresh, weakly jointed, low permeability bedrock through a saprock zone which has generally variable low to moderate permeability.

Groundwater quality is fresh to brackish at Hub and GTS, less than 5,000 mg/L Total Dissolved Solids (TDS), neutral to slightly alkaline, and within the potable limits for dissolved metals and most other parameters. The regional groundwater flow direction north of this divide is towards a tributary paleochannel of the Carey Palaeovalley, which is located just south of the Hub deposit and runs in a north-easterly direction.

There will be temporary lowering of the water table for the short duration of mining, however this will be localised and will recover at cessation of mining (GRM 2021b). The short duration and localised lowering of the water table is approved and regulated through the *Rights in Water and Irrigation Act 1914* (RIWI) (WA) Groundwater Licences 207510 and 207546. The Project has a low water demand, with processing of ore planned to occur offsite at the nearby Mt Morgans Gold Project. Hub and GTS open pit operations are expected to experience groundwater infiltration during mining. The Hub mine water will be discharged into the existing Redcliffe and Mesa open pits and GTS mine water will be discharged into the existing Mertondale 5 open pit, effectively resulting in recharge of the water back into the local aquifers (Dacian 2022). Expected dewatering rates are low (ranging between 5 and 25 L/s), and drawdown will be localised (GRM 2021b).



## 6.7 Heritage values

### 6.7.1 Commonwealth Heritage

There are no Commonwealth heritage places in, or near, the Project development area, or on the Commonwealth land

### 6.7.2 Indigenous Heritage

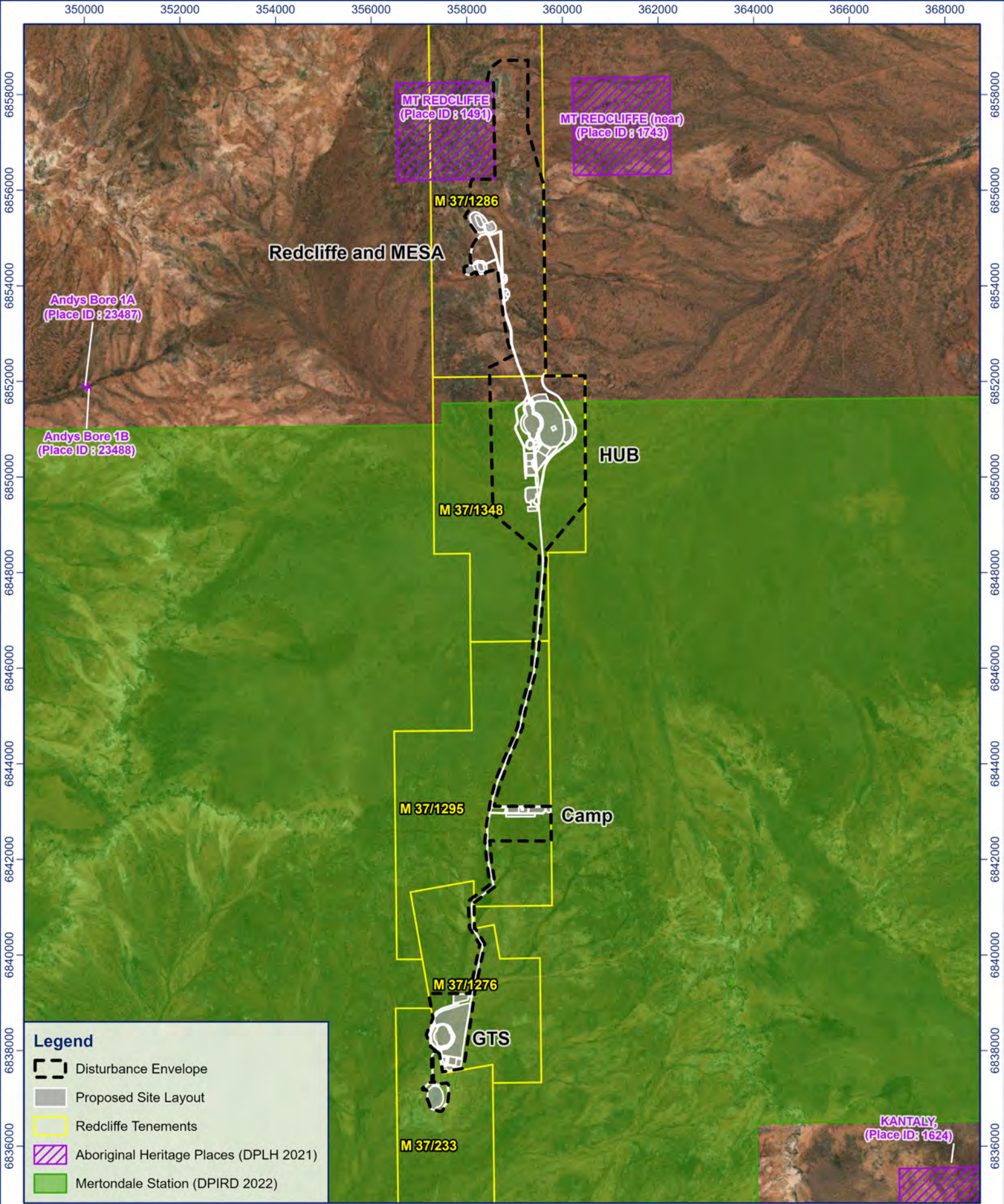
Three recent Aboriginal heritage surveys and assessments were completed for the RGP area to provide an understanding of archaeological and ethnographic heritage sites (Czerwinski, 2021a, 2021b, de Gand & Associates Pty Ltd, 2021). The surveys detail consultation with the Tjupan (Harris) Group, part of the Darlot Native Title Claim (accepted but not granted), with long-term historical, traditional and ancestral affiliations with the region.

There is one previously recorded Aboriginal heritage site on the DPLH Aboriginal Heritage Inquiry System (AHIS) within the RGP area. There are no registered sites located within Mertondale Station (**Figure 6-7**).

No other Aboriginal heritage sites of significance have been recorded for the RGP area. Ongoing consultation with the key Aboriginal group, the Tjupan (Harris) Group will continue. Based on the findings of the heritage surveys, the Project will not:

- destroy, remove or alter any heritage sites.
- extend, renovate or alter any heritage sites.
- impact heritage place site lines.
- substantially diminish heritage value of a heritage place.
- substantially alter the setting of a heritage place.

Extensive and ongoing heritage consultation has been completed and is ongoing and no restriction to heritage sites is anticipated.



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 Projection: GDA2020 MGA Zone 51  
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**RPMGLOBAL**

PROJECT		CLIENT
<b>Dacian - Redcliffe - ESG - EPBC Assessment</b>		
<b>Aboriginal Heritage</b>		
Figure 6.7	ADV-AU-00393	



## 6.8 People and Communities

Pastoral (cattle grazing), mining and exploration activities are the primary land uses of the RGP area. A section of the RGP area falls within the Mertondale Station Pastoral Lease (N049506) which is owned by the Australian Government Department of Defence. The local Traditional Owners, the Tjupan Group, have been consulted about the proposed activities on their lands. The Tjupan Group are part of the Darlot Native Title Claim and have long term historical, traditional, and ancestral affiliations with the region where the RGP is located.

The Project area is relatively remote, with the surrounding area sparsely populated. The nearest residence is the Mertondale homestead, located 10 km to the south.

The town of Leonora is located 50 km south-southwest of the RGP. Leonora is located between the towns of Kalgoorlie and Laverton and is a significant support centre for the local community, tourism, Aboriginal communities, and Pastoral Lease holders. According to the Australian Bureau of Statistics (ABS) 2016 census, Leonora has a population of 781 people and of this, Aboriginal and/or Torres Strait Islander People comprise of 22.7% of the population (ABS, 2016).

The closest major mining operation to the RGP is the Great Western Gold Mine approximately 37 km to the west.



## 7. Potential Impacts

The following section aims to identify the potential impacts of the RGP to the existing environment in accordance with step 2 of the referral process outlined in *Actions on, or impacting upon, Commonwealth land Significant impact guidelines 1.2* (Commonwealth of Australia, 2013).

The action is a small gold mining operation. The main components on Mertondale Station include:

- Native vegetation clearing of 239.97 ha, of which 184.6 ha (77%) will be rehabilitated to native vegetation.
- Two open cut pit operations, with a combined area of 40.9 ha. They will remain after closure.
- Two waste rock dumps, with a combined area of 86.3 ha. They will be rehabilitated to blend with the natural environment after closure.
- Other mine components including run of mine pads, abandonment bunds, flood bunds, topsoil stockpiles, access tracks, washdown pad, mine roads, supporting infrastructure, flood protection and drainage diversion features.

### 7.1 Summary of adverse impacts to Commonwealth land

The predicted adverse impacts associated with the proposed Action includes impacting:

- A total area of 49.1 ha of native vegetation.
- An area of 12.3 ha of potential Malleefowl habitat. Further assessment of the impact to the species is provided in section 7.1.3.

#### 7.1.1 Impact Severity

The Commonwealth Significant Impact Guidelines 1.2 (2013) provide definitions of severity based on the ‘scale’, ‘intensity’ and ‘timing, duration and frequency’ of the action. The project has been considered against these definitions and results provided in **Table 7-1**.

**Table 7-1 RGP Impact Severity**

Criteria	Description	Severity
Scale	239.97 ha of new disturbance (clearing), of which 184.6 ha (77%) will be rehabilitated to native vegetation leaving 49.1 ha of disturbance – small scale, localised action.	Minor
Intensity	Open cut mining is listed as a high intensity impact under the guidelines. The majority of other disturbance is to be rehabilitated.	Severe
Timing	The project has a relatively short life of mine at 2 years, although as the pits will remain at closure, they are considered a long term impact.	Moderate

Overall, when the ‘scale’, ‘intensity’, and ‘timing, duration and frequency’ of impacts is considered, the project is considered to have a severity rating of Moderate.

#### 7.1.2 Uncertainty of Impacts

There is little uncertainty around the potential impacts of the proposed Project on Commonwealth Land. The proposed mine is like many others in the region, including on Mertondale Station, that have been operating for many years with minimal impact. Several approvals have already been sought and gained under state government legislation, without being referred to the state Environmental Protection Authority or Department of Climate Change, Energy, the Environment and Water (DCCEEW).

These include:

- Mining Act 1978 (WA):
  - Mining Proposal and Mine Closure Plan: This comprises a comprehensive assessment of the environmental setting and an environmental risk assessment, submitted to the DMIRS. The Mining Proposal and associated Mine Closure Plan (REG ID 102646) were approved on 13 June 2022.
- Environmental Protection Act 1986 (EP Act) (WA):
  - Part V: A NVCP (9608/1) which comprises assessment against ten clearing principles, was approved on 11 June 2022. Native vegetation clearing processes under Part V Division 2 of the EP Act have been accredited under the Commonwealth's EPBC Act.
  - Part V: A Works Approval Application was prepared and submitted, and a Works Approval (W6650/2022/1) has been issued by the DWER.

### 7.1.3 Significance Assessment – *Leipoa ocellata* (Malleefowl) (EPBC – Vulnerable)

Two habitats were identified as being potentially used by Malleefowl as part of the proposed Action. These habitats are outlined in **Table 7-2**.

**Table 7-2 Potential habitat for Malleefowl within the Project area**

Habitat type	Description	Impact
Habitat 3	Mulga tall shrubland on sandplain	A total of 9.25 ha of potential Malleefowl habitat is proposed to be cleared (5% of the habitat mapped in the fauna survey).
Habitat 4	Mallee over mulga shrubland with hummock grass on sandplain	A total of 3.05 ha of potential Malleefowl habitat is proposed to be cleared (7% of the habitat mapped in the fauna survey).

A 'significant impact' is an impact which is important, notable, or of consequence, having regard to its context or intensity. This depends on the sensitivity, value, and quality of the environment and intensity, duration, magnitude, and geographic extent of the impacts.

The following Significant Impact Assessment was undertaken for the Malleefowl in accordance with *Matters of National Environmental Significance: Significant Impact Guidelines 1.1* (DoE, 2013) for Vulnerable Species to determine if the Project will have a significant impact on this species. **Table 7-3** outlines the Significant Impact Criteria that need to be considered, with a response to each criterion.

Based on the results in **Table 7-3**, it is considered highly unlikely that the Project will have a significant impact on listed species, with only 12.3 ha of Malleefowl habitat to be cleared, of which 100% will be rehabilitated following completion of the operation. This determination is supported by the granting of the NVCP without referral to the EPA or the Australian Department of Climate Change, Energy, the Environment and Water (DCCEEW).

**Table 7-3 Significant Impact Assessment for "Vulnerable" Malleefowl**

Significant Impact Criteria	Project Response
Will the Project lead to a long-term decrease in the size of an important population of a species?	In accordance with the definition of an 'important population' provided in the Significant Impact Guidelines 1.1 (DoE 2013), the potential population of Malleefowl recorded within the Project area is not considered necessary for the species' long-term survival and recovery. No particular populations or general areas can be described as being of greater importance for the long-term survival of Malleefowl than any other at this stage (Benshemesh, 2007).

Significant Impact Criteria	Project Response
	<p>The area of habitat to be impacted by the action is small in size (12.3 ha) and short term, in an area modified by previous mining and grazing activities.</p> <p>Conclusion: The Project is unlikely to cause a long-term decrease in the size of an important population as the Malleefowl population is unlikely to constitute an important population and the Project is short term.</p>
<p>Will the Project reduce the area of occupancy of an important population?</p>	<p>In accordance with the definition of an 'important population' provided in the Significant Impact Guidelines 1.1 (DoE 2013), the potential population of Malleefowl recorded within the Project area is not considered necessary for the species' long-term survival and recovery. No particular populations or general areas can be described as being of greater importance for the long-term survival of Malleefowl than any other at this stage (Benshemesh, 2007).</p> <p>Conclusion: The Project is unlikely to reduce the area of occupancy of an important population as the Malleefowl population is unlikely to constitute an important population.</p>
<p>Will the Project fragment an existing important population into two or more populations?</p>	<p>Malleefowl mostly move about their home range by foot, and rarely fly except when they are disturbed or to roost in the canopy. A pair may move several kilometres between nesting seasons. Home ranges during the breeding season may be reduced. Anecdotal reports suggest they use corridors of relatively thick vegetation when dispersing through open landscapes. The Project will temporarily remove 12.3 ha of potential habitat for the species in a landscape that is generally intact but has been previously modified by mining and grazing activities. The area to be removed is linear. Based on the layout of the habitat to be removed, the mobility of the birds, and the size of their home range, it is unlikely that a population will be fragmented.</p> <p>In accordance with the definition of an 'important population' provided in the Significant Impact Guidelines 1.1 (DoE 2013), the potential population of Malleefowl recorded within the Project area is not considered necessary for the species' long-term survival and recovery. No particular populations or general areas can be described as being of greater importance for the long-term survival of Malleefowl than any other at this stage (Benshemesh, 2007).</p> <p>Conclusion: The Project is unlikely to fragment habitat, especially for an important population as the Malleefowl population is unlikely to constitute an important population.</p>
<p>Will the Project adversely affect habitat critical to the survival of a species?</p>	<p>Malleefowl may use the project area intermittently for dispersal and foraging but were not considered resident or breeding populations. The Fauna and habitat survey (Phoenix 2021) identified the following Malleefowl habitats:</p> <ul style="list-style-type: none"> <li>▪ Mulga tall shrubland on sandplain (9.25 ha cleared/5% of the mapped habitat).</li> <li>▪ Mallee over mulga shrubland with hummock grass on sandplain (3.05 ha cleared/7% of the mapped habitat).</li> </ul> <p>The total disturbance to the potential habitat types is 12.3 ha.</p> <p>The following mitigations will be undertaken, from Conditions 6 and 7 of the NVCP provide further safeguards for protection of Malleefowl:</p> <ul style="list-style-type: none"> <li>▪ Within two weeks prior to undertaking clearing, engage an environmental specialist to conduct an inspection of the area to be cleared to identify active (in use) Malleefowl (<i>Leipoa ocellata</i>) mounds.</li> <li>▪ Where an active (in use) Malleefowl mound is identified the Permit Holder shall ensure that no clearing occurs within 50 metres of the mound, during the months of September through to January, unless first approved by the CEO.</li> </ul>



Significant Impact Criteria	Project Response
	<p>Conclusion: By implementing the mitigation measures, it is unlikely that removing 12.3 ha of potential habitat will adversely affect habitat critical to the survival of the species.</p>
<p>Will the Project disrupt the breeding cycle of an important population?</p>	<p>Malleefowl may use the project area intermittently for dispersal and foraging but were not considered resident or breeding populations.</p> <p>The following mitigations will be undertaken, from Condition 8 of the NVCP provide further safeguards for protection of Malleefowl:</p> <ul style="list-style-type: none"> <li>▪ Within two weeks prior to undertaking clearing, engage an environmental specialist to conduct an inspection of the area to be cleared to identify active (in use) Malleefowl (<i>Leipoa ocellata</i>) mounds.</li> <li>▪ Where an active (in use) Malleefowl mound is identified the Permit Holder shall ensure that no clearing occurs within 50 metres of the mound, during the months of September through to January, unless first approved by the CEO.</li> </ul> <p>Conclusion: Given the required mitigation measures, it is unlikely the Project will disrupt the breeding cycle of the species.</p>
<p>Will the project modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?</p>	<p>Based upon the species distribution and occurrence mapping available through <a href="http://www.ala.org.au">www.ala.org.au</a>, Malleefowl are distributed throughout south-eastern and south-western Australia. They are generalist feeders, food resources for Malleefowl are typically varied, transient and patchily distributed, reflecting the highly irregular rainfall and inherent patchiness of the habitats they occur in (Benshemesh, 2007).</p> <p>The disturbance will modify 12.3 ha of potential habitat for the species. However, clearing that area of habitat is unlikely to remove or isolate, or decrease the availability or quality of the habitat to the extent that it would lead to a decline in the species.</p> <p>Conclusion: The Project is unlikely to disturb habitat to the extent that the species is likely to decline.</p>
<p>Will the Project result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species habitat?</p>	<p>Based on the activities to be undertaken for the project, it is unlikely that invasive weeds and pests will be established. The Project has specific conditions in the NVCP to control weeds, therefore any new exotic species will be managed for the project.</p> <p>Established populations of rabbits, camels, cows, goats, donkeys, dogs/dingoes, and cats were found to occur during the fauna and habitat survey (Phoenix, 2021) in the project area.</p> <p>Conclusion: The Project is unlikely to introduce new invasive species.</p>
<p>Will the Project introduce disease that may cause the species to decline?</p>	<p>There is no information on disease in wild Malleefowl populations although the species is susceptible to a range of common diseases in captive situations and may also be susceptible to exotic diseases (Benshemesh, 2007). Exposure to chemicals will be managed by fencing areas, and no clearing will occur within 50 metres of Malleefowl mounds per Condition 8 of the NVCP.</p> <p>Conclusion: Based on the activities proposed to be undertaken, the Project is unlikely to introduce any diseases that could cause this species to decline.</p>
<p>Will the project interfere substantially with the recovery of the species?</p>	<p>Clearing is a known threat for the species. The Project is located entirely within the previously disturbed land. The project will remove 12.3 ha of potential habitat for the species, which will be rehabilitated after completion of the project.</p> <p>Conclusion: Based on the mitigation measures outlined, it is unlikely that the Project will substantially interfere with the recovery of the species.</p>

## 8. Impact Avoidance, Mitigation and Management

The site was selected based on the location of the gold resource and designed to utilise existing disturbance and minimise new clearing. There is little uncertainty around the potential impacts on Commonwealth Land.

The proposal was designed to minimize native vegetation clearing and utilise existing disturbance where possible. All impact avoidance and management measures have been implemented to ensure the Project remains a low-impact activity for the duration of mining and rehabilitation.

The proposed mine is like many others in the region and previously on Mertondale Station, that have been operating for many years with minimal impact. Several approvals have already been sought and gained under state government legislation, without being referred to the state Environmental Protection Authority or Department of Climate Change, Energy, the Environment and Water (DCCEEW).

The proposal has been designed with extensive environmental management measures, considered standard practice in the Western Australian mining industry. These have been committed to throughout the following approval documents, which have been approved and as such are considered statutory requirements if the project proceeds:

- *Mining Act 1978 (WA):*
  - Mining Proposal and Mine Closure Plan: This comprises a comprehensive assessment of the environmental setting and an environmental risk assessment, submitted to the DMIRS. The Mining Proposal and associated Mine Closure Plan (REG ID 102646) were approved on 13 June 2022.
- *Environmental Protection Act 1986 (EP Act) (WA):*
  - Part V: A NVCP (9608/1) which comprises assessment against ten clearing principles, was approved on 11 June 2022. Native vegetation clearing processes under Part V Division 2 of the EP Act have been accredited under the Commonwealth's EPBC Act.
  - Part V: A Works Approval Application was prepared and submitted, and a Draft Works Approval (W6650/2022/1) has been issued by the DWER.

The approval letter for these documents is attached to provide evidence of the extent of environmental management measures (**Appendix E**). Key management measures for water, soil, waste rock and fauna to be implemented for the project are:

- The Project Baseline Hydro-Meteorological & Surface Water Management Study (GRM, 2021a) developed feasibility level designs for the surface water management works required at each of the proposed mining areas including diversion channels, bunds, raised haul roads and floodways. Hydrogeological management measures, such as groundwater quality, dewatering and drawdown management, were also designed during this study.
- Soil and waste rock management will be conducted in accordance with the Redcliffe Waste Rock Management Plan. The estimated low volume of shale will be co-mingled with all other NAF waste material excavated from the GTS pit and stored within a minimum of 3 metres from the edge and surface of the GTS WRD. Only oxide material will be used in the construction of infrastructure including ROM pad, abandonment bunds and water diversion bunds.
- A Ground Control Management Plan (GCMP) will be finalised and implemented prior to the commencement of mining. Prism monitoring (or equivalent) for slope assessment will be used to develop benchmark criteria, with external review and periodic inspection to determine overall slope stability performance.
- Fauna measurement measures have been provided as conditions of the Project NVCP. Condition 8 of the NVCP provides safeguards for protection of Malleefowl, which states:
  - Within two weeks prior to undertaking clearing, engage an environmental specialist to conduct an inspection of the area to be cleared to identify active (in use) Malleefowl mounds.
  - Where an active (in use) Malleefowl mound is identified the Permit Holder shall ensure that no clearing occurs within 50 metres of the mound, during the months of September through to January, unless first approved by the CEO.

## 9. Conclusions

The proposed RGP will result in modifications to Commonwealth Land. Modifications from within the RGP will include the construction of standard infrastructure associated with a small gold mining project, including pits, waste rock dumps, dewatering infrastructure and supporting infrastructure, the majority of which will be removed and rehabilitated within two years.

Based on the Commonwealth guidelines, the project was assessed overall to have a moderate severity impact rating, based on the mining activities. However, the project is considered a small mining operation, and similar scale operations have occurred historically on Mertondale Pastoral lease.

The project is unlikely to have a significant impact on any other Matters of National Significance.

The assessment has indicated the project will have the following impacts on Commonwealth Land:

- The scale of the project is small, with a total footprint of 239.97 ha in an area region with a history of mining.
- The duration of mining will be short (two years), and the majority of the site will be rehabilitated to native vegetation (184.6 ha, or 77%)
- There will be 12.3 ha of potential Malleefowl habitat impacted by the activities. Based on the mitigation measures to be implemented and described in **Table 7-3**, it is considered that the project will not have a significant impact on the species

The project will implement avoidance, management and mitigation measures to minimize environmental impacts to Commonwealth land. The impact to Commonwealth land will have a short-term duration, and generally all be rehabilitated.



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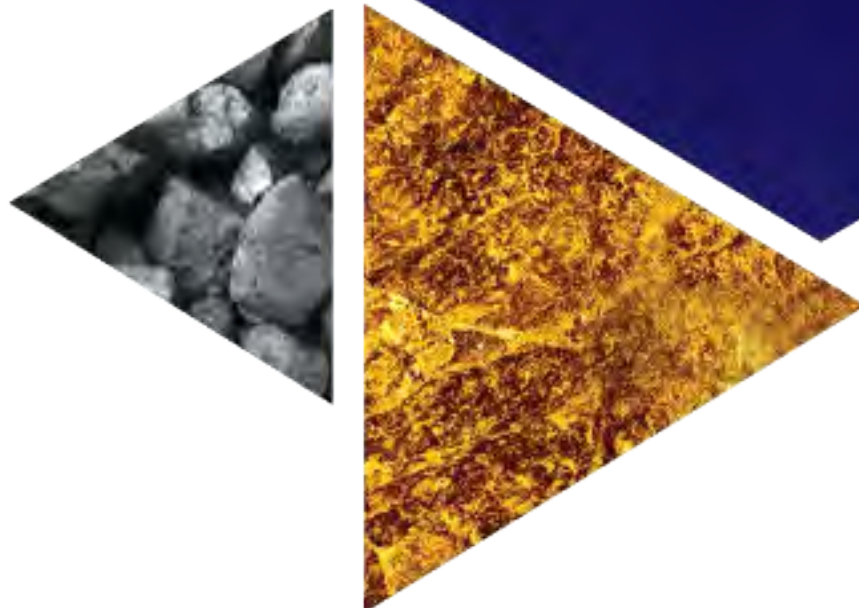
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# Appendix A. Important Information about this Document





## **IMPORTANT INFORMATION ABOUT THIS DOCUMENT**

### **1. Our Client**

*This report has been produced by or on behalf of RPM Advisory Services Pty Ltd (“RPM”) solely for Dacian Gold Limited (the “Client”).*

### **2. Client Use**

*The Client’s use and disclosure of this report is subject to the terms and conditions of the engaging Agreement under which RPM prepared the report.*

### **3. Notice to Third Parties**

*RPM prepared this report for the Client only. If you are not the Client:*

- *RPM has prepared this report having regard to the particular needs and interests of the Client, and in accordance with the Client’s instructions and in accordance with the terms and conditions of its engagement. It did not draft this report having regard to any other person’s particular needs or interests. Your needs and interests may be distinctly different to the Client’s needs and interests, and the report may not be sufficient, fit or appropriate for your purposes.*
- *Other than as expressly agreed by RPM in writing, RPM does not authorise, nor does it accept any liability to any party other than the Client who chooses to rely on this Report. Any such reliance is at the user’s sole and exclusive risk.*
- *RPM does not make and expressly disclaims from making any representation or warranty to you – express or implied – regarding this report or the conclusions or opinions set out in this report (including without limitation any representation or warranty regarding the standard of care used in preparing this report, or that any forward-looking statements, forecasts, opinions or projections contained in the report will be achieved, will prove to be correct or are based on reasonable assumptions).*
- *RPM expressly disclaims any liability to you and any duty of care to you.*
- *RPM does not authorise you to rely on this report. If you choose to use or rely on all or part of this report, then any loss or damage you may suffer in so doing is at your sole and exclusive risk.*

### **4. Independence**

*RPM provides advisory services to the mining and finance sectors. Within its core expertise it provides independent technical reviews, resource evaluation, mining engineering, environmental assessments and mine valuation services to the resources and financial services industries.*

*RPM have independently assessed the subject of the report (the “Project”) by reviewing pertinent data, which may include Resources, Reserves, existing approvals, licences and permits, manpower requirements and the life of mine plans relating to productivity, production, operating costs and capital expenditures. All opinions, findings and conclusions expressed in this report are those of RPM and specialist advisors.*

*Drafts of this report were provided to the Client, but only for the purpose of confirming the accuracy of factual material and the reasonableness of assumptions relied upon in this report.*

*RPM has been paid, and has agreed to be paid, professional fees for the preparation of this report. The remuneration for this report is not dependent upon the findings of this report. RPM does not have any economic or beneficial interest (present or contingent), in the Project, in securities of the companies associated with the Project or the Client*

### **5. Inputs, subsequent changes and no duty to update**

*RPM has created this report using data and information provided by or on behalf of the Client. Unless specifically stated otherwise, RPM has not independently verified that data and information. RPM accepts no liability for the accuracy or completeness of that data and information, even if that data and information has been incorporated into or relied upon in creating this report (or parts of it).*

*The conclusions and opinions contained in this report apply as at the date of the report. Events (including changes to any of the data and information that RPM used in preparing the report) may have occurred since that date which may impact on those conclusions and opinions and make them unreliable. RPM is under no duty to update the report upon the occurrence of any such event, though it reserves the right to do so.*

## **6. Inherent Mining Risks**

*Mining is carried out in an environment where not all events are predictable.*

*Whilst an effective management team can identify the known risks and take measures to manage and mitigate those risks, there is still the possibility for unexpected and unpredictable events to occur. It is not possible therefore to totally remove all risks or state with certainty that an event that may have a material impact on the operation of a mine, will not occur.*

*The ability of any person to achieve forward-looking production and economic targets is dependent on numerous factors that are beyond RPM's control and that RPM cannot anticipate. These factors include, but are not limited to, site-specific mining and geological conditions, management and personnel capabilities, availability of funding to properly operate and capitalize the operation, variations in cost elements and market conditions, developing and operating the mine in an efficient manner, unforeseen changes in legislation and new industry developments. Any of these factors may substantially alter the performance of any mining operation.*

## **7. Limitations and Exclusions**

*RPM 's report is based on data, information reports, plans and tabulations, as applicable, provided by Client or on behalf of the Client. The Client has not advised RPM of any material change, or event likely to cause material change, to the operations or forecasts since the date of assets inspections.*

*The work undertaken for this report is that required for a technical review of the information, coupled with such inspections as RPM considered appropriate to prepare this report.*

*Unless otherwise stated specifically in writing, the report specifically excludes all aspects of legal issues, commercial and financing matters, land titles and agreements, except such aspects as may directly influence technical, operational or cost issues and where applicable to the JORC Code guidelines.*

*RPM has specifically excluded making any comments on the competitive position of the relevant assets compared with other similar and competing producers around the world. RPM strongly advises that any potential investors make their own comprehensive assessment of the competitive position of the relevant assets in the market.*

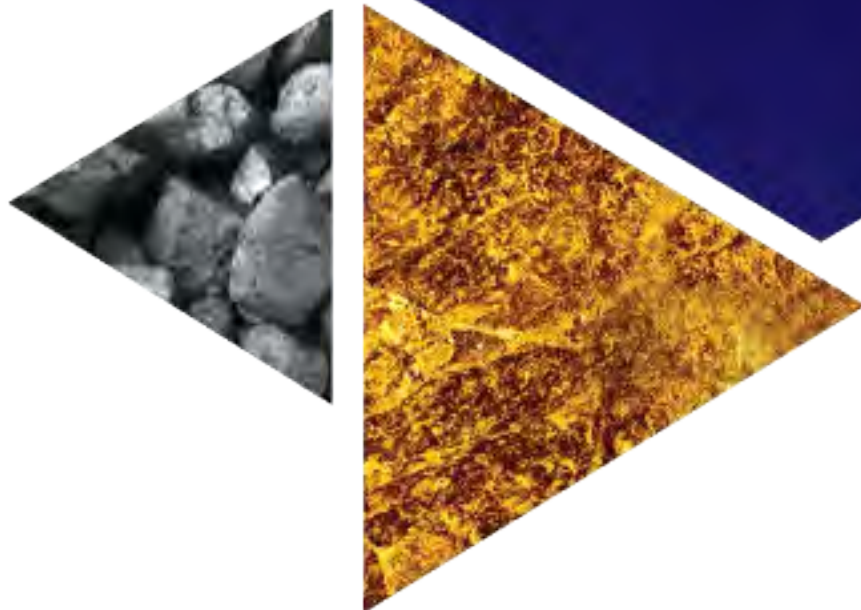
## **8. Indemnification**

*The Client has indemnified and held harmless RPM and its subcontractors, consultants, agents, officers, directors and employees from and against any and all claims, liabilities, damages, losses and expenses (including lawyers' fees and other costs of litigation, arbitration or mediation) arising out of or in any way related to:*

- *RPM 's reliance on any information provided by Client; or*
- *RPM 's services or materials; or*
- *Any use of or reliance on these services or materials by any third party not expressly authorised by RPM,*

*save and except in cases of death or personnel injury, property damage, claims by third parties for breach of intellectual property rights, gross negligence, wilful misconduct, fraud, fraudulent misrepresentation or the tort of deceit, or any other matter which be so limited or excluded as a matter of applicable law (including as a Competent Person under the Listing Rules) and regardless of any breach of contract or strict liability by RPM.*

# Appendix B. EPBC Protected Matters Report







# EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about [Environment Assessments](#) and the EPBC Act including significance guidelines, forms and application process details.

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[Summary](#)

[Details](#)

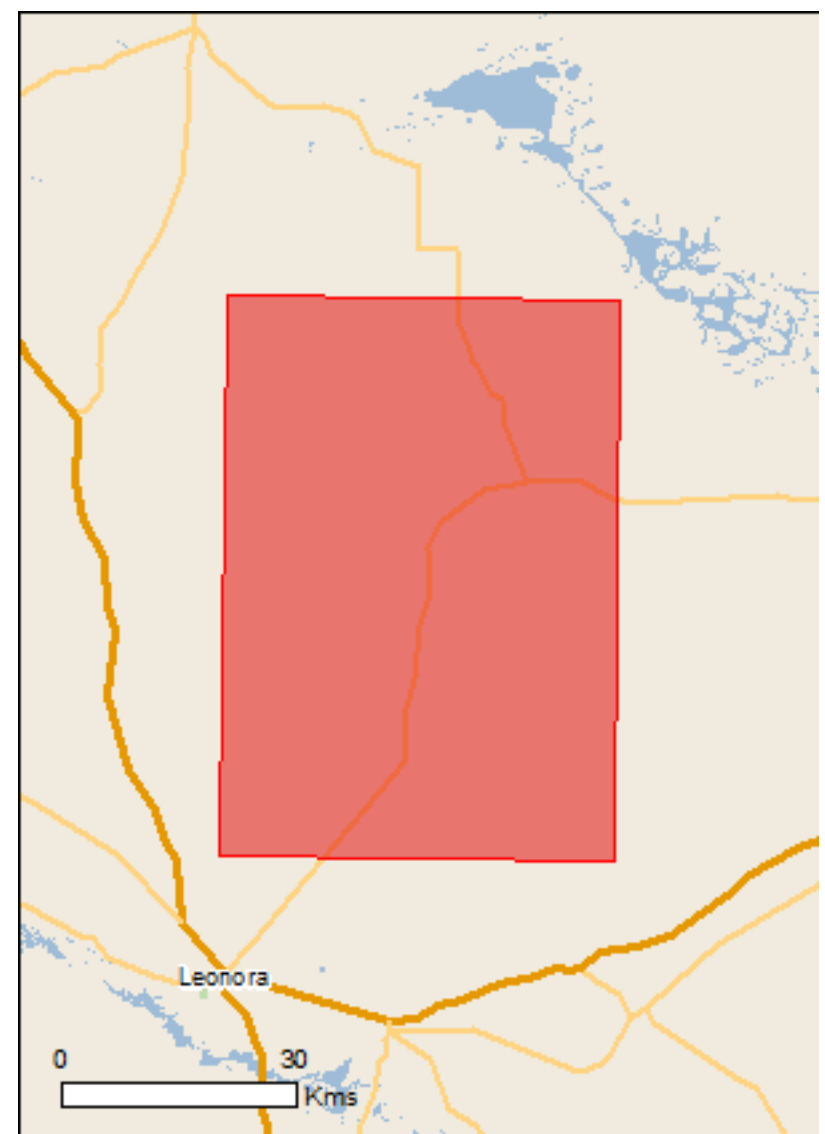
[Matters of NES](#)

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

[Extra Information](#)

[Caveat](#)

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This map may contain data which are  
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Buffer: 0.0Km



# Summary

## Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the [Administrative Guidelines on Significance](#).

<a href="#">World Heritage Properties:</a>	None
<a href="#">National Heritage Places:</a>	None
<a href="#">Wetlands of International Importance:</a>	None
<a href="#">Great Barrier Reef Marine Park:</a>	None
<a href="#">Commonwealth Marine Area:</a>	None
<a href="#">Listed Threatened Ecological Communities:</a>	None
<a href="#">Listed Threatened Species:</a>	5
<a href="#">Listed Migratory Species:</a>	8

## Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at <http://www.environment.gov.au/heritage>

A [permit](#) may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

<a href="#">Commonwealth Land:</a>	None
<a href="#">Commonwealth Heritage Places:</a>	None
<a href="#">Listed Marine Species:</a>	10
<a href="#">Whales and Other Cetaceans:</a>	None
<a href="#">Critical Habitats:</a>	None
<a href="#">Commonwealth Reserves Terrestrial:</a>	None
<a href="#">Australian Marine Parks:</a>	None

## Extra Information

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

<a href="#">State and Territory Reserves:</a>	None
<a href="#">Regional Forest Agreements:</a>	None
<a href="#">Invasive Species:</a>	14
<a href="#">Nationally Important Wetlands:</a>	None
<a href="#">Key Ecological Features (Marine)</a>	None

# Details

## Matters of National Environmental Significance

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

Name	Status	Type of Presence
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#### Birds

<a href="#">Falco hypoleucos</a> Grey Falcon [929]	Vulnerable	Species or species habitat may occur within area
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<a href="#">Leipoa ocellata</a> Malleefowl [934]	Vulnerable	Species or species habitat likely to occur within area
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<a href="#">Pezoporus occidentalis</a> Night Parrot [59350]	Endangered	Species or species habitat may occur within area
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<a href="#">Polytelis alexandrae</a> Princess Parrot, Alexandra's Parrot [758]	Vulnerable	Species or species habitat likely to occur within area
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#### Mammals

<a href="#">Dasyurus geoffroii</a> Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat may occur within area
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### Listed Migratory Species [\[ Resource Information \]](#)

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

Name	Threatened	Type of Presence
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#### Migratory Marine Birds

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

<a href="#">Motacilla cinerea</a> Grey Wagtail [642]		Species or species habitat may occur within area
---	--	--

<a href="#">Motacilla flava</a> Yellow Wagtail [644]		Species or species habitat may occur within area
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#### Migratory Wetlands Species

<a href="#">Actitis hypoleucos</a> Common Sandpiper [59309]		Species or species habitat may occur within area
--	--	--

<a href="#">Calidris acuminata</a> Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
--	--	--



Name	Threatened	Type of Presence
<a href="#">Calidris melanotos</a> Pectoral Sandpiper [858]		Species or species habitat may occur within area
<a href="#">Charadrius veredus</a> Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area
<a href="#">Tringa nebularia</a> Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

## Other Matters Protected by the EPBC Act

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

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

Name	Threatened	Type of Presence
<b>Birds</b>		
<a href="#">Actitis hypoleucos</a> Common Sandpiper [59309]		Species or species habitat may occur within area
<a href="#">Apus pacificus</a> Fork-tailed Swift [678]		Species or species habitat likely to occur within area
<a href="#">Calidris acuminata</a> Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
<a href="#">Calidris melanotos</a> Pectoral Sandpiper [858]		Species or species habitat may occur within area
<a href="#">Charadrius veredus</a> Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area
<a href="#">Chrysococcyx osculans</a> Black-eared Cuckoo [705]		Species or species habitat likely to occur within area
<a href="#">Merops ornatus</a> Rainbow Bee-eater [670]		Species or species habitat may occur within area
<a href="#">Motacilla cinerea</a> Grey Wagtail [642]		Species or species habitat may occur within area
<a href="#">Motacilla flava</a> Yellow Wagtail [644]		Species or species habitat may occur within area
<a href="#">Tringa nebularia</a> Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

## Extra Information

### Invasive Species

[ [Resource Information](#) ]

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

Name	Status	Type of Presence
<b>Birds</b>		
<i>Columba livia</i> Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
<i>Streptopelia senegalensis</i> Laughing Turtle-dove, Laughing Dove [781]		Species or species habitat likely to occur within area
<b>Mammals</b>		
<i>Camelus dromedarius</i> Dromedary, Camel [7]		Species or species habitat likely to occur within area
<i>Canis lupus familiaris</i> Domestic Dog [82654]		Species or species habitat likely to occur within area
<i>Capra hircus</i> Goat [2]		Species or species habitat likely to occur within area
<i>Equus asinus</i> Donkey, Ass [4]		Species or species habitat likely to occur within area
<i>Felis catus</i> Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
<i>Mus musculus</i> House Mouse [120]		Species or species habitat likely to occur within area
<i>Oryctolagus cuniculus</i> Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
<i>Vulpes vulpes</i> Red Fox, Fox [18]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
<b>Plants</b>		
Carrichtera annua Ward's Weed [9511]		Species or species habitat may occur within area
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species habitat may occur within area
Cylindropuntia spp. Prickly Pears [85131]		Species or species habitat likely to occur within area
Tamarix aphylla Athel Pine, Athel Tree, Tamarisk, Athel Tamarisk, Athel Tamarix, Desert Tamarisk, Flowering Cypress, Salt Cedar [16018]		Species or species habitat likely to occur within area



# Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

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

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

# Coordinates

-28.20018 121.33397,-28.2049 121.78223,-28.76603 121.77577,-28.7612 121.32514,-28.20018 121.33397

# Acknowledgements

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

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

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

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

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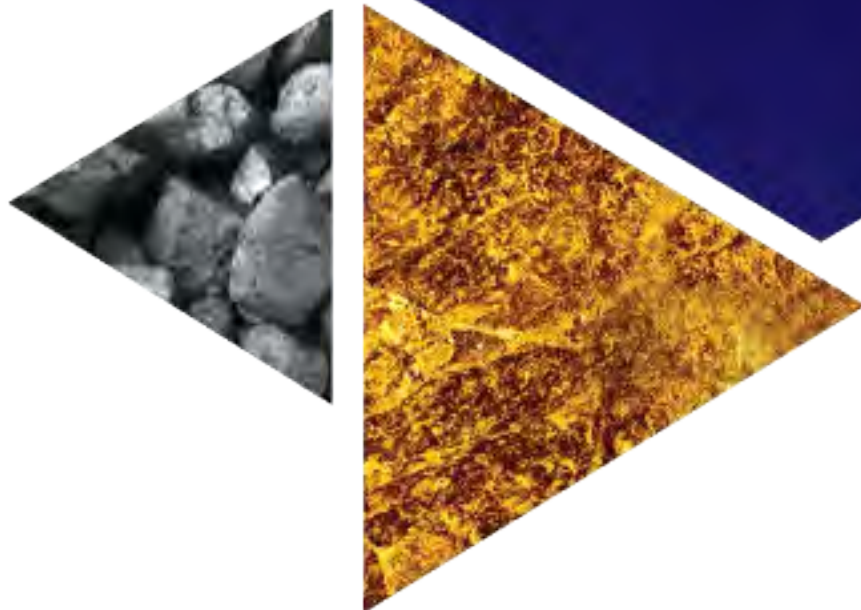
Department of Agriculture Water and the Environment

GPO Box 858

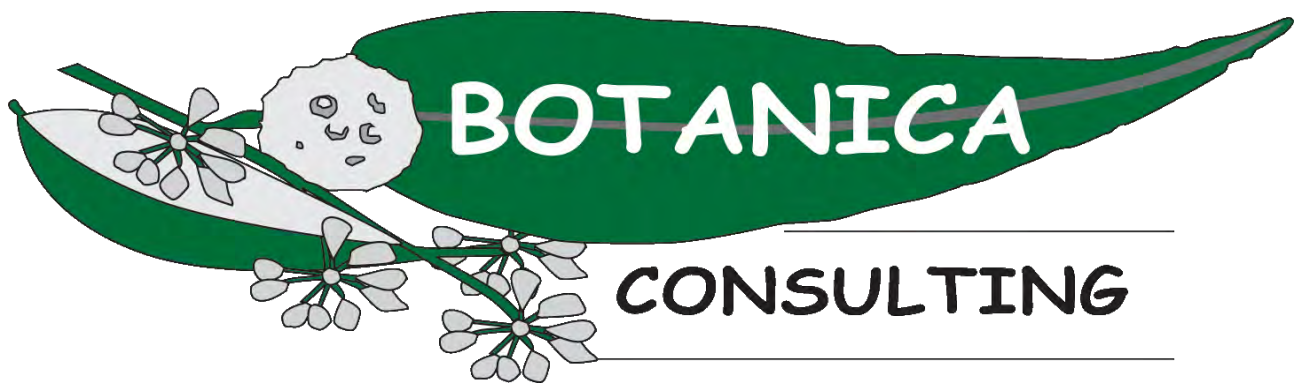
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# Appendix C. Flora and Vegetation Survey







# Detailed Flora and Vegetation Survey of the Redcliffe Gold Project

Prepared For  
Dacian Gold Ltd.



October 2021  
Version FINAL

Prepared by:  
Botanica Consulting Pty Ltd  
33 Brewer Street, Perth, WA 6000

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## Glossary

Acronym	Description
ANCA	Australian Nature Conservation Agency.
BA	Birdlife Australia (Formerly RAOU, Birds Australia).
BAM Act	<i>Biosecurity and Agriculture Management Act</i> 2007, WA Government.
BC Act	<i>Biodiversity Conservation Act</i> 2016, WA Government.
Botanica	Botanica Consulting.
BoM	Bureau of Meteorology.
CAMBA	China Australia Migratory Bird Agreement 1998.
DAFWA	Department of Agriculture and Food (now DPIRD), WA Government.
DAWE	Department Agriculture, Water and Environment (formerly DotEE), Australian Government.
DBCA	Department of Biodiversity, Conservation and Attractions (formerly DPaW), WA Government.
DEC	Department of Environment and Conservation (now DBCA), WA Government.
DER	Department of Environment Regulation (now DWER), WA Government.
DMIRS	Department of Mines, Industry Regulation and Safety (formerly DMP), WA Government.
DMP	Department of Mines and Petroleum (now DMIRS), WA Government.
DotEE	Department of the Environment and Energy (now DAWE), Australian Government.
DoW	Department of Water (now DWER), WA Government.
DPaW	Department of Parks and Wildlife (now DBCA), WA Government.
DPIRD	Department of Primary Industries and Regional Development, WA Government.
DWER	Department of Water and Environmental Regulation (formerly OEPA, DER and DoW), WA Government.
EP Act	<i>Environmental Protection Act 1986</i> , WA Government.
EPA	Environmental Protection Authority, WA Government.
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act</i> 1999, Australian Government.
ESA	Environmentally Sensitive Area.
Ha	Hectare (10,000 square metres).
IBRA	Interim Biogeographic Regionalisation for Australia.
IUCN	International Union for the Conservation of Nature and Natural Resources – commonly known as the World Conservation Union.
JAMBA	Japan Australia Migratory Bird Agreement 1981.
Km	Kilometre (1,000 metres).
MVG	Major Vegetation Groups.
NVIS	National Vegetation Information System.
PEC	Priority Ecological Community.
RAOU	Royal Australia Ornithologist Union.
ROKAMBA	Republic of Korea-Australia Migratory Bird Agreement 2007.
SRE	Short Range Endemic.
SSC	Species Survival Commission, International.
TEC	Threatened Ecological Community.
UCL	Unallocated Crown Land
WA	Western Australia.
WAHERB	Western Australian Herbarium.
WAM	Western Australian Museum, WA Government.
WC Act	<i>Wildlife Conservation Act</i> 1950 (now BC Act), WA Government.

## **EXECUTIVE SUMMARY**

Botanica Consulting Pty Ltd (Botanica) was commissioned by Dacian Gold Ltd. (Dacian) to undertake a detailed flora and vegetation survey of the Redcliffe Gold Project (RGP). The RGP is located approximately 50 km north-east of Leonora, Western Australia. The survey area is 1,731 ha in extent and encompasses the proposed Nambi, Hub, Bindy and Gold Terrace South deposits, as well as the Nambi road alignment. These areas are located within mining tenements M37/134, M37/1286, M37/1276, M37/1295. The flora and vegetations assessment is required to inform and support the development of a Mining Proposal for the RGP.

The study area lies within the Eastern Murchison (MUR1) subregion of the Murchison Bioregion, as defined by the Interim Biogeographic Regionalisation of Australia (IBRA).

The Eastern Murchison comprises the northern parts of the craton's Southern Cross and Eastern Goldfields Terrains and is characterised by internal drainage and extensive areas of elevated red desert sandplains with minimal dune development. Salt Lake systems are associated with the occluded paleodrainage system. Broad plains of red-brown soils and breakaways complexes as well as red sandplains are widespread. Vegetation is dominated by Mulga woodlands and is often rich in ephemerals, hummock grasslands, saltbush shrublands and *Tecticornia* shrublands (Cowan, 2001).

Prior to the field assessment a literature review was undertaken of previous flora assessments conducted within the local region. Documents reviewed included:

- G&G Environmental Pty Ltd (2010). *Flora and Vegetation survey of the Golden Terrace South Tenement, M37/1276*. Unpublished report prepared on behalf of Pacrim Energy Limited.
- Botanica Consulting Pty Ltd (2019). *Reconnaissance Flora/ Vegetation & Fauna Survey Redcliffe Gold Project*. Unpublished report prepared on behalf of NTM Gold Limited.
- Botanica Consulting Pty Ltd. (2021). *Flora, Vegetation and Fauna Assessment of the Leonora-Laverton Road Material Pits (SLK 53, 75 & 76)*. Unpublished report prepared on behalf of Main Roads Western Australia.
- Botanica Consulting Pty Ltd. (2021). *Reconnaissance Flora and Basic Fauna Survey of the Malcom Challenger Project*. Unpublished report prepared on behalf of Kumarina Resources Ltd.

In addition to the literature review, searches of the following databases were undertaken to aid in the compilation of a list of significant flora within the survey area:

- DBCA Threatened/ Priority Flora spatial data (DBCA, 2019a);
- DBCA NatureMap database (DBCA, 2021b); and
- EPBC Protected Matters search tool (DAWE, 2021a).

The NatureMap species search and EPBC Protected Matters search were conducted with a 40 km buffer from the survey area.

The NatureMap search identified 90 vascular flora species as occurring within 40 km of the survey area, representing 50 genera from 25 families. The most diverse families were Scrophulariaceae (16 species), Fabaceae (13 species) and Asteraceae (10 species). Significant genera were *Eremophila* (16 species), *Acacia* (10 species) and *Sclerolaena*, *Atriplex*, *Maireana* and *Eucalyptus* (three species each).

The desktop review identified eight introduced flora (weed) species as potentially occurring in the vicinity of the survey area, representing six families. One species, *Cylindropuntia* spp. (Prickly Pear) is listed as a Declared Pest on the Western Australian Organism List (WAOL) under the *Biosecurity and Agriculture Management (BAM) Act 2007* and as a Weeds of National Significance (WONS). In addition, *Tamarix aphylla* (Athel Tamarisk) is also listed as a WONS.

The desktop assessment identified 16 significant flora species recorded within a 40 km radius of the survey area. These are comprised of three Priority 1, seven Priority 3 and one Priority 4 taxa.

These taxa were assessed for distribution and known habitat to determine their likelihood of occurrence within the survey area. The assessment identified two significant flora taxa as likely to occur in the survey area, consisting of one Priority 3 and one Priority 4 taxa. In addition, nine significant taxa were identified as possibly occurring in the survey area, consisting of three Priority 1 and six Priority 3 taxa.

The Protected Matters search (DAWE, 2021a) did not identify any Threatened Ecological Communities as potentially occurring within the survey area. Analysis of the Priority Ecological Communities within the Midwest region (DBCA, 2021a) did not identify any significant communities as likely or possibly occurring within the survey area.

There are no DBCA managed or interest lands located within or adjacent to the survey area.

There are no Environmentally Sensitive Areas located within or adjacent to the survey area.

There are no Nationally Important or RAMSAR wetlands located within or adjacent to the survey area.

The nearest significant environmental feature is an un-named nature reserve (R46847), located approximately 85 km south of the survey area. Development within the survey area is unlikely to impact the environmental values of this area.

Botanica conducted a detailed flora and vegetation survey on the 13<sup>th</sup>-15<sup>th</sup> July 2021, with the area traversed on foot and 4WD by Jim Williams (Director/Principal Botanist, Diploma of Horticulture) and Jennifer Jackson (Senior Botanist, BSc (Honours) Environmental Management).

A total of 44 quadrats were installed and surveyed, and opportunistic observations were taken throughout the survey effort.

The field survey identified 122 vascular flora taxa within the survey area. These taxa represented 62 genera across 31 families, with the most diverse families being Fabaceae (19 species), Scrophulariaceae (17 species) and Asteraceae (14 species). The most diverse genera were *Eremophila* (17 species), *Acacia* (14 species) and *Maireana* (six species). There were no recorded introduced (weed) species.

No Threatened flora species were recorded within the survey area.

No Priority or otherwise significant flora were recorded within the survey area.

A total of eight broad-scale vegetation communities were identified within the survey area. Vegetation community descriptions and extents were determined from field survey results, aerial imagery interpretation and extrapolation of the communities.

The survey found SLP-AFW1 was the most widespread vegetation type in the survey area, occupying 396.7 ha (22.9%), while B-MWS1 was the most restricted with 9.4 ha (0.5%). Species diversity averaged 34 species per quadrat. The most diverse vegetation type was QRP-AFW1 with 64 species (52.5%), while the least diverse was B-MWS1 with 11 species (9.0%).

Native vegetation within the survey area was rated as 'good' to 'very good'. 'Very Good' condition shows relatively slight signs of damage caused by human activities such as the presence of some relatively non-aggressive weeds or occasional vehicle tracks 'Good' condition depicts more significant damage

caused by human activity since European settlement, including impacts to vegetation structure and composition from historical clearing, significant grazing, changed fire regimes and/or aggressive weeds. Cleared areas associated with mining operations access roads were rated as 'completely degraded'.



# **1 INTRODUCTION**

## **1.1 Project Description**

Botanica Consulting Pty Ltd (Botanica) was commissioned by Dacian Gold Ltd. (Dacian) to undertake a detailed flora and vegetation survey of the Redcliffe Gold Project (RGP). The RGP is located approximately 50 km north-east of Leonora, Western Australia (Figure 1-1). The survey area is 1,731 ha in extent and encompasses the proposed Nambi, Hub, Bindy and Gold Terrace South deposits, as well as the Nambi road alignment. These areas are located within mining tenements M37/134, M37/1286, M37/1276, M37/1295. The flora and vegetation assessment is required to inform and support the development of a Mining Proposal for the RGP.

## **1.2 Objectives**

### **1.2.1 Detailed Flora Survey**

The flora/vegetation assessment was conducted in accordance with the requirements of a detailed survey as defined in *Technical Guidance - Flora and Vegetation Surveys for Environmental Impact Assessment – December 2016* (EPA, 2016a). The objectives of the assessment were to:

- Gather background information on flora and vegetation in the desktop study area (literature review, database and map-based searches);
- Conduct a field survey to verify / ground truth the desktop study findings through reconnaissance survey;
- Define and map vegetation communities of the survey area to a scale appropriate for the Bioregion and described according to the National Vegetation Information System (NVIS) classification (NVIS Level V – Association);
- Record the species composition (abundance and diversity) of each vegetation community within the survey area and compile a species list for the survey area by vegetation type;
- Provide quadrat-based data from plots representative of each vegetation type (minimum of three quadrats per vegetation type) according to Environmental Protection Authority (EPA) guidelines;
- Assess the species composition of each quadrat;
- Determine the local and regional conservation significance of flora and vegetation within the survey area;
- Identify and record the locations of any conservation significant flora/vegetation within the survey area;
- Identify and record the locations of any introduced flora species (including Declared Pests) within the survey area;
- Provide a map showing the distribution of conservation significant flora/vegetation within the survey area; and
- Define and map the condition of vegetation within the survey area in accordance with the vegetation condition rating scale specified in the Environmental Protection Authority (EPA) *Technical Guidance - Flora and Vegetation Surveys for Environmental Impact Assessment – December 2016* (EPA, 2016a).



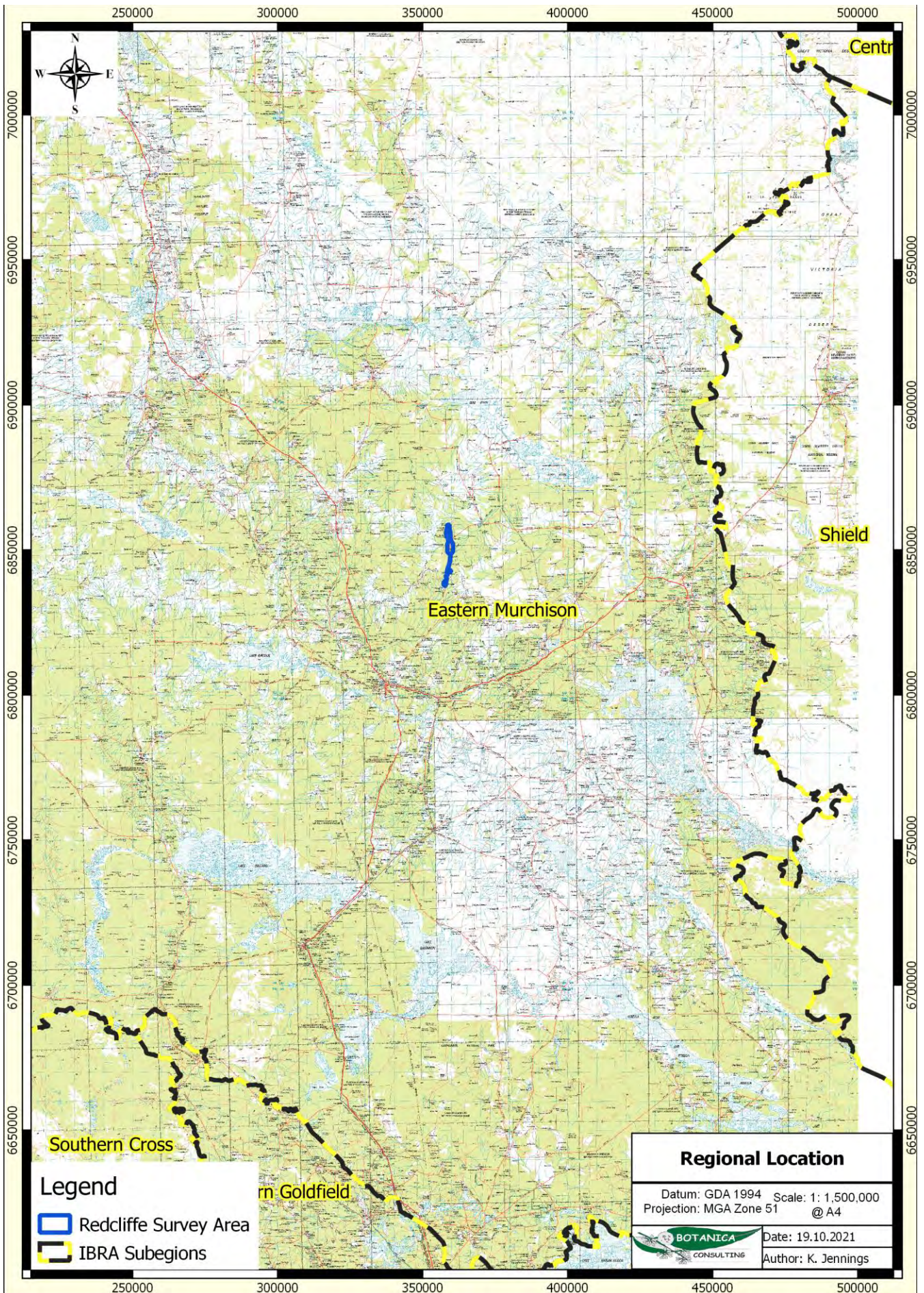


Figure 1-1: Regional location of the survey area



## **2 BIOPHYSICAL ENVIRONMENT**

### **2.1 Regional Environment**

The study area lies within the Eastern Murchison (MUR1) subregion of the Murchison Bioregion, as defined by the Interim Biogeographic Regionalisation of Australia (IBRA).

The Eastern Murchison comprises the northern parts of the craton's Southern Cross and Eastern Goldfields Terrains and is characterised by internal drainage and extensive areas of elevated red desert sandplains with minimal dune development. Salt Lake systems are associated with the occluded paleodrainage system. Broad plains of red-brown soils and breakaways complexes as well as red sandplains are widespread. Vegetation is dominated by Mulga woodlands and is often rich in ephemerals, hummock grasslands, saltbush shrublands and *Tecticornia* shrublands (Cowan, 2001).

In accordance with Beard (1990), the Murchison region is located in the Austin Botanical District within the Eremaean Province of WA. It is defined by the vegetational expression of geological boundaries of the Yilgarn Block, described as Archaean granite with infolded volcanics and meta-sediments (greenstones) of a like age. The topography is undulating, with occasional ranges of low hills and extensive sandplains in the eastern half. The principal soil type is shallow earthy loam overlying red-brown hardpan, with shallow stony loams on hills and red earthy sands on sandplains. The western half of the region more or less coincides with the basin of the Murchison River, the eastern half embraces the drainage of former rivers, now dry, draining towards the Eucla Basin. Vegetation is predominantly mulga low woodland (*Acacia aneura*) on plains, reduced to scrub on hills, with a tree steppe of *Eucalyptus* spp. and *Triodia basedowii* on sandplains. The climate is arid, with summer and winter rains and an average annual precipitation of 200 mm.

## 2.2 Land Use

The dominant land uses of the Eastern Murchison subregion include grazing native pastures (85.47%), unallocated crown reserves (11.34%), conservation (1.4%) and mining (1.79%) (Cowan, 2001). The survey area is located within the Nambi and Mertondale pastoral stations.

## 2.3 Soils and Landscape Systems

The study area lies within the Murchison Province, which consists of hardpan wash plains and sandplains (with some stony plains, hills, mesas and salt lakes) on the granitic rocks and greenstone of the Yilgarn Craton. The Murchison Province is located in the inland Mid-west and northern Goldfields between three Springs, the Gascoyne River, Wiluna, Cosmo Newberry and Menzies. Soil types consist of red loamy earths, red sandy earths, red shallow loams, red deep sands and red-brown hardpan shallow loams with some red shallow sands and red shallow sandy duplexes present. Vegetation communities are predominately Mulga shrublands with spinifex grasslands, with areas of bowgada shrublands, Eucalypt woodlands and halophytic shrublands (Tille, 2006).

The Murchison Province is further divided into soil-landscape zones, with the survey area located within the Salinaland Plains Zone (279). The Salinaland Plains Zone comprises of sandplains (with hardpan wash plains and some mesas, stony plains and salt lakes) on granitic rocks (and some greenstone) of the Yilgarn Craton. Soils include red sandy earths, red deep sands, red shallow loams and red loamy earths with some red-brown hardpan shallow loams, salt lake soils and red shallow sandy duplexes. Vegetation consists of mulga shrublands with spinifex grasslands (and some halophytic shrublands and eucalypt woodlands). This zone is located in the northern Goldfields from Lakes Barlee and Ballard to Wiluna and Laverton (Tille, 2006).

The Salinaland Plains Zone is further divided into soil landscape systems (Government of Western Australia, 2019), with the survey area located within eight soil landscape systems, as described in Table 2-1 and shown in Figure 2-1.

**Table 2-1: Soil landscape systems within the desktop study area/ survey area**

System Name	Description	Area (ha)	% of survey area
Bevon System	Irregular low ironstone hills with stony lower slopes supporting mulga shrublands.	144	8.3
Bullimore System	Gently undulating sandplain with occasional linear dunes and stripped surfaces supporting spinifex grasslands with mallees and acacia shrubs.	28	1.6
Desdemona System	Plains with deep sandy or loamy soils supporting mulga tall shrublands and wanderrie grasses.	30	1.7
Jundee System	Hardpan plains with variable gravelly mantles and minor sandy banks supporting weakly groved mulga shrublands.	769	44.4
Monk System	Hardpan plains with occasional sandy banks supporting mulga tall shrublands and wanderrie grasses.	245	14.2
Nubev System	Gently undulating stony plains, minor limonitic low rises and drainage floors supporting mulga and halophytic shrublands.	35	2
Violet System	Gently undulating gravelly plains on greenstone, laterite and hardpan, with low stony rises and minor saline plains; supporting groved mulga and bowgada shrublands and occasionally chenopod shrublands.	447	25.8
Wyari System	Granite domes, hills and tor fields with gritty-surfaced fringing plains supporting mulga and granite wattle shrublands.	33	1.9



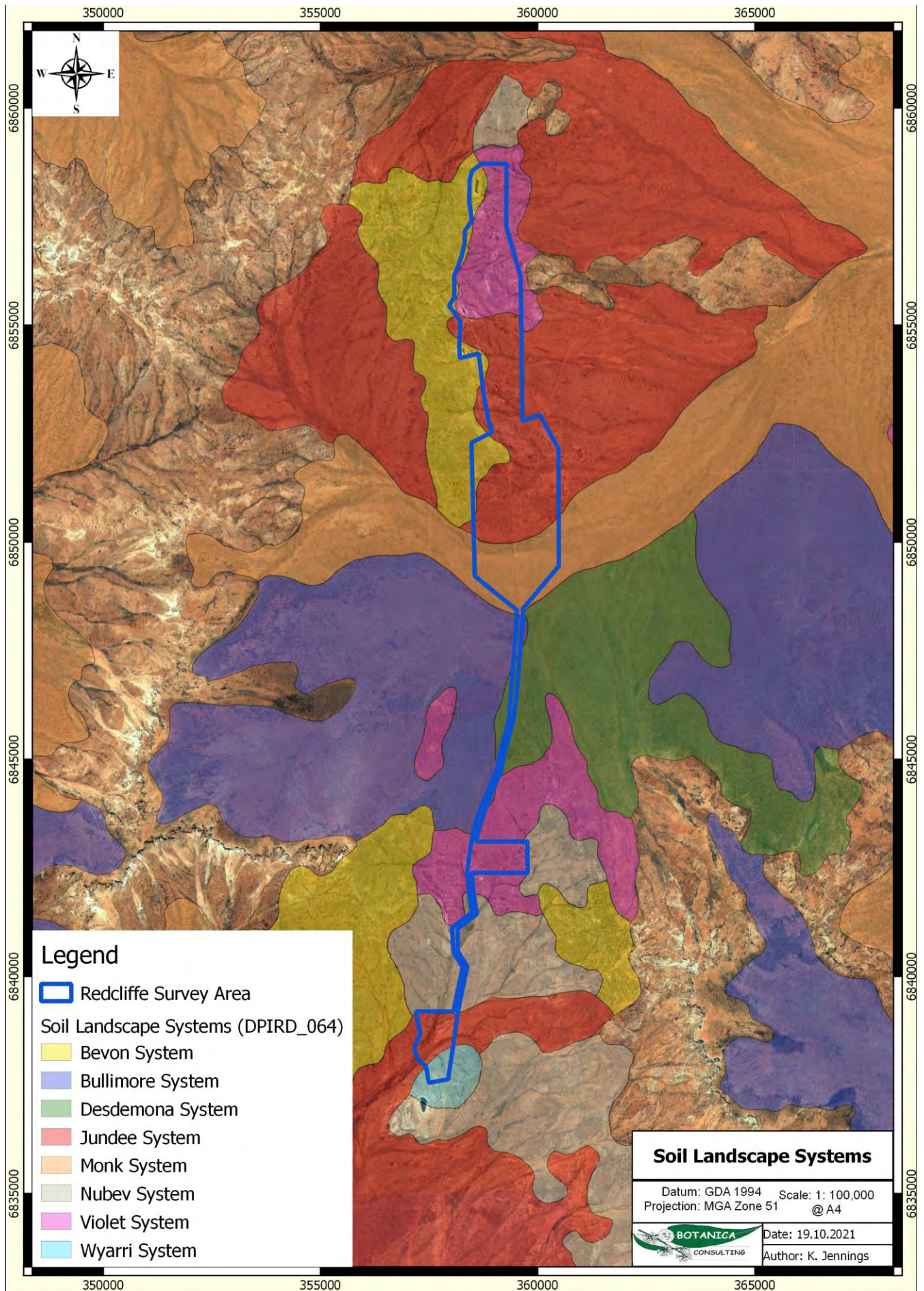


Figure 2-1: Soil landscape systems within the survey area

## 2.4 Regional Vegetation

The vegetation of the Murchison Bioregion is described by Tille (2006) as Mulga (*Acacia aneura*) shrublands and woodlands with gidgee (*A. pruinocarpa*), kurara (*A. tetragonophylla*), *A. linophylla*, bowgada (*A. ramulosa*), jam (*A. acuminata*), minniritchie (*A. grasbyi*), *Senna* spp. and *Eremophila* spp. which dominate the hardpan wash plains. Denser, taller mulga woodlands are found on groves while the sandy banks support mulga, bowgada and kurara shrublands with an understorey of wanderrie grasses (*Eragrostis* and *Eriachne* spp. and *Monachather paradoxa*). Snakewood (*A. xiphophylla*), bluebush (*Maireana* spp.) and saltbush (*Atriplex* spp.) grow on the saline drainage tracts.

The sandplains in the east support grasslands of hard spinifex (*Triodia basedowii*). These grasslands occur with an open tree and shrub steppe of mulga, marble gum (*Eucalyptus gongylocarpa*), mallees (*E. kingsmillii*, *E. longissima*, *E. brachycorys* and *E. youngiana*), bowgada and spinifex wattle (*A. coolgardiensis*). In places denser woodlands of mulga, spinifex wattle or mallee are found over the spinifex. On western sandplains shrublands are dominated by bowgada with cypress pine (*Callitris columellaris*), mallees (e.g. *E. leptopoda* and *E. kingsmillii*), mulga and *Grevillea* spp. On the yellow sandplains in the south-west are closed mixed shrublands with *Melaleuca*, *Hakea*, *Calothamnus*, *Baeckea*, *Banksia prionotes*, *Allocasuarina*. and *Acacia* spp. The mesas have bowgada, mulga and *A. linophylla* shrublands above the breakaways, while the footslopes support shrublands with saltbush (*Atriplex* spp.), *Frankenia* spp., *Ptilotus* spp. and *Eremophila pterocarpa*. The hilly terrain has shrublands of mulga, minniritchie, *Eremophila* spp. and cotton bush (*Ptilotus obovatus*). Hills in the far west have woodlands of York gum (*Eucalyptus loxophleba*), salmon gum (*E. salmonophloia*) and jam (*Acacia acuminata*). The stony plains support shrublands of mulga, gidgee, granite wattle (*Acacia quadrimarginea*), minniritchie, prickly wattle, snakewood, jam and *Eremophila* spp. in the valley floors there are shrublands of samphire (*Tecticornia* spp.), saltbush, sage (*Cratystylis subspinescens*) and *Frankenia* spp. surrounding salt lakes. Floodplains along the Murchison and its tributaries have shrublands of bluebush (*Maireana* spp.), saltbush and *Frankenia* spp., as well as mulga, prickly wattle and *Acacia distans* (Tille 2006).

## 2.5 Conservation Values

The Murchison Bioregion contains 41 vegetation associations (hummock grasslands, succulent steppe or low woodlands) that have at least 85 per cent of their total extent in the Bioregion. The Bioregion is rich and diverse in flora and fauna but most species are wide ranging and usually occur in adjoining regions. A snake (*Pseudechis butleri*) is the only known regionally endemic vertebrate species.

There are six wetlands of national importance in the Bioregion, all of which are salt lakes: Lake Ballard, Lake Barlee, Lake Marmion, Lake Wooleen, Lake Breberle and Lake Anneen. There is one wetland of regional importance within the Murchison Bioregion; the Mungawolagudgi Claypan on Muggon Station.

No ecosystems are listed as threatened under WA State legislation occur within the Murchison Bioregion, but 52 communities and vegetation associations are thought to be at risk for a variety of reasons. Grazing from livestock, goats and rabbits and changed fire regimes are the main threatening processes in the region, with clearing, impacts of mining, erosion and sedimentation also causing significant impacts.

## 2.6 Climate

The climate of the Eastern Murchison subregion is characterised as an arid climate with mainly winter rainfall and annual rainfall of approximately 200 millimetres (mm) (Beard, 1990); Cowan, 2001b). Rainfall data for the Leonora aero weather station (#12241), located approximately 45 km south-west of the survey area is shown in Figure 2-2. Rainfall received prior to the field survey (July-August) was above average due to significant rains in July, although rain for June was below average. Climate conditions are not expected to be a limiting factor to the survey.

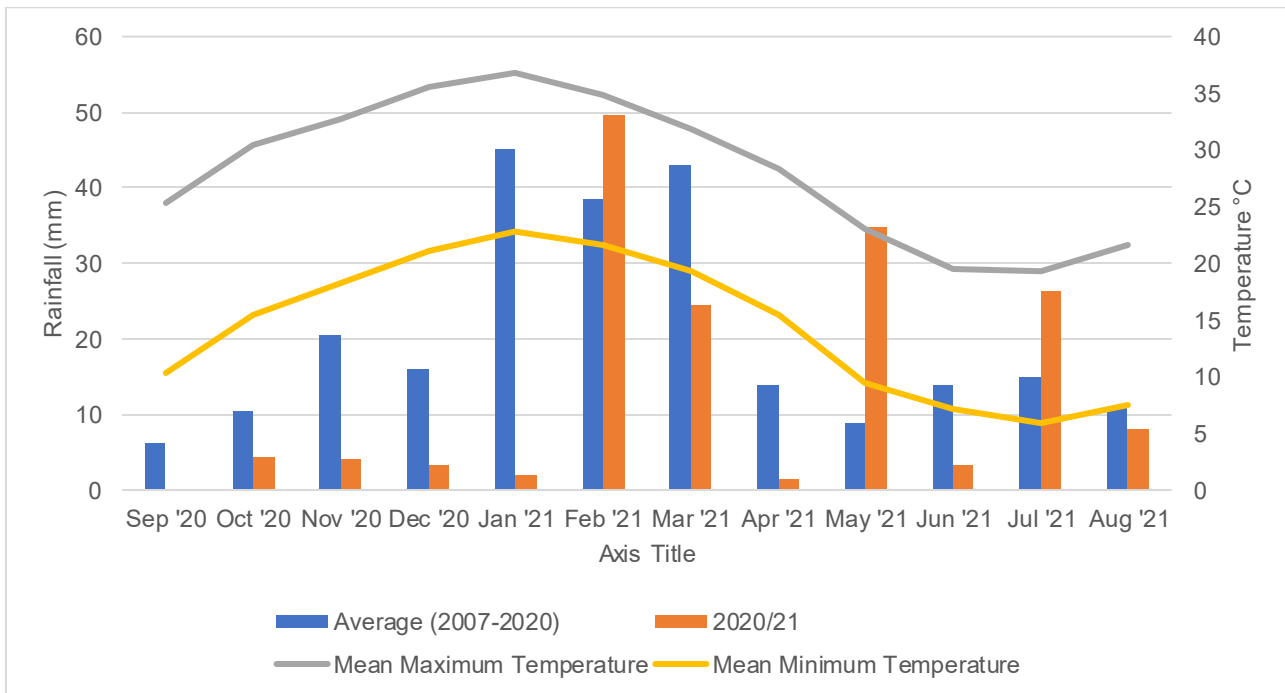


Figure 2-2: Rainfall and temperature data for Leonora aero weather station (#12241) (BOM, 2021a)

## 2.7 Hydrology

According to the Geoscience Australia database (2015) there are no surface water bodies within the survey area. However, there are several ephemeral drainage lines that intersect the survey area, including Dillon Creek (Figure 2-3).

Groundwater Dependent Ecosystems (GDE) includes biological assemblages of species such as wetlands or woodlands that use groundwater either opportunistically or as their primary water source. For the purposes of this report, a GDE is defined as any vegetation community that derives part of its water budget from groundwater and must be assumed to have some degree of groundwater dependency. According to the BoM *Atlas of Groundwater Dependent Ecosystems* (BoM, 2021b) database, there are no known or potential aquatic GDE's within the survey area (Figure 2-3).

The survey area has low potential to contain a terrestrial GDE, described as 'hardpan plains with occasional sandy banks supporting mulga tall shrublands and wanderrie grasses' (BoM, 2021b).



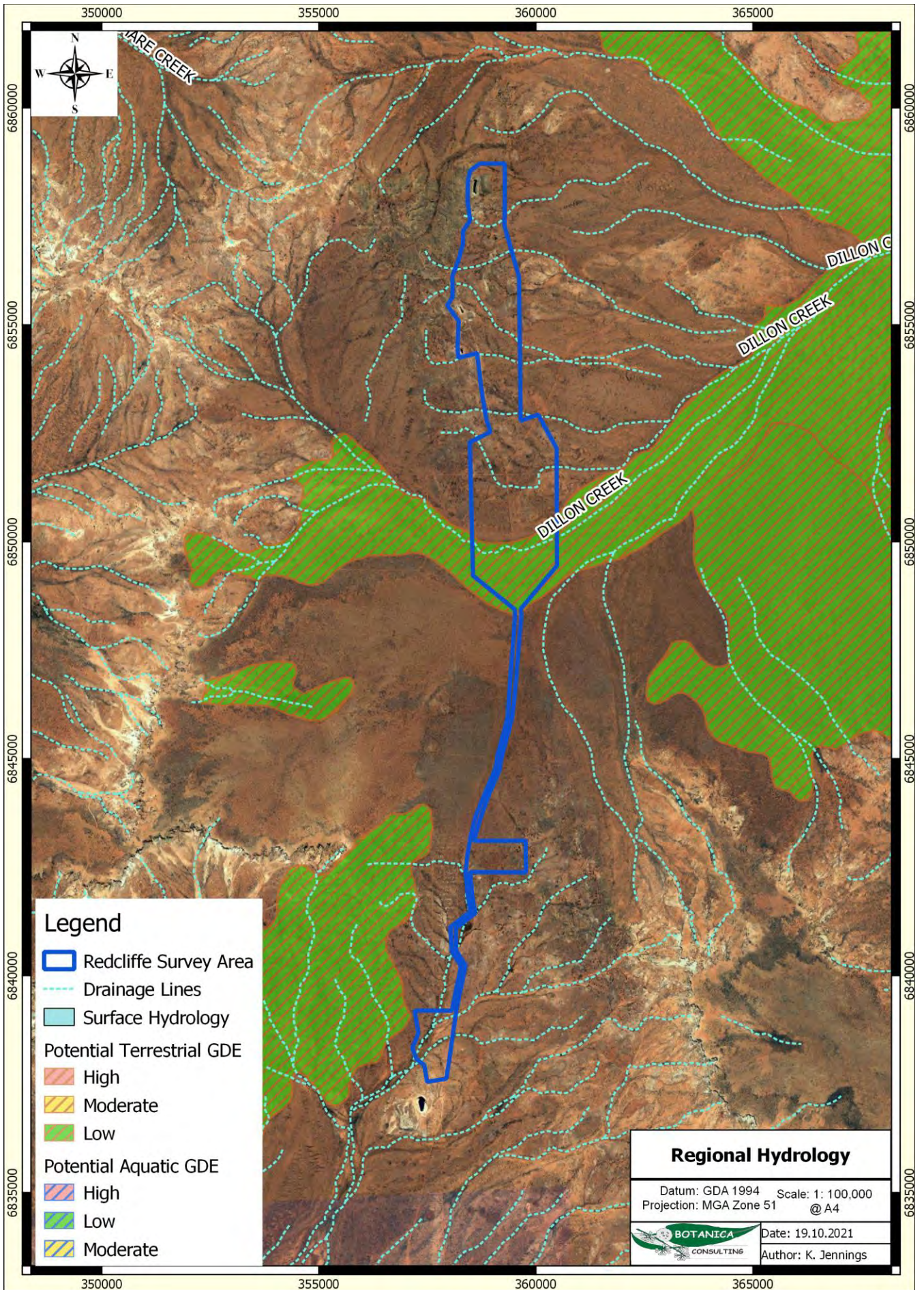


Figure 2-3: Regional hydrology of the survey area



### **3 SURVEY METHODOLOGY**

#### **3.1 Desktop Assessment**

Prior to the field assessment a literature review was undertaken of previous flora assessments conducted within the local region. Documents reviewed included:

- G&G Environmental Pty Ltd (2010). *Flora and Vegetation survey of the Golden Terrace South Tenement, M37/1276*. Unpublished report prepared on behalf of Pacrim Energy Limited.
- Botanica Consulting Pty Ltd (2019). *Reconnaissance Flora/ Vegetation & Fauna Survey Redcliffe Gold Project*. Unpublished report prepared on behalf of NTM Gold Limited.
- Botanica Consulting Pty Ltd. (2021). *Flora, Vegetation and Fauna Assessment of the Leonora-Laverton Road Material Pits (SLK 53, 75 & 76)*. Unpublished report prepared on behalf of Main Roads Western Australia.
- Botanica Consulting Pty Ltd. (2021). *Reconnaissance Flora and Basic Fauna Survey of the Malcom Challenger Project*. Unpublished report prepared on behalf of Kumarina Resources Ltd.

In addition to the literature review, searches of the following databases were undertaken to aid in the compilation of a list of significant flora within the survey area:

- DBCA Threatened/ Priority Flora spatial data (DBCA, 2019a);
- DBCA NatureMap database (DBCA, 2021b); and
- EPBC Protected Matters search tool (DAWE, 2021a).

The NatureMap species search and EPBC Protected Matters search were conducted with a 40 km buffer from the survey area.

Significant flora identified by the desktop review were assessed with regards to their population extent and distribution and preferred habitat to determine their likelihood of occurrence within the survey area.

The assessment categorised flora species as follows:

- Unlikely- Suitable habitat is not expected to occur and/or the survey area is outside the known range of the species.
- Possible- Suitable habitat may be present, and the area is within the known range of the species. This option is also used when there is insufficient information to determine the preferred habitat of a species.
- Likely- Suitable habitat is expected to occur and there are records within 10 km of the survey area.
- Previously Recorded- A record for this species is located within the survey area. Field survey will ground-truth currently occurring individuals and populations.

It should be noted that these lists are based on observations from a broader area than the assessment area (40 km radius) and therefore may include taxa not present. The databases also often include very old records that may be incorrect or in some cases the taxa in question have become locally or regionally extinct. Information from these sources should therefore be taken as indicative only and local knowledge and information also needs to be taken into consideration when determining what actual species may be present within the specific area being investigated.

The conservation significance of flora taxa was assessed using data from the following sources:

- *Environment Protection and Biodiversity and Conservation (EPBC) Act 1999*. Administered by the Australian Government (DAWE);
- *Biodiversity Conservation (BC) Act 2016*. Administered by the WA Government (DBCA); and
- Priority Flora list. A non-legislative list maintained by DBCA for management purposes (released December 2018).

### **3.2 Flora Field Assessment**

Botanica conducted a detailed flora/ vegetation survey on the 13<sup>th</sup>-15<sup>th</sup> July 2021, with the area traversed on foot and 4WD by Jim Williams (Director/Principal Botanist, Diploma of Horticulture) and Jennifer Jackson (Senior Botanist, BSc (Honours) Environmental Management).

A total of 44 quadrats were installed and surveyed, and opportunistic observations were taken throughout the survey effort. The location of quadrats within the survey area and the GPS track log from the field survey are shown in Figure 3-1 and Figure 3-2. The geographic locations (Easting/ Northing (GDA 94, Zone 51)) of the north-west corner of the quadrats are listed in Appendix 3.



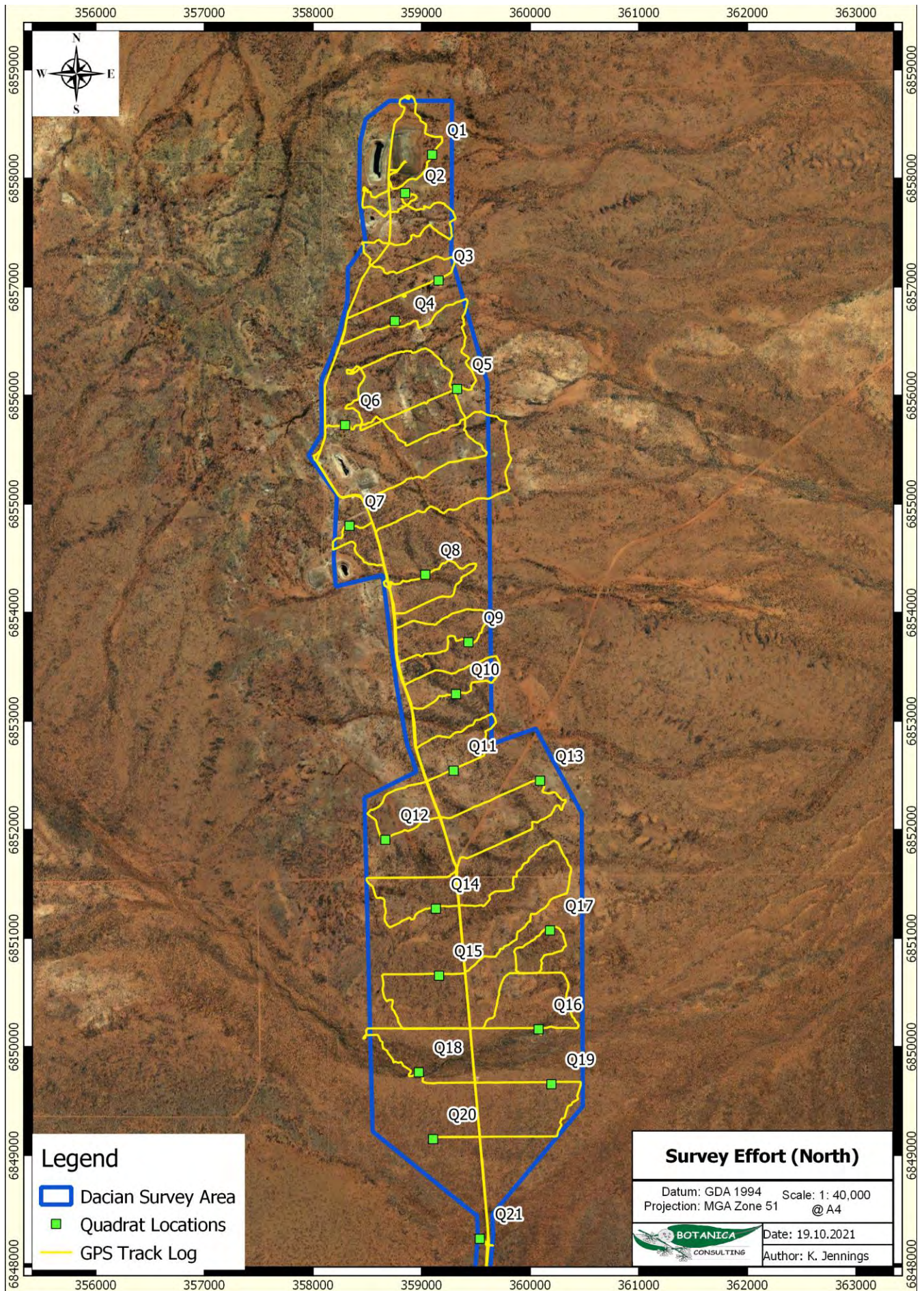


Figure 3-1: Quadrat locations and field survey effort (North)



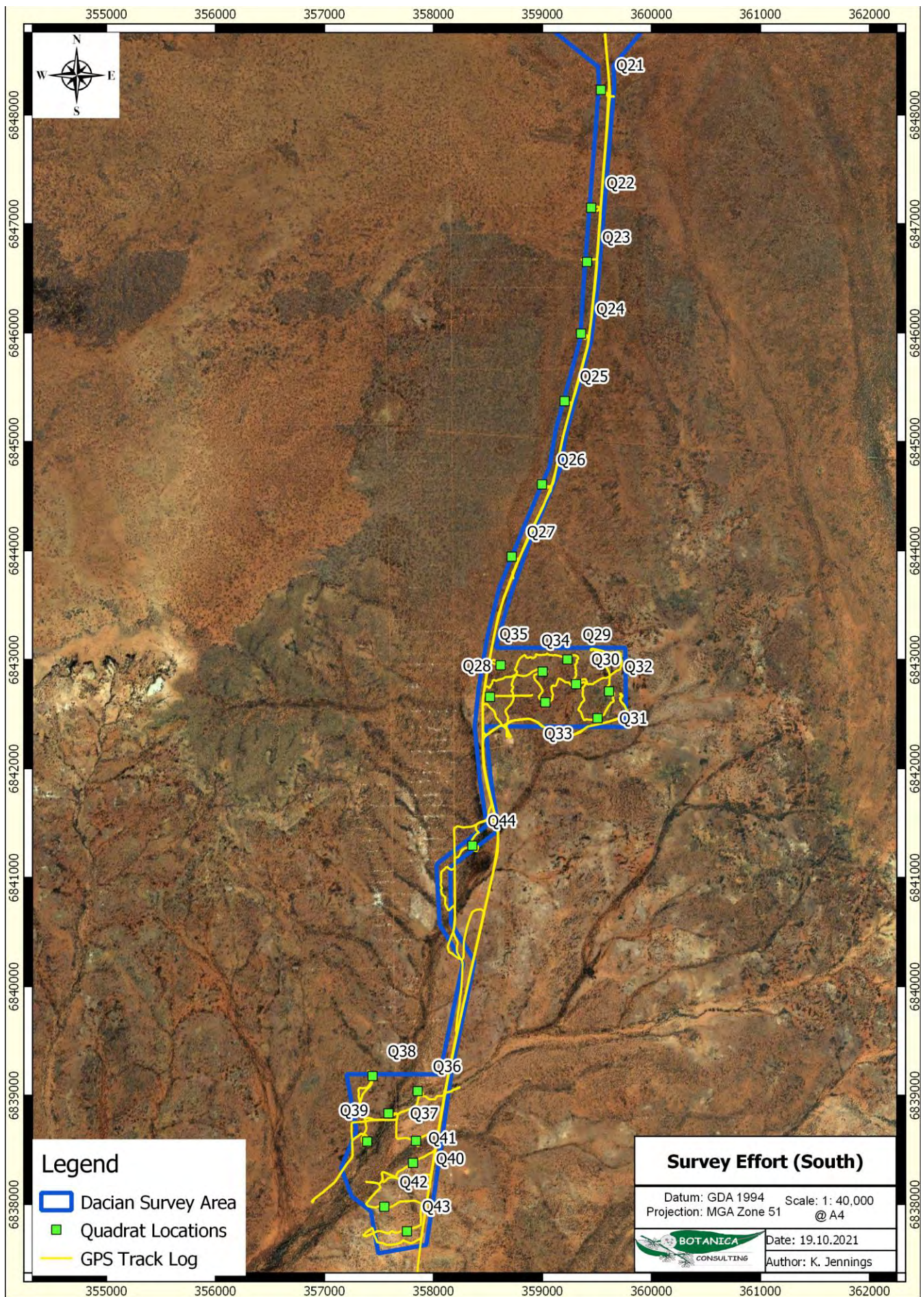


Figure 3-2: Quadrat locations and field survey effort (South)



### 3.2.1 Vegetation Mapping

Prior to the commencement of field work, aerial photography was inspected and obvious differences in the vegetation assemblages were identified. The different vegetation types identified were then inspected during the field survey to assess their validity. A handheld GPS unit was used to record the coordinates of the boundaries between vegetation types.

At each sample point, the following information was recorded:

- GPS location;
- Photograph of vegetation;
- Dominant taxa for each stratum (including height and percentage cover of dominant taxa);
- All vascular taxa (including annual taxa);
- Landform classification;
- Vegetation condition rating;
- Collection and documentation of unknown plant specimens; and
- Collection of flora of conservation significance if encountered.

Vegetation types were classified in accordance with the NVIS Level V-Association classification.

### 3.2.2 Detailed Flora and Vegetation Survey

A total of 44 quadrats were established within the survey area (Figure 3-1 and Appendix 3). According to the recommended quadrat size specified in the Environmental Protection Authority (EPA) Guidelines, 20m X 20m quadrats are recommended for the Murchison Bioregion. However, due to the low level of species richness present within the survey area, 50m X 50m quadrats were established to allow for a better representation of species composition. The quadrats were established by inserting metal pickets into the NW corner and measuring the length of the resultant boundaries to verify the quadrats were 50 m X 50 m (square quadrats). The objective was to have at least three quadrats per vegetation type to capture the floristic variations within the survey area. Quadrats were not established within regrowth/modified vegetation.

Following their establishment and boundary verification, the NW corner of each quadrat was recorded by GPS and three photographs of the quadrat were taken from the NW corner. All vascular plants within the quadrat were recorded (Appendix 8). This included recording of dominant taxa from the upper, middle and lower stratum, and sampling of all unknown taxa. Unknown taxa were identified using Botanica's own reference herbarium and relevant taxonomic keys or by a taxonomic consultant. Data on level of disturbance, presence of coarse fragments on surface, topographical position, elevation, aspect, percentage litter, percentage bare ground, percentage surface rock (bedrock and surface deposits), soil types (colour, profile, field texture and surface type), and vegetation structure were collected from each quadrat (Appendix 8). Methods of recording data from these quadrats largely follow those outlined in CSIRO's *Australian Soil and Land Survey Field Handbook* (McDonald *et al.* 1998) and in accordance with EPA Guidelines (2016). Presence/absence data of taxa from sample sites were used to compile the representative vegetation types.

### 3.2.3 Flora Identification

Unknown specimens collected during the survey were identified with the aid of samples housed at the Botanica Herbarium and the Western Australian Herbarium.

## 3.3 Data Analysis Tools

Following field assessments, vegetation types and condition were mapped using the GIS program QGIS, and the hectare area/ percentage area of each vegetation type and within the survey area was

calculated. Spatial maps illustrating the location of vegetation types and any significant flora and/or vegetation were generated using QGIS.

### 3.3.1 PATN Analysis

The PATN software package was used to assess the similarities/ dissimilarities between quadrats based on presence/absence of species. A total of 51 species were excluded from the analysis; 26 annuals and 25 singleton species. A total of 59 taxa recorded within the quadrats were included in the analysis.

The analysis produced a quantitative estimate of the relationship between species composition of each quadrat. The classifications were based upon a Bray-Curtis association matrix using a flexible Unweighted Pair Group Arithmetic Mean (UPGMA) method (with a beta value of -0.1) which standardises the data enabling the analysis to be completed. Semi-strong hybrid (SSH) ordination of the quadrat is then undertaken to show spatial relationships between groups and to elucidate possible environmental correlates with the classification.

The analysis also produced a stress value which is a measure of the 'strength' of the analysis (i.e. how well the quadrats are grouped together into the appropriate floristic groups). The lower the stress value the greater the strength of the analysis with a value of less than 0.3 showing that the analysis appropriately grouped quadrats. A stress value greater than 0.3 suggests that the analysis was unable to group quadrats appropriately due to extraneous variables (i.e. other factors influencing differences in floristic groups other than species composition e.g. fire, clearing disturbance etc.).

### 3.3.2 EstimateS

EstimateS software was used to estimate species richness present using the Chao2 richness estimator. For any number of samples, the estimator uses the existing pattern of species accumulation to estimate the true number of species at a site. The estimators tend to under-estimate species number when sample size is small, hence the estimated number of true species can be seen to increase with sample size. This software was also used to compute Coleman rarefaction curves estimates which were used to calculate species accumulation curves.

## 3.4 Scientific Licences

Table 3-1: Scientific Licences of Botanica Staff coordinating the survey

Licensed staff	Permit Number	Valid Until
Jim Williams	FB62000108 (Licence to flora for scientific purposes)	27/05/2022
Jennifer Jackson	FB62000309 (Licence to take flora for scientific purposes)	11/01/2024

### 3.5 Survey Limitations and Constraints

It is important to note that flora and vegetation surveys will entail limitations notwithstanding careful planning and design. Potential limitations are listed in Table 3-2.

**Table 3-2: Limitations and constraints associated with the flora and vegetation survey**

Variable	Potential Impact on Survey	Details
Access problems	Not a constraint	The survey was conducted via 4WD and on foot. Numerous access tracks were present within the survey area providing ease of access.
Competency/ Experience	Not a constraint	The Botanica personnel that conducted the survey were regarded as suitably qualified and experienced. <b>Coordinating Staff:</b> Jim Williams (Botanist) <b>Field Staff:</b> Jim Williams and Jennifer Jackson <b>Data Interpretation:</b> Jim Williams, Jennifer Jackson and Kelby Jennings.
Timing of survey, weather & season	Not a constraint	Fieldwork was conducted in July 2021, within the EPA recommended approximate timing (6-8 weeks post wet season). Flowering material was available and multiple annual species were present and able to be identified to species level.
Area disturbance	Not a constraint	The majority of the survey area was in very good condition and comprised of native vegetation. Disturbance in the area was a result of access roads and historical mining activity.
Survey Effort/ Extent	Not a constraint	Survey intensity was appropriate for the size/significance of the area with a detailed flora and vegetation survey completed to identify vegetation types and significant flora and vegetation.
Availability of contextual information at a regional and local scale	Not a constraint	Conservation significant flora database searches provided by the DBCA were used to identify any potential locations of Threatened/Priority flora species.  BoM, DWER, DPIRD, DBCA and DAWE databases were reviewed to obtain appropriate regional desktop information on the biophysical environment of the local region.  Botanica has conducted a number of surveys within the Murchison Bioregion and was also able to obtain information about the area from previous research conducted within the area. Results of previous assessments in the local area were reviewed to provide context on the local environment.
Data Analysis	Minor constraint	Botanica staff conducting the PATN statistical analyses are not statistical analysts and have basic statistics training. These analyses were used to provide basic information on the relationships between vegetation communities delineated in the field.
Completeness	Not a constraint	In the opinion of Botanica, the survey area was covered sufficiently in order to identify vegetation assemblages. Survey work was conducted within EPAs recommended approximate timing (6-8 weeks post wet season), and multiple annual species were present and able to be identified to species level.  The vegetation associations for this study were based on visual descriptions of locations in the field. The distribution of these vegetation associations outside the study area is not known, however vegetation associations identified were categorised via comparison to vegetation distributions throughout WA given on NVIS (DotEE, 2017).



## 4 **RESULTS**

### 4.1 **Desktop Assessment**

#### 4.1.1 **Flora**

The NatureMap search identified 90 vascular flora species as occurring within 40 km of the survey area, representing 50 genera from 25 families. The most diverse families were Scrophulariaceae (16 species), Fabaceae (13 species) and Asteraceae (10 species). Significant genera were *Eremophila* (16 species), *Acacia* (10 species) and *Sclerolaena*, *Atriplex*, *Maireana* and *Eucalyptus* (three species each). This total includes no introduced (weed) species.

##### 4.1.1.1 **Introduced Flora**

The desktop review identified eight introduced flora (weed) species as potentially occurring in the vicinity of the survey area, representing six families. One species, *Cylindropuntia* spp. (Prickly Pear) is listed as a Declared Pest on the Western Australian Organism List (WAOL) under the *Biosecurity and Agriculture Management (BAM) Act 2007* and as a Weeds of National Significance (WONS). In addition, *Tamarix aphylla* (Athel Tamarisk) is also listed as a WONS.

The full list of potential weed species is contained in Appendix 2.

##### 4.1.1.2 **Significant Flora**

The assessment of the DBCA Priority/ Threatened flora data (DBCA, 2019a), NatureMap search (DBCA, 2021b), Protected Matters searches (DAWE, 2021a) and previous relevant literature identified 12 significant flora species recorded within a 40 km radius of the survey area. These are comprised of three Priority 1, eight Priority 3 and one Priority 4 taxa (Appendix 4).

These taxa were assessed for distribution and known habitat to determine their likelihood of occurrence within the survey area. The assessment identified two significant flora taxa as likely to occur in the survey area, consisting of one Priority 3 and one Priority 4 taxa. In addition, nine significant taxa were identified as possibly occurring in the survey area, consisting of three Priority 1 and six Priority 3 taxa (Table 4-1). The full flora likelihood assessment is listed in Appendix 4. The locations of the DBCA database records are illustrated spatially in Figure 4-1.

**Table 4-1: Potentially occurring significant flora species**

DBCA Rank	Taxon	Habitat	Comments	Likelihood
P1	<i>Acacia websteri</i>	Red sand, clay or loam. Low-lying areas, flats.	Recorded within 40 km, habitat may be present	Possible
	<i>Philothea tubiflora</i>	Rocky rises & hills, outcrops	Recorded within 40 km, habitat may be present	Possible
	<i>Stenanthemum patens</i>	Rocky hillside.	Recorded within 40 km, habitat may be present	Possible
P3	<i>Acacia</i> sp. Marshall Pool (G. Cockerton 3024)	-	Little known, records within 30km.	Possible
	<i>Calytrix praecipua</i>	Skeletal sandy soils over granite or laterite. Breakaways, outcrops.	Recorded within 40 km, habitat may be present	Possible
	<i>Cratystylis centralis</i>	Red sandy loam with ironstone gravel. Flat plains, breakaway country.	Recorded within 40 km, habitat may be present	Possible
	<i>Eremophila annosicaulis</i>	On stony loams (ironstone laterite).	Recorded within 40 km, habitat may be present	Possible
	<i>Eremophila shonae</i> subsp. <i>diffusa</i>	Stony yellow or red sandy soils	Recorded within 10 km, habitat may be present	Possible
	<i>Eremophila simulans</i> subsp. <i>megacalyx</i>	-	Recorded within 20 km, habitat may be present	Possible
	<i>Hybanthus floribundus</i> subsp. <i>chloroxanthus</i>	Dark red-brown soil, never sandy, rich in iron oxide, laterite. Rocky areas, creek banks, along drainage lines.	Recorded within 40 km, habitat may be present	Possible
P4	<i>Hemigenia exilis</i>	Laterite. Breakaways, slopes.	Recorded within 40 km, habitat likely to be present	Likely

## 4.1.2 Vegetation and Ecological Communities

### 4.1.2.1 Vegetation Associations

The Pre-European vegetation association spatial mapping dataset (DPIRD, 2018) identified two vegetation associations as occurring within the survey area (Table 4-2). The association descriptions and their remaining extents, as specified in the 2018 Statewide Vegetation Statistics (DBCA, 2019b) are provided in Table 4-2. Areas retaining less than 30% of their pre-European vegetation extent generally experience exponentially accelerated species loss, while areas with less than 10% are considered “endangered” (EPA, 2000). All vegetation associations retain >99% of their pre-European extent, and development within the survey area will not significantly reduce the current extent of these vegetation associations.

**Table 4-2: Pre-European Vegetation Associations within the survey area**

Vegetation Association	Current Extent (ha)	Pre-European extent remaining	% Protected for Conservation	Floristic Description	Extent within Survey Area
Laverton 18	2,339,335	99.95	-	Low woodland; mulga ( <i>Acacia aneura</i> )	1,669 ha (96.4%)
Laverton 109	152,223	99.37	-	Hummock grasslands, shrub steppe; <i>Eucalyptus youngiana</i> over hard spinifex	62 ha (3.6%)

### 4.1.2.2 Significant Ecological Communities

The Protected Matters search (DAWE, 2021a) did not identify any Threatened Ecological Communities as potentially occurring within the survey area. Analysis of the Priority Ecological Communities within the Midwest region (DBCA, 2021a) did not identify any significant communities as likely or possibly occurring within the survey area.



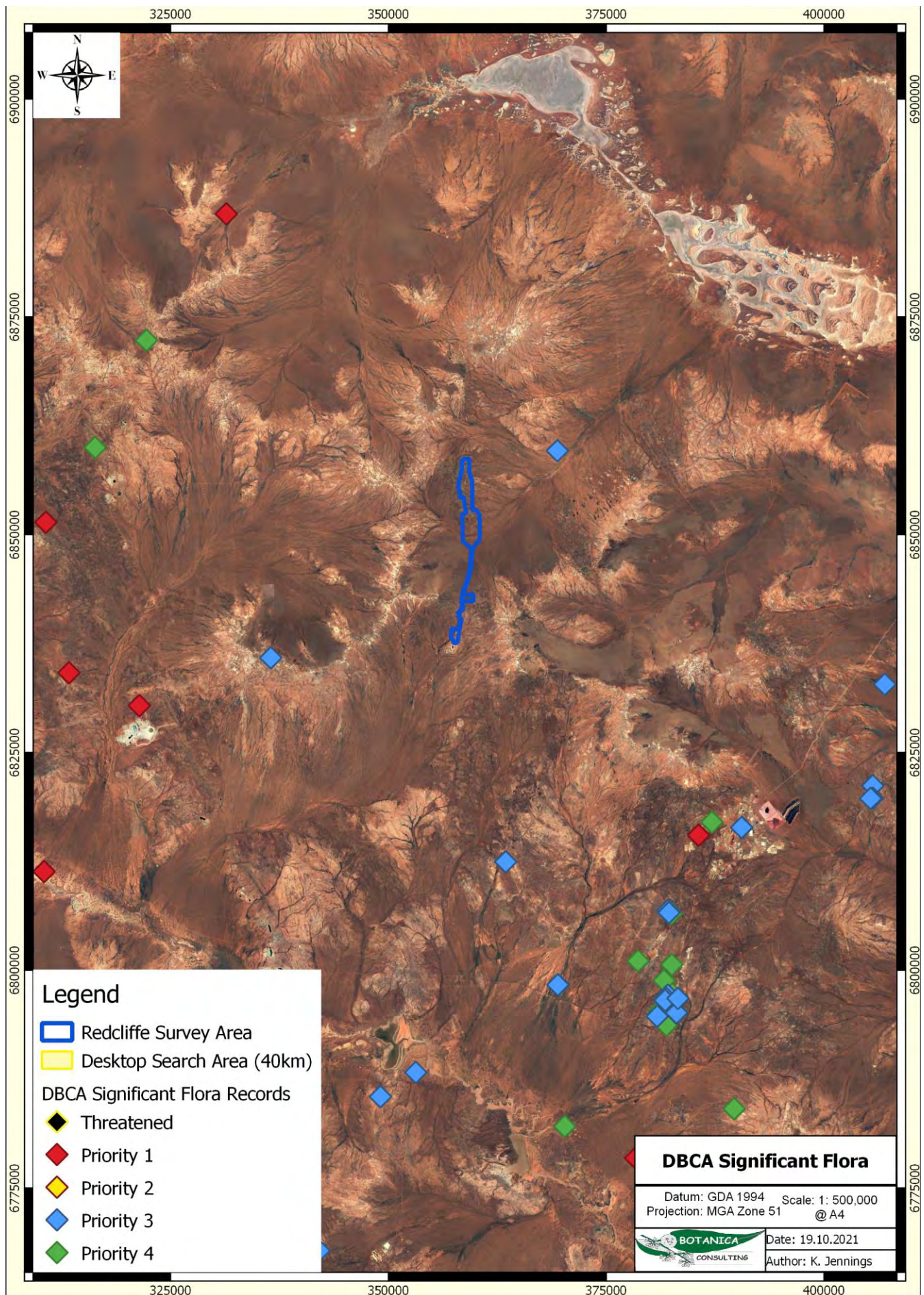


Figure 4-1: Significant flora within the desktop search area (40 km)

### **4.1.3 Conservation Areas**

There are no DBCA managed or interest lands located within or adjacent to the survey area.

There are no Environmentally Sensitive Areas located within or adjacent to the survey area.

There are no Nationally Important or RAMSAR wetlands located within or adjacent to the survey area.

The nearest significant environmental feature is an un-named nature reserve (R46847), located approximately 85 km south of the survey area. Development within the survey area is unlikely to impact the environmental values of this reserve. The location of proposed and vested Conservation Reserves, ESA's and Nationally Important Wetlands in relation to the survey area is provided in Figure 4-2.



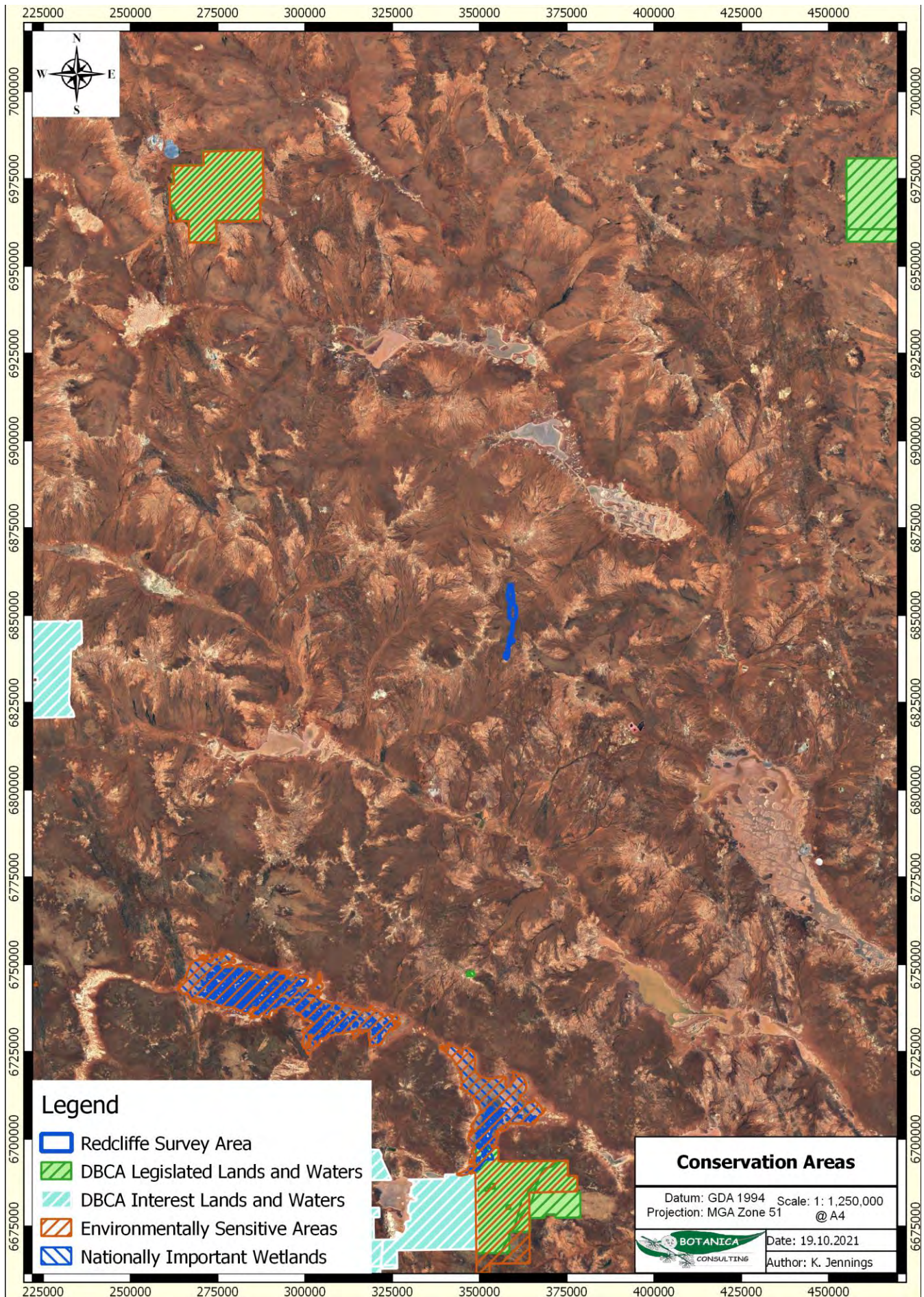


Figure 4-2: Conservation Areas



## 4.2 Field Assessment

### 4.2.1 Flora

The field survey identified 122 vascular flora taxa within the survey area. These taxa represented 62 genera across 31 families, with the most diverse families being Fabaceae (19 species), Scrophulariaceae (17 species) and Asteraceae (14 species). The most diverse genera were *Eremophila* (17 species), *Acacia* (14 species) and *Maireana* (six species). There were no recorded introduced (weed) species. The full field species inventory is listed in Appendix 5.

#### 4.2.1.1 Significant Flora

According to the EPA *Environmental Factor Guideline for Flora and Vegetation* (EPA, 2016b) significant flora includes:

- flora being identified as threatened or priority species;
- locally endemic flora or flora associated with a restricted habitat type (e.g. surface water or groundwater dependent ecosystems);
- new species or anomalous features that indicate a potential new species;
- flora representative of the range of a species (particularly, at the extremes of range, recently discovered range extensions, or isolated outliers of the main range);
- unusual species, including restricted subspecies, varieties or naturally occurring hybrids; and
- flora with relictual status, being representative of taxonomic groups that no longer occur widely in the broader landscape.

No Threatened flora species were recorded within the survey area. No Priority or otherwise significant flora were recorded within the survey area.



### 4.2.2 Vegetation Communities



A total of eight broad-scale vegetation communities were identified within the survey area. Vegetation community descriptions and extents were determined from field survey results, aerial imagery interpretation and extrapolation of the communities. Vegetation community descriptions and extent are listed below in Table 4-3 and illustrated spatially in Figure 4-3 and Figure 4-4.

The survey found SLP-AFW1 was the most widespread vegetation type in the survey area, occupying 396.7 ha (22.9%), while B-MWS1 was the most restricted with 9.4 ha (0.5%). Species diversity averaged 34 species per quadrat. The most diverse vegetation type was QRP-AFW1 with 64 species (52.5%), while the least diverse was B-MWS1 with 11 species (9.0%).





Table 4-3: Summary of vegetation types within the survey area



Landform	Vegetation Community	Broad Floristic Formation (NVIS III)	Vegetation Description (NVIS V)	Image
Breakaway	B-AFW1 17.8 ha (1.0%)	Acacia Forests and Woodlands (MVG 6)	Low woodland of <i>Acacia quadrimarginea</i> over tall shrubland of <i>Acacia ramulosa</i> var. <i>linophylla</i> / <i>Thryptomene decussata</i> and low open shrubland of <i>Calytrix uncinata</i> / <i>Eremophila latrobei</i> on breakaway	
Breakaway	B-MWS1 9.4 ha (0.5%)	Mallee Woodlands and Shrublands (MVG 14)	Mid open mallee forest of <i>Eucalyptus carnei</i> over mid sparse shrubland of <i>Eremophila pantonii</i> and low shrubland of <i>Olearia muelleri</i> / <i>Ptilotus obovatus</i> on breakaway	

Landform	Vegetation Community	Broad Floristic Formation (NVIS III)	Vegetation Description (NVIS V)	Image
Drainage Depression	DD-AFW1 54.5 ha (3.1%)	Acacia Forests and Woodlands (MVG 6)	Low woodland of <i>Acacia incurvaneura</i> , <i>A. tetragonophylla</i> and <i>A. burkittii</i> over sparse shrubland of <i>Eremophila citrina</i> , <i>Senna artemisioides</i> subsp. <i>artemisioides</i> and <i>Grevillea deflexa</i> over low sparse shrubland of <i>Ptilotus obovatus</i> var. <i>obovatus</i> , <i>Lepidium platypetalum</i> and <i>Roepera eremaea</i>	
Open Depression	OD-AFW1 330.1 ha (15.9%)	Acacia Forests and Woodlands (MVG 6)	Low open forest of <i>Acacia caesaneura</i> / <i>A. incurvaneura</i> over tall shrubland of <i>Acacia ramulosa</i> / <i>A. tetragonophylla</i> and low tussock grassland of <i>Eragrostis eriopoda</i> in drainage line	



Landform	Vegetation Community	Broad Floristic Formation (NVIS III)	Vegetation Description (NVIS V)	Image
Quartz Rocky Plain	QRP-AFW1 732.4 ha (42.3%)	Acacia Forests and Woodlands (MVG 6)	Low open forest of <i>Acacia caesaneura</i> / <i>A. incurvaneura</i> over tall open shrubland of <i>Acacia ramulosa</i> / <i>A. tetragonophylla</i> and low shrubland of <i>Ptilotus obovatus</i> / low tussock grassland of <i>Eragrostis eriopoda</i> on quartz-rocky plain	
Rocky Hillslope	RH-AFW1 22.8 ha (1.3%)	Acacia Forests and Woodlands (MVG 6)	Low open forest of <i>Acacia incurvaneura</i> / <i>A. quadrimarginea</i> over tall shrubland of <i>Acacia ramulosa</i> and low shrubland of <i>Ptilotus obovatus</i> / low tussock grassland of <i>Eragrostis eriopoda</i> on rocky hillslope	



Landform	Vegetation Community	Broad Floristic Formation (NVIS III)	Vegetation Description (NVIS V)	Image
Sand-Loam Plain	SLP-AFW1 396.7 ha (22.9%)	Acacia Forests and Woodlands (MVG 6)	Low open forest of <i>Acacia caesaneura</i> / <i>A. incurvaneura</i> over mid shrubland of <i>Eremophila forrestii</i> subsp. <i>forrestii</i> / <i>Eremophila margarethae</i> and low tussock grassland of <i>Eragrostis eriopoda</i> on sand-loam plain	
Sand-Loam Plain	SLP-AFW2 113.5 ha (6.6%)	Acacia Forests and Woodlands (MVG 6)	Open mallee shrubland of <i>Eucalyptus youngiana</i> / Low open forest of <i>Acacia caesaneura</i> / <i>A. incurvaneura</i> over mid hummock grassland of <i>Triodia scariosa</i> on sand-loam plain	



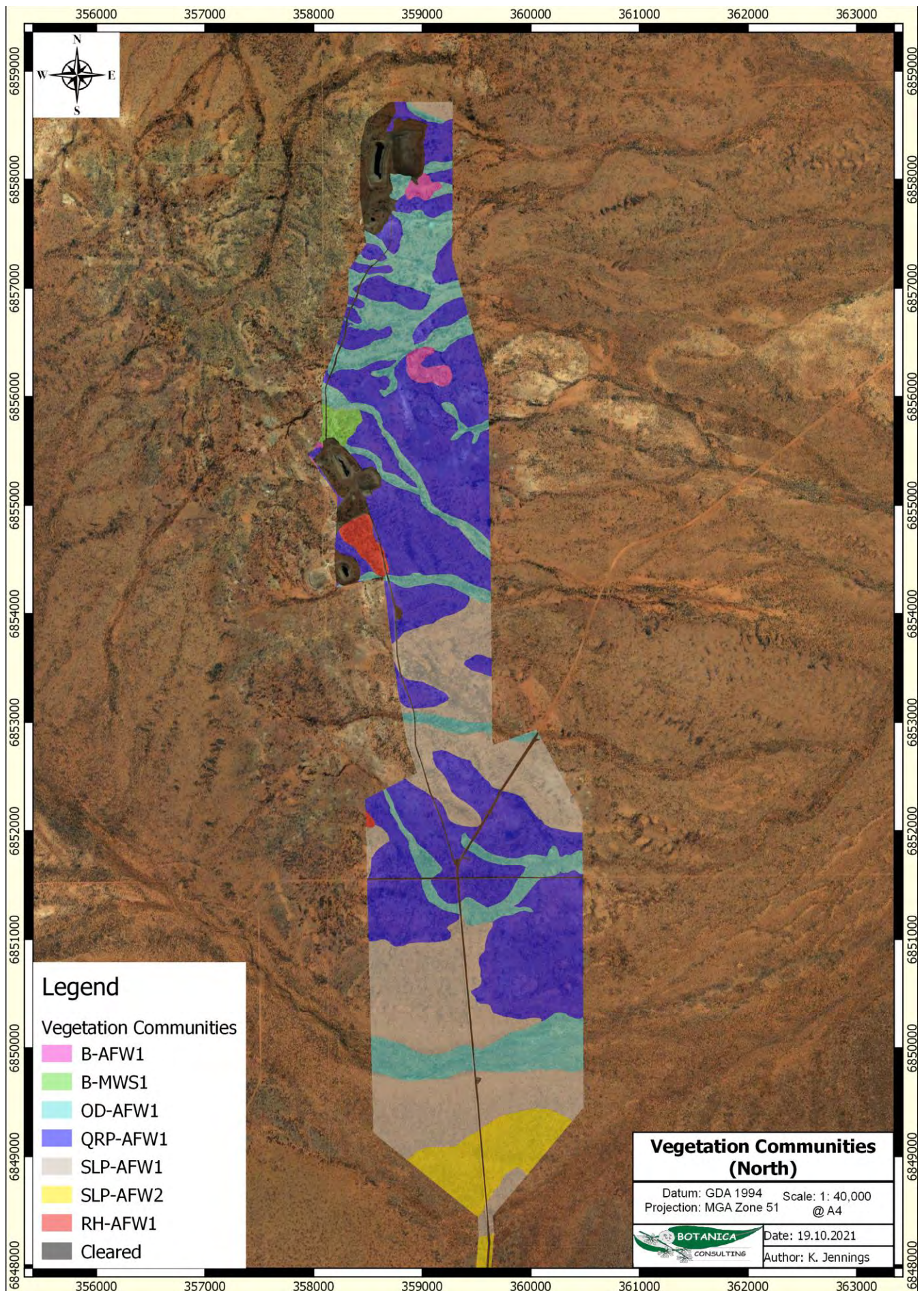


Figure 4-3: Vegetation types within the survey area (North)



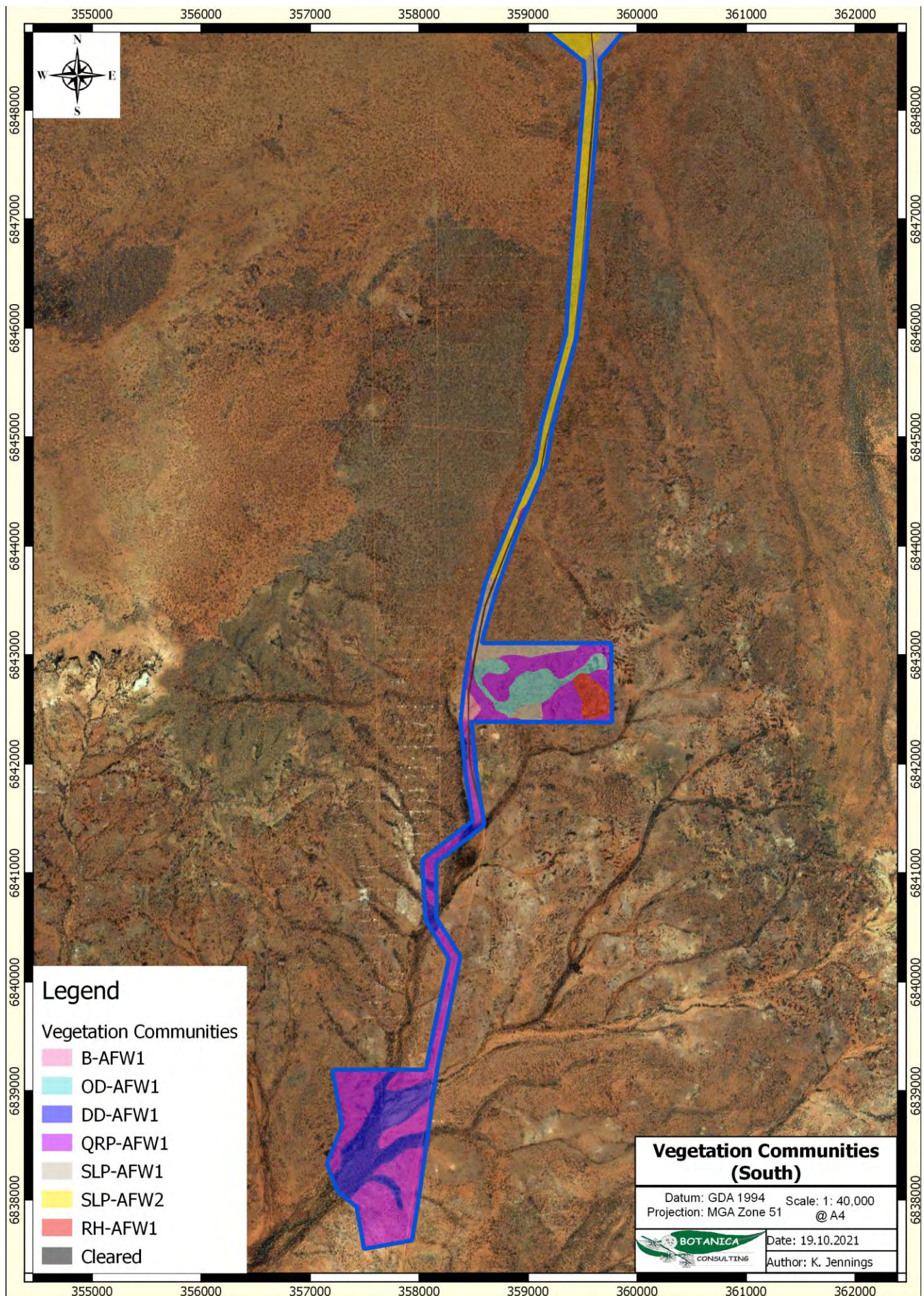


Figure 4-4: Vegetation types within the survey area (South)



### 4.2.3 Floristic Composition

Statistical analysis was conducted on quadrat data obtained from the survey to determine the similarities or differences in floristic composition between vegetation associations. The dendrogram, two-way table and ordination graph generated from the PATN statistical analysis is provided in Appendix 6. A list of the 44 quadrats and their respective vegetation associations are provided in Table 4-4. The PATN analysis produced a stress value of 0.1816.

**Table 4-4: Vegetation communities with corresponding quadrats**

Vegetation Community	Vegetation Code	Quadrats
Low open forest of <i>Acacia caesaneura</i> / <i>A. incurvaneura</i> over tall open shrubland of <i>Acacia ramulosa</i> / <i>A. tetragonophylla</i> and low shrubland of <i>Ptilotus obovatus</i> / low tussock grassland of <i>Eragrostis eriopoda</i> on quartz-rocky plain	QRP-AFW1	Q1, Q3, Q4, Q5, Q8, Q12, Q31, Q41
Open mallee shrubland of <i>Eucalyptus youngiana</i> / Low open forest of <i>Acacia caesaneura</i> / <i>A. incurvaneura</i> over mid hummock grassland of <i>Triodia scariosa</i> on sand-loam plain	SLP-AFW2	Q19-Q27
Low open forest of <i>Acacia caesaneura</i> / <i>A. incurvaneura</i> over mid shrubland of <i>Eremophila forrestii</i> subsp. <i>forrestii</i> / <i>Eremophila margarethae</i> and low tussock grassland of <i>Eragrostis eriopoda</i> on sand-loam plain	SLP-AFW1	Q9-Q11, Q13, Q14, Q16-Q18, Q33, Q36, Q38, Q40, Q42
<i>Acacia incurvaneura</i> , <i>A. tetragonophylla</i> and <i>A. burkittii</i> low woodland over <i>Eremophila citrina</i> , <i>Senna artemisioides</i> subsp. <i>artemisioides</i> and <i>Grevillea deflexa</i> sparse shrubland over <i>Ptilotus obovatus</i> var. <i>obovatus</i> , <i>Lepidium platypetalum</i> and <i>Roepera eremaea</i> low sparse shrubland	DD-AFW1	Q 37, Q39, Q44
Low open forest of <i>Acacia caesaneura</i> / <i>A. incurvaneura</i> over tall shrubland of <i>Acacia ramulosa</i> / <i>A. tetragonophylla</i> and low tussock grassland of <i>Eragrostis eriopoda</i> in drainage line	OD-AFW1	Q7, Q29, Q30, Q32, Q34, Q35, Q43
Low woodland of <i>Acacia quadrimarginea</i> over tall shrubland of <i>Acacia ramulosa</i> var. <i>linophylla</i> / <i>Thryptomene decussata</i> and low open shrubland of <i>Calytrix uncinata</i> / <i>Eremophila latrobei</i> on breakaway	B-AFW1	Q2, Q28
Mid open mallee forest of <i>Eucalyptus carnei</i> over mid sparse shrubland of <i>Eremophila pantonii</i> and low shrubland of <i>Olearia muelleri</i> / <i>Ptilotus obovatus</i> on breakaway	B-MWS1	Q6
Low open forest of <i>Acacia incurvaneura</i> / <i>A. quadrimarginea</i> over tall shrubland of <i>Acacia ramulosa</i> and low shrubland of <i>Ptilotus obovatus</i> / low tussock grassland of <i>Eragrostis eriopoda</i> on rocky hillslope	RH-AFW1	Q7, Q31, Q32

Seven species groups were identified in the analysis (species group A to G) as shown in the two-way table (Appendix 6).

The first floristic group was characterised by species group E (see two-way table provided in Appendix 7), with an average species richness of 18 taxa per quadrat (ranged from 12 to 25 taxa per quadrat).

The second floristic group was mostly characterised by species groups B, D and E (Appendix 6). This floristic group had an average species richness of 15 taxa per quadrat.

The third floristic group was mostly characterised by species groups B and E. This floristic group had an average species richness of 14.3 taxa per quadrat (ranged from 12 to 19 taxa per quadrat).

The fourth floristic group was characterised by species groups B and C, with an average species richness of 13.8 taxa per quadrat (ranged from seven to 24 taxa per quadrat).

The fifth floristic group was characterised by species groups A and B, with an average species richness of 16.7 taxa per quadrat (ranged from 16 to 17 taxa per quadrat).

The sixth floristic group was characterised by species group B, with an average species richness of 7.5 taxa per quadrat (ranged from seven to eight taxa per quadrat).

The seventh floristic group was characterised by species groups B and F, with an average species richness of 8.2 taxa per quadrat (ranged from five to 11 taxa per quadrat).

Field based observations of vegetation type delineations were mostly supported by the results of the PATN analysis.

## Species Richness and Accumulation Estimates

A total of 111 species were recorded within the 44 quadrats. The Chao 2 richness estimator provided an estimated species richness of 122 species in 60 sample sites (quadrats). A species accumulation curve was created to display the rate of species accumulation. The  $R^2$  value (0.98) suggests that the data “fits” the species accumulation curve shown in Figure 4-5. Species accumulation ranged from 10 to two species per quadrat from 1-24 sample sites, and one species per quadrat between 25-60 sample sites. Botanica has determined that according to this data a sufficient number of quadrats were established in the survey area to adequately assess the floristic composition of the area.

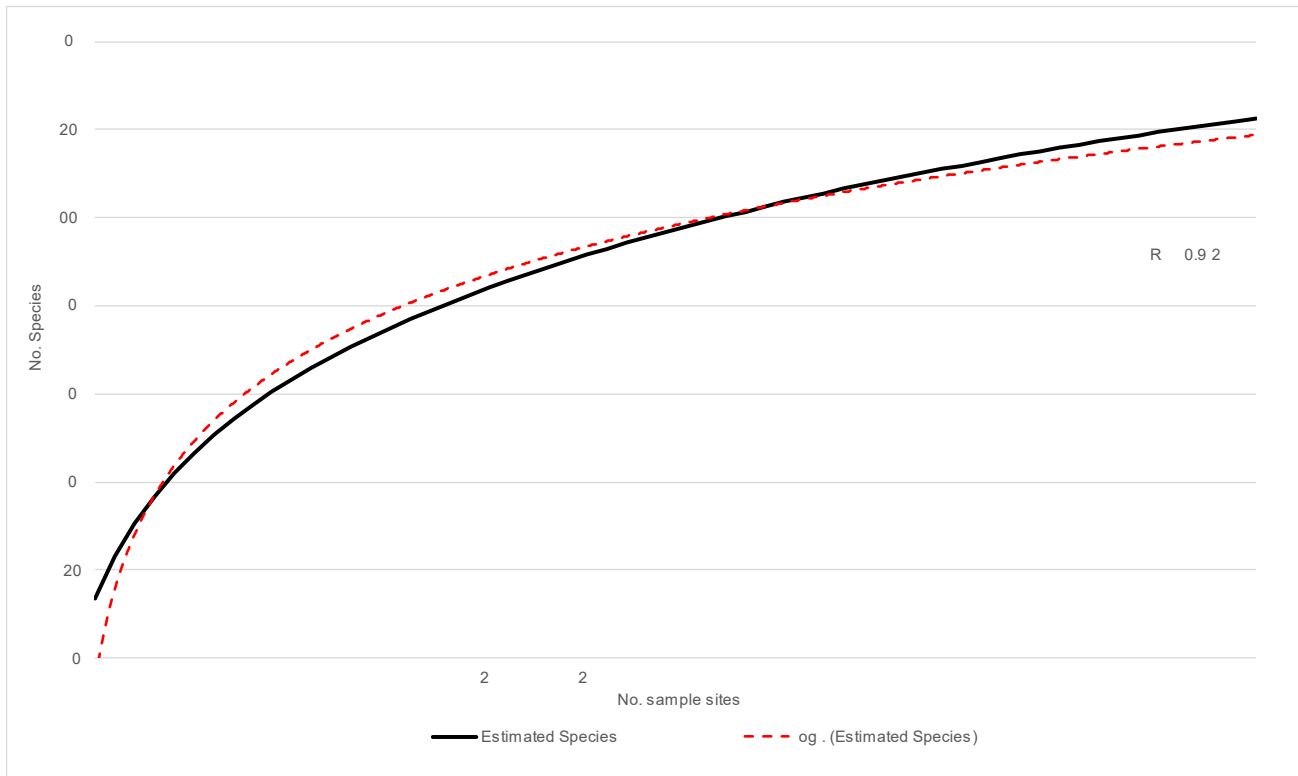


Figure 4-5: Species accumulation curve



#### 4.2.4 Significant Vegetation

According to the EPA *Environmental Factor Guideline for Flora and Vegetation* (EPA, 2016b) significant vegetation includes:

- vegetation being identified as Threatened or Priority Ecological Communities;
- vegetation with restricted distribution;
- vegetation subject to a high degree of historical impact from threatening processes;
- vegetation which provides a role as a refuge; and
- vegetation providing an important function required to maintain ecological integrity of a significant ecosystem.

No significant vegetation as described above was identified within the survey area.

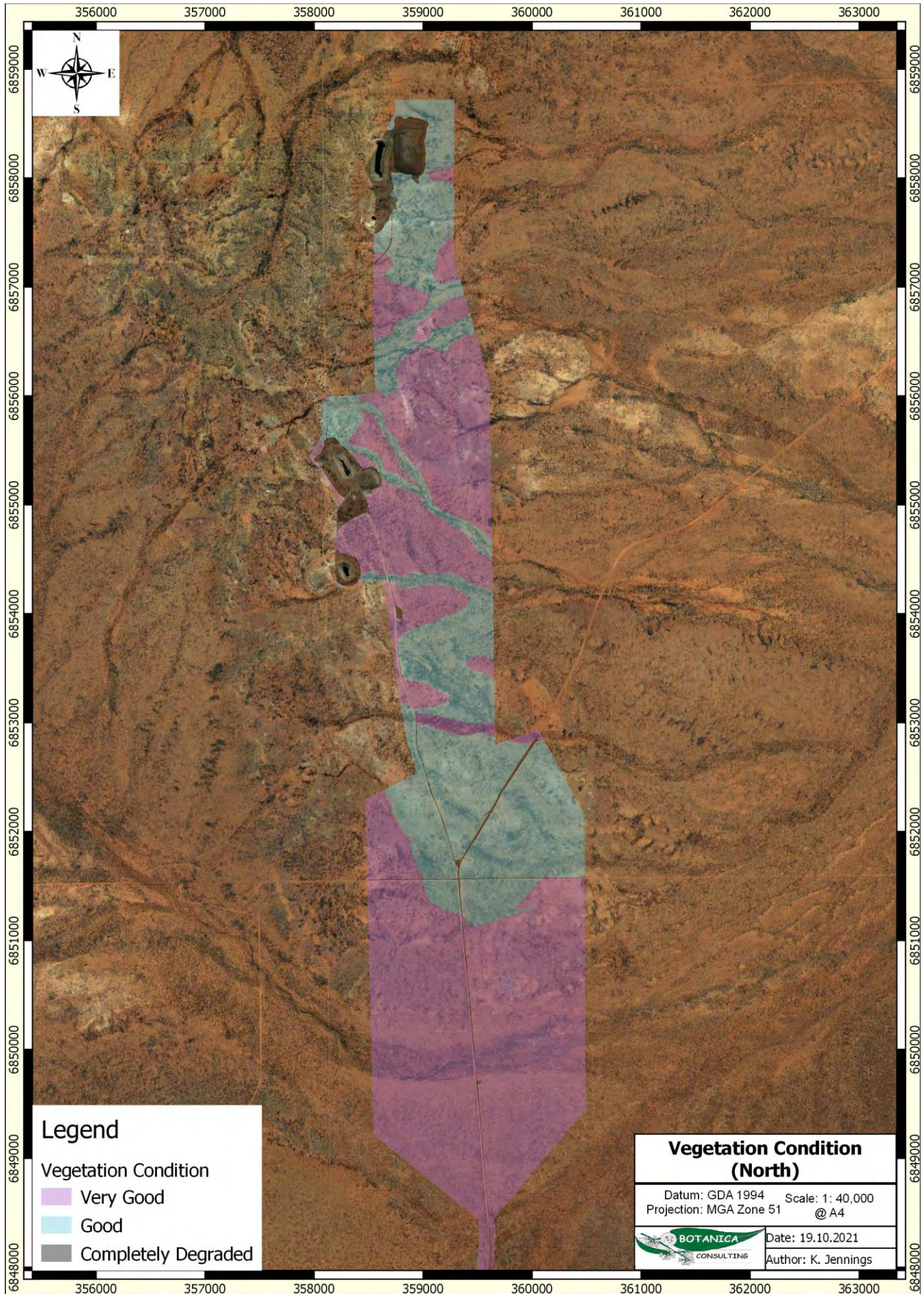
#### 4.2.5 Vegetation Condition

Based on the vegetation condition rating scale obtained from the EPA (2016a), provided in Appendix 7, the majority of native vegetation was rated as 'good' to 'very good' (Table 4-5). 'Disturbance in the area was a result of existing mining operations and access roads. These areas were categorised as completely degraded. Vegetation condition within the survey area is shown spatially in Figure 4-6.

**Table 4-5: vegetation condition within the survey area**

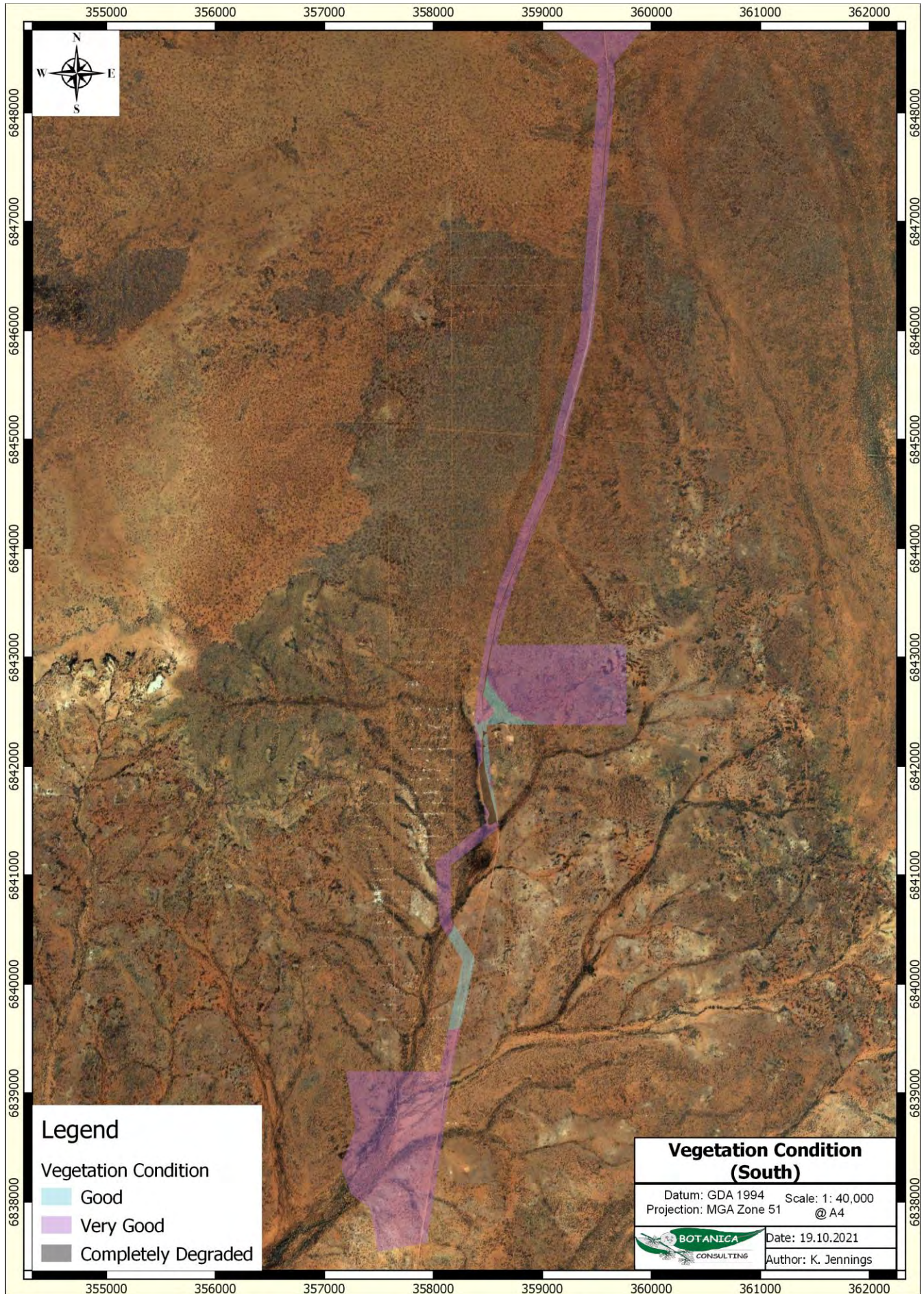
Condition rating	Description (EPA, 2016a)	Area (ha)	Area (%)
Very Good	Relatively slight signs of damage caused by human activities such as the presence of some relatively non-aggressive weeds or occasional vehicle tracks	1,128	65 %
Good	More obvious signs of damage caused by human activity since European settlement, including historical clearing, grazing by introduced animals, changed fire regimes and the presence of aggressive weed species.	495	29%
Completely Degraded	Existing gravel extraction pits, access roads and water discharge areas	108	6%





**Figure 4-6: Vegetation condition rating of the survey area (North)**





**Figure 4-7: Vegetation condition rating of the survey area (South)**



### 4.3 Matters of National Environmental Significance

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

The EPBC Act protects matters of national environmental significance and is used by the Commonwealth DAWE to list threatened taxa and ecological communities into categories based on the criteria set out in the Act ([www.environment.gov.au/epbc/index.html](http://www.environment.gov.au/epbc/index.html)). The Act provides a national environmental assessment and approval system for proposed developments and enforces strict penalties for unauthorised actions that may affect matters of national environmental significance. Matters of national environmental significance as defined by the Commonwealth EPBC Act include:

- Nationally threatened flora and fauna species;
- World heritage properties;
- National heritage places;
- Wetlands of international importance (often called ‘Ramsar’ wetlands after the international treaty under which such wetlands are listed);
- Nationally threatened ecological communities;
- Commonwealth marine area;
- The Great Barrier Reef Marine Park; and
- Nuclear actions (including uranium mining) a water resource, in relation to coal seam gas development and large coal mining development.

No matters of national environmental significance as defined by the Commonwealth EPBC Act were identified within the survey area.

### 4.4 Matters of State Environmental Significance

#### 4.4.1 *Environmental Protection Act WA 1986*

The EP Act provides for the prevention, control and abatement of pollution and environmental harm, for the conservation, preservation, protection, enhancement and management of the environment. The Act is administered by The Department of Water and Environment Regulation (DWER), which is the State Government’s environmental regulatory agency.

Under Section 51C of the EP Act and the *Environmental Protection (Clearing of Native Vegetation) Regulations (Regulations) WA 2004* any clearing of native vegetation in Western Australia that is not eligible for exemption under Schedule 6 of the *EP Act 1986* or under the Regulations 2004 requires a clearing permit from the DWER or DMIRS. Under Section 51A of the *EP Act 1986* native vegetation includes aquatic and terrestrial vegetation indigenous to Western Australia, and intentionally planted vegetation declared by regulation to be native vegetation, but not vegetation planted in a plantation or planted with commercial intent. Section 51A of the *EP Act 1986* defines clearing as “the killing or destruction of; the removal of; the severing or ringbarking of trunks or stems of; or the doing of substantial damage to some or all of the native vegetation in an area, including the flooding of land, the burning of vegetation, the grazing of stock or an act or activity that results in the above”. Exemptions under Schedule 6 of the EP Act and the EP Regulations do not apply in ESAs as declared under Section 51B of the EP Act or TEC listed under State and Commonwealth legislation.

No evidence of the survey area containing any TEC or Threatened flora was found during the survey period. The survey area is not located within an ESA.



#### **4.4.2 Biodiversity Conservation Act 2016**

This Act is used by the Western Australian DBCA for the conservation and protection of biodiversity and biodiversity components in Western Australia and to promote the ecologically sustainable use of biodiversity components in the State. Taxa are classified as “Threatened” when their populations are geographically restricted or are threatened by local processes (see following sections for Threatened definitions). Under this Act all native flora and fauna are protected throughout the State. Financial penalties are enforced under this Act if threatened species are collected without an appropriate license.

Under Section 54(1) of the BC Act, habitat is eligible for listing as critical habitat if:

- a) it is critical to the survival of a threatened species or a threatened ecological community; and
- b) its listing is otherwise in accordance with the ministerial guidelines.

No threatened species or critical habitat listed under the BC Act were recorded within the survey area.

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# Appendix 1: Conservation Significant Species/ Communities Categories (BC Act and EPBC Act)

## Definitions of Conservation Significant Species

Code	Category
<b>State categories of Threatened and Priority species</b>	
<b>Threatened Species (T)</b> Listed by order of the Minister as Threatened in the category of critically endangered, endangered or vulnerable under section 19(1), or is a rediscovered species to be regarded as Threatened species under section 26(2) of the Biodiversity Conservation Act 2016 (BC Act).	
CR	<p><b>Critically Endangered</b> Threatened species considered to be “facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with criteria set out in the ministerial guidelines”.</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 Wildlife Conservation (Specially Protected Fauna) Notice 2018 for critically endangered fauna or the Wildlife Conservation (Rare Flora) Notice 2018 for critically endangered flora.</p>
EN	<p><b>Endangered</b> Threatened species considered to be “facing a very high risk of extinction in the wild in the near future, as determined in accordance with criteria set out in the ministerial guidelines”.</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 Wildlife Conservation (Specially Protected Fauna) Notice 2018 for endangered fauna or the Wildlife Conservation (Rare Flora) Notice 2018 for endangered flora.</p>
VU	<p><b>Vulnerable</b> Threatened species considered to be “facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with criteria set out in the ministerial guidelines”.</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 Wildlife Conservation (Specially Protected Fauna) Notice 2018 for vulnerable fauna or the Wildlife Conservation (Rare Flora) Notice 2018 for vulnerable flora.</p>
<b>Extinct species</b> Listed by order of the Minister as extinct under section 23(1) of the BC Act as extinct or extinct in the wild.	
EX	<p><b>Extinct</b> 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><b>Extinct in the Wild</b> 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). 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><b>Specially protected species</b> 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>	

Code	Category
IA	<p><b>International Agreement/ Migratory</b> 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><b>Species of special conservation interest</b> 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><b>Other specially protected species</b> 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>
<p><b>Priority species</b> 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>	
P1	<p><b>Priority 1: Poorly-known species</b> 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>
P2	<p><b>Priority 2: Poorly-known species</b> 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>
P3	<p><b>Priority 3: Poorly-known species</b> 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</p>

Code	Category
	and known threatening processes exist that could affect them. Such species are in need of further survey.
P4	<p><b>Priority 4: Rare, Near Threatened and other species in need of monitoring</b></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>
<b>Commonwealth categories of Threatened species</b>	
EX	<p><b>Extinct</b></p> <p>Taxa where there is no reasonable doubt that the last member of the species has died.</p>
EW	<p><b>Extinct in the Wild</b></p> <p>Taxa where it is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or it has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.</p>
CR	<p><b>Critically Endangered</b></p> <p>Taxa that are facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.</p>
EN	<p><b>Endangered</b></p> <p>Taxa which are not critically endangered and is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria.</p>
VU	<p><b>Vulnerable</b></p> <p>Taxa which are not critically endangered or endangered and is facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.</p>
CD	<p><b>Conservation Dependent</b></p> <p>Taxa which are 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:</p> <p>(i) the species is a species of fish;</p> <p>(ii) the species is the focus of a plan of management that provides for 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;</p> <p>(iii) the plan of management is in force under a law of the Commonwealth or of a State or Territory;</p> <p>(iv) cessation of the plan of management would adversely affect the conservation status of the species.</p>



## Definitions of conservation significant communities

Category Code	Category
<b>State categories of Threatened Ecological Communities (TEC)</b>	
PD	<p><b>Presumed Totally Destroyed</b></p> <p>An ecological community will be listed as Presumed Totally Destroyed if there are no recent records of the community being extant and either of the following applies:</p> <ul style="list-style-type: none"> <li>• records within the last 50 years have not been confirmed despite thorough searches or known likely habitats or;</li> <li>• all occurrences recorded within the last 50 years have since been destroyed.</li> </ul>
CR	<p><b>Critically Endangered</b></p> <p>An ecological community will be listed as Critically Endangered when it has been adequately surveyed and is found to be facing an extremely high risk of total destruction in the immediate future, meeting any one of the following criteria:</p> <p>The estimated geographic range and distribution has been reduced by at least 90% and is either continuing to decline with total destruction imminent, or is unlikely to be substantially rehabilitated in the immediate future due to modification;</p> <p>The current distribution is limited i.e. highly restricted, having very few small or isolated occurrences, or covering a small area;</p> <p>The ecological community is highly modified with potential of being rehabilitated in the immediate future.</p>
EN	<p><b>Endangered</b></p> <p>An ecological community will be listed as Endangered when it has been adequately surveyed and is not Critically Endangered but is facing a very high risk of total destruction in the near future. The ecological community must meet any one of the following criteria:</p> <p>The estimated geographic range and distribution has been reduced by at least 70% and is either continuing to decline with total destruction imminent in the short-term future, or is unlikely to be substantially rehabilitated in the short-term future due to modification;</p> <p>The current distribution is limited i.e. highly restricted, having very few small or isolated occurrences, or covering a small area;</p> <p>The ecological community is highly modified with potential of being rehabilitated in the short-term future.</p>
VU	<p><b>Vulnerable</b></p> <p>An ecological community will be listed as Vulnerable when it has been adequately surveyed and is not Critically Endangered or Endangered but is facing high risk of total destruction in the medium to long term future. The ecological community must meet any one of the following criteria:</p> <p>The ecological community exists largely as modified occurrences that are likely to be able to be substantially restored or rehabilitated;</p> <p>The ecological community may already be modified and would be vulnerable to threatening process, and restricted in range or distribution;</p> <p>The ecological community may be widespread but has potential to move to a higher threat category due to existing or impending threatening processes.</p>
<b>Commonwealth categories of Threatened Ecological Communities (TEC)</b>	
CE	<p><b>Critically Endangered</b></p> <p>If, at that time, an ecological community is facing an extremely high risk of extinction in the wild in the immediate future (indicative timeframe being the next 10 years).</p>
EN	<p><b>Endangered</b></p> <p>If, at that time, an ecological community is not critically endangered but is facing a very high risk of extinction in the wild in the near future (indicative timeframe being the next 20 years).</p>
VU	<p><b>Vulnerable</b></p> <p>If, at that time, an ecological community is not critically endangered or endangered, but is facing a high risk of extinction in the wild in the medium-term future (indicative timeframe being the next 50 years).</p>

Category Code	Category
<b>Priority Ecological Communities (PEC)</b>	
P1	<p><b>Poorly-known ecological communities</b></p> <p>Ecological communities with apparently few, small occurrences, all or most not actively managed for conservation (e.g. within agricultural or pastoral lands, urban areas, active mineral leases) and for which current threats exist.</p>
P2	<p><b>Poorly-known ecological communities</b></p> <p>Communities that are known from few small occurrences, all or most of which are actively managed for conservation (e.g. within national parks, conservation parks, nature reserves, State forest, un-allocated Crown land, water reserves, etc.) and not under imminent threat of destruction or degradation.</p>
P3	<p><b>Poorly known ecological communities</b></p> <p>Communities that are known from several to many occurrences, a significant number or area of which are not under threat of habitat destruction or degradation or:</p> <p>Communities known from a few widespread occurrences, which are either large or within significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat, or;</p> <p>Communities made up of large, and/or widespread occurrences, that may or not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing and inappropriate fire regimes.</p>
P4	<p><b>Ecological communities that are adequately known, rare but not threatened</b> or meet criteria for near threatened, or that have been recently removed from the threatened list. These communities require regular monitoring.</p>
P5	<p><b>Conservation Dependent ecological communities</b></p> <p>Ecological communities that are not threatened but are subject to a specific conservation program, the cessation of which would result in the community becoming threatened within five years.</p>

## Appendix 2: Potentially Occurring Introduced (Weed) Flora Species

Family	Taxon	Common Name	WAOL Status	Control Category	WONS
Brassicaceae	<i>Carrichtera annua</i>	Ward's Weed	Permitted - s11	No Control Category	No
Cactaceae	<i>Cylindropuntia</i> spp.	Prickly Pears	Declared Pest - s22(2)	C3 Management, Whole of State	Yes
Cucurbitaceae	<i>Cucumis myriocarpus</i> subsp. <i>myriocarpus</i>	-	Permitted - s11	No Control Category	No
Geraniaceae	<i>Erodium cicutarium</i>	Common Storksbill	Permitted - s11	No Control Category	No
Poaceae	<i>Cenchrus ciliaris</i>	Buffel Grass	Permitted - s11	No Control Category	No
Primulaceae	<i>Lysimachia arvensis</i>	Pimpemel	Permitted - s11	No Control Category	No
Tamaricaceae	<i>Tamarix aphylla</i>	Athel Tamarisk	Exempt	No Control Category	Yes



**Appendix 3: Quadrat locations (NW Corner)(GDA94, Zone 51J)**

Quadrat	Easting	Northing
Q1	359097	6858219
Q2	358848	6857865
Q3	359156	6857059
Q4	358754	6856686
Q5	359327	6856060
Q6	358295	6855727
Q7	358336	6854799
Q8	359034	6854349
Q9	359432	6853727
Q10	359317	6853249
Q11	359295	6852544
Q12	358666	6851906
Q13	360091	6852450
Q14	359131	6851272
Q15	359161	6850654
Q16	360077	6850161
Q17	360183	6851072
Q18	358975	6849765
Q19	360195	6849655
Q20	359106	6849149
Q21	359536	6848231
Q22	359447	6847149
Q23	359409	6846651
Q24	359354	6845993
Q25	359203	6845373
Q26	358996	6844609
Q27	358718	6843946
Q28	358519	6842658
Q29	359229	6843002
Q30	359309	6842776
Q31	359506	6842463
Q32	359611	6842709
Q33	359026	6842609
Q34	359002	6842890
Q35	358616	6842949
Q36	357855	6839039
Q37	357587	6838836
Q38	357441	6839178
Q39	357392	6838576
Q40	357840	6838583
Q41	357813	6838381
Q42	357549	6837978
Q43	357757	6837753
Q44	358357	6841293

#### Appendix 4: Significant Flora Likelihood Assessment

DBCA Rank	Taxon	Habitat	Comments	Likelihood
P1	<i>Acacia websteri</i>	Red sand, clay or loam. Low-lying areas, flats.	Recorded within 40 km, habitat may be present	Possible
	<i>Philotheca tubiflora</i>	Rocky rises & hills, outcrops	Recorded within 40 km, habitat may be present	Possible
	<i>Stenanthemum patens</i>	Rocky hillside.	Recorded within 40 km, habitat may be present	Possible
P3	<i>Acacia</i> sp. Marshall Pool (G. Cockerton 3024)	-	Little known, records within 30km.	Possible
	<i>Calytrix praecipua</i>	Skeletal sandy soils over granite or laterite. Breakaways, outcrops.	Recorded within 40 km, habitat may be present	Possible
	<i>Cratystylis centralis</i>	Red sandy loam with ironstone gravel. Flat plains, breakaway country.	Recorded within 40 km, habitat may be present	Possible
	<i>Eremophila annosicaulis</i>	On stony loams (ironstone laterite).	Recorded within 40 km, habitat may be present	Possible
	<i>Eremophila shonae</i> subsp. <i>diffusa</i>	Stony yellow or red sandy soils	Recorded within 10 km, habitat may be present	Possible
	<i>Eremophila simulans</i> subsp. <i>megacalyx</i>	-	Recorded within 20 km, habitat may be present	Possible
	<i>Hybanthus floribundus</i> subsp. <i>chloroxanthus</i>	Dark red-brown soil, never sandy, rich in iron oxide, laterite. Rocky areas, creek banks, along drainage lines.	Recorded within 40 km, habitat may be present	Possible
P4	<i>Hemigenia exilis</i>	Laterite. Breakaways, slopes.	Recorded within 40 km, habitat likely to be present	Likely

**Appendix 5: List of species identified within each vegetation community**

Family	Taxon	B-AFW1	B-MWS1	DD-AFW1	OD-AFW1	QRP-AFW1	RH-AFW1	SLP-AFW2	SLP-AF1
Amaranthaceae	<i>Ptilotus aervoides</i> (A)					X			
	<i>Ptilotus exaltatus</i>					X			
	<i>Ptilotus helipteroides</i>				X	X	X		
	<i>Ptilotus obovatus</i> var. <i>obovatus</i>	X		X	X	X	X		X
	<i>Ptilotus schwartzii</i>	X			X	X	X		X
Apocynaceae	<i>Leichardtia australis</i>	X		X	X	X	X		X
Asparagaceae	<i>Thysanotus manglesii</i>							X	
Asteraceae	<i>Angianthus milnei</i> (A)				X				
	<i>Brachyscome ciliaris</i> (A)				X				X
	<i>Bulbine semibarbata</i> (A)			X					
	<i>Calotis multicaulis</i> (A)					X			
	<i>Cephalopterum drummondii</i> (A)					X			X
	<i>Cratystylis subspinescens</i>					X			
	<i>Helipterum craspedioides</i> (A)							X	
	<i>Lemooria burkittii</i> (A)					X			X
	<i>Olearia muelleri</i>					X			
	<i>Podolepis capillaris</i> (A)					X			
	<i>Podotheca wilsonii</i> (A)				X				
	<i>Rhodanthe charsleyae</i> (A)			X					X
	<i>Rhodanthe chlorocephala</i> (A)								X
<i>Rhodanthe chlorocephala</i> subsp. <i>rosea</i> (A)					X		X		
Brassicaceae	<i>Lepidium platypetalum</i>			X					
Casuarinaceae	<i>Casuarina pauper</i>	X				X	X		



Family	Taxon	B-AFW1	B-MWS1	DD-AFW1	OD-AFW1	QRP-AFW1	RH-AFW1	SLP-AFW2	SLP-AF1
Chenopodiaceae	<i>Atriplex bunburyana</i>					X			
	<i>Enchylaena tomentosa</i>			X					X
	<i>Maireana convexa</i>								X
	<i>Maireana georgei</i>			X	X	X	X		X
	<i>Maireana pyramidata</i>								X
	<i>Maireana sedifolia</i>					X			
	<i>Maireana trichoptera</i>					X			
	<i>Maireana triptera</i>			X	X		X		X
	<i>Rhagodia eremaea</i>		X	X	X	X	X	X	X
	<i>Sclerolaena densiflora</i>					X			
	<i>Sclerolaena diacantha</i>					X			
Convolvulaceae	<i>Convolvulus remotus</i>			X					
	<i>Duperreya commixta</i>								X
Euphorbiaceae	<i>Euphorbia boophthona</i> (A)					X			
Fabaceae	<i>Acacia aptaneura</i>					X			X
	<i>Acacia ayersiana</i>			X	X	X	X		X
	<i>Acacia burkittii</i>			X		X	X		X
	<i>Acacia caesaneura</i>		X	X	X	X	X	X	X
	<i>Acacia craspedocarpa</i>	X							X
	<i>Acacia effusifolia</i>							X	
	<i>Acacia incurvaneura</i>		X	X	X	X	X	X	X
	<i>Acacia kempeana</i>					X	X		
	<i>Acacia mulganeura</i>	X			X	X			X
	<i>Acacia oswaldii</i>					X			
	<i>Acacia quadrimarginea</i>	X			X	X	X		

Family	Taxon	B-AFW1	B-MWS1	DD-AFW1	OD-AFW1	QRP-AFW1	RH-AFW1	SLP-AFW2	SLP-AF1
	<i>Acacia ramulosa</i>				X		X	X	X
	<i>Acacia tetragonophylla</i>			X	X	X	X	X	X
	<i>Acacia youngiana</i>							X	
	<i>Senna artemisioides</i> subsp. <i>artemisioides</i>			X					X
	<i>Senna artemisioides</i> subsp. <i>filifolia</i>			X		X	X		X
	<i>Senna cardiosperma</i>					X			
	<i>Senna charlesiana</i>								X
	<i>Senna manicula</i>								X
Frankeniaceae	<i>Frankenia georgei</i>					X			
Geraniaceae	<i>Erodium crinitum</i> (A)			X		X			
Goodeniaceae	<i>Brunonia australis</i>							X	
	<i>Goodenia macroplectra</i> (A)				X	X	X		
	<i>Goodenia peacockiana</i> (A)			X					
	<i>Goodenia rosea</i> (A)			X		X		X	X
	<i>Goodenia xanthosperma</i> (A)					X		X	X
	<i>Scaevola spinescens</i>	X			X	X	X		X
Haloragaceae	<i>Haloragis odontocarpa</i>			X					
Hemerocallidaceae	<i>Dianella revoluta</i>		X					X	X
Lamiaceae	<i>Teucrium teucriiflorum</i>				X	X		X	X
Loranthaceae	<i>Amyema fitzgeraldii</i>					X			
Malvaceae	<i>Abutilon otocarpum</i>							X	
	<i>Androcalva luteiflora</i>							X	
	<i>Brachychiton gregorii</i>				X				
	<i>Sida calyxhymentia</i>	X			X	X	X	X	X



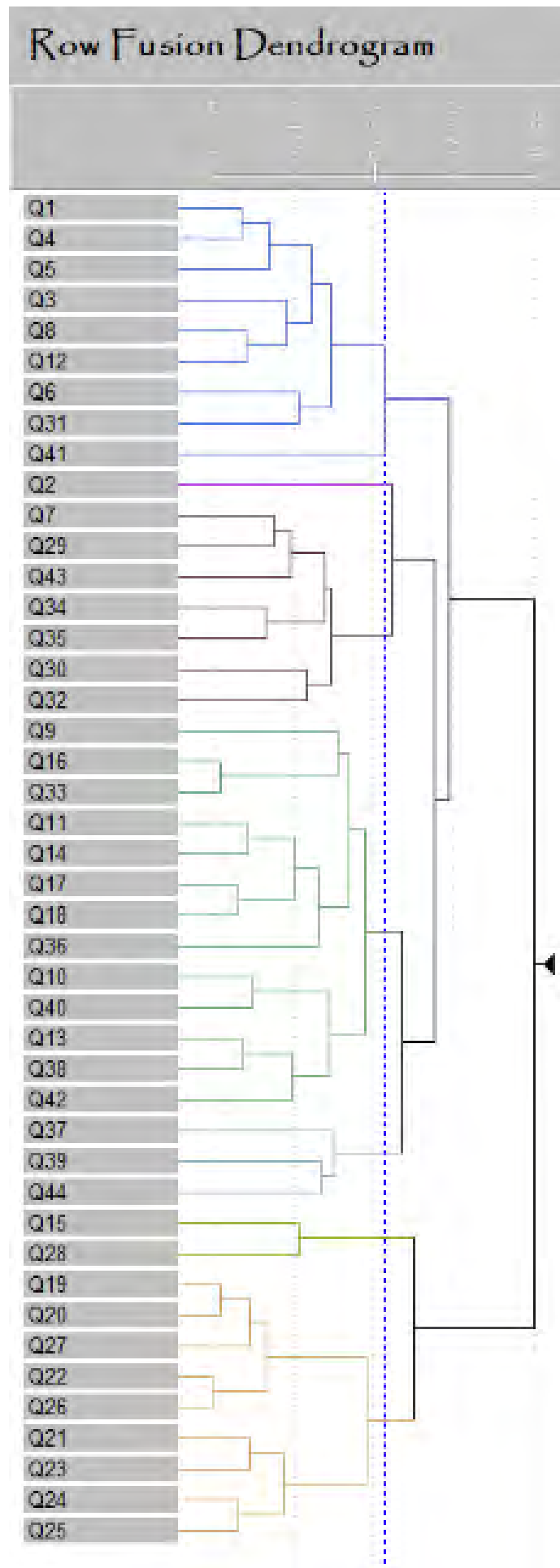


Family	Taxon	B-AFW1	B-MWS1	DD-AFW1	OD-AFW1	QRP-AFW1	RH-AFW1	SLP-AFW2	SLP-AF1
	<i>Hakea preissii</i>				X	X			
Pteridaceae	<i>Cheilanthes sieberi</i>	X		X	X		X		X
Rubiaceae	<i>Psydrax latifolia</i>				X		X		
	<i>Psydrax suaveolens</i>	X	X	X	X		X	X	X
Santalaceae	<i>Santalum lanceolatum</i>					X			X
	<i>Santalum spicatum</i>					X			
Sapindaceae	<i>Dodonaea rigida</i>		X		X		X		
Scrophulariaceae	<i>Eremophila alternifolia</i>					X			X
	<i>Eremophila citrina</i>			X		X			
	<i>Eremophila clarkei</i>			X	X				
	<i>Eremophila eriocalyx</i>				X		X		
	<i>Eremophila forrestii</i> subsp. <i>forrestii</i>		X		X				X
	<i>Eremophila georgei</i>		X	X	X		X		X
	<i>Eremophila gilesii</i>								X
	<i>Eremophila granitica</i>	X							
	<i>Eremophila homoplastica</i>							X	
	<i>Eremophila latrobei</i> subsp. <i>latrobei</i>			X	X	X	X		X
	<i>Eremophila longifolia</i>			X		X			
	<i>Eremophila malacoides</i>					X			
	<i>Eremophila margarethae</i>		X	X	X			X	X
	<i>Eremophila oldfieldii</i> subsp. <i>angustifolium</i>						X	X	
<i>Eremophila oppositifolia</i>									
<i>Eremophila pantonii</i>				X		X	X		

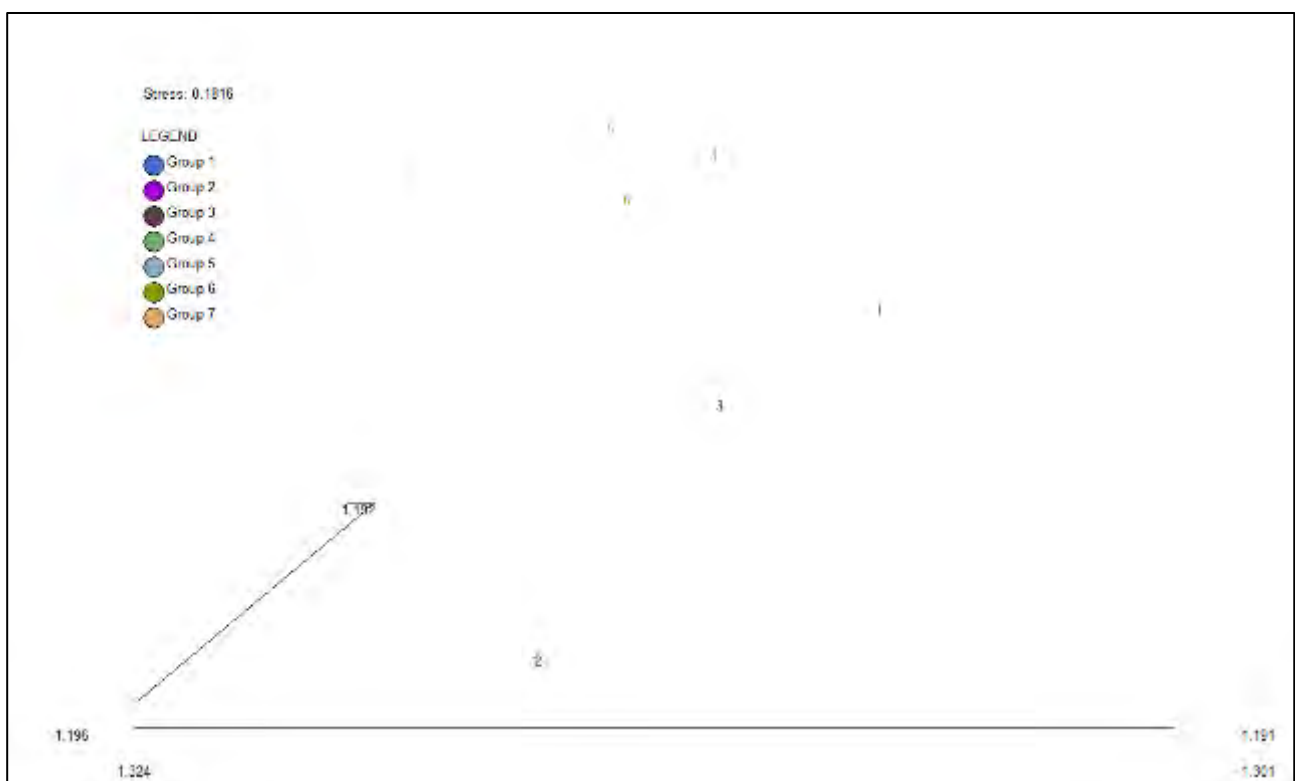
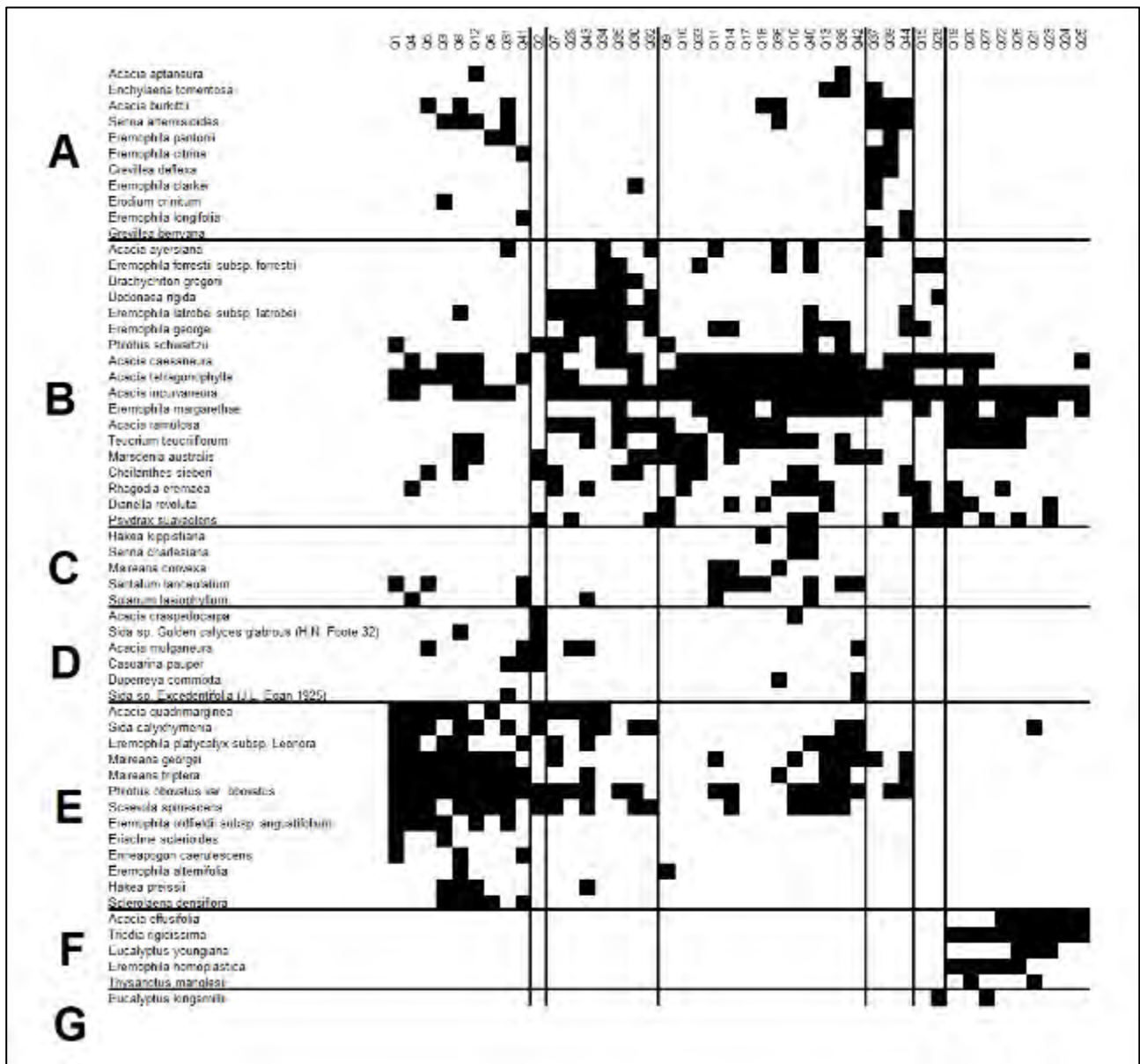
Family	Taxon	B-AFW1	B-MWS1	DD-AFW1	OD-AFW1	QRP-AFW1	RH-AFW1	SLP-AFW2	SLP-AF1
	<i>Eremophila platycalyx</i> subsp. Leonora				X	X	X		X
Solanaceae	<i>Solanum lasiophyllum</i>				X	X			X
Zygophyllaceae	<i>Roepera eremaea</i> (A)			X	X	X	X		X
	<i>Zygophyllum eremaeum</i> (A)					X	X		

(A) Denotes annual species

## Appendix 6: PATN Analysis







## Appendix 7: Vegetation Condition Rating

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

## Appendix 8: Quadrat Data Sheets



Project Name: Dacian		
Date: 13/07/2021	Botanist: JW/JJ	Photo (NW corner): 185-187
Quadrat: Q1	Quadrat size: 50m x 50m	Waypoint (NW corner): 31
Coordinates (GDA94): 51 J 359097 6858219		
Aspect: SW	Fire (yrs): >20	Condition rating: Very Good
Landform: Flat		
Coarse fragments on the surface: Quartz, ironstone/ 50-90%/ 20-60mm		
Rock outcrop (abundance/runoff): Nil/ slow		
Soil (profile/field texture/soil surface): Red-brown/ Clay Loam		
Cover leaf litter: 20%		
Cover bare ground: 70%		
Upper stratum	Mid-stratum	Lower stratum
Growth form: Tree	Growth form: Shrub	Growth form: Shrub
Height: 5-12 m	Height: 1-3 m	Height: 0.5-1 m
Crown cover: 10-30%	Crown cover: <10%	Crown cover: <10%
Dominant taxa		
<i>Acacia incurvaneura</i>	<i>Eremophila oldfieldii</i> subsp. <i>angustifolia</i>	<i>Ptilotus obovatus</i> var. <i>obovatus</i>
Other Taxa		
<i>Acacia quadrimarginea</i>	<i>Eremophila platycalyx</i>	<i>Maireana triptera</i>
<i>Santalum lanceolatum</i>	<i>Sida calyxhymenia</i>	<i>Maireana georgei</i>
	<i>Senna cardiosperma</i>	<i>Ptilotus schwartzii</i>
	<i>Scaevola spinescens</i>	<i>Ptilotus helipteroides</i>
	<i>Acacia tetragonophylla</i>	<i>Roepera eremaea</i>
		<i>Eriachne sclerioides</i>
		<i>Marsdenia australis</i>
		<i>Goodenia peacockiana</i>
		<i>Enneapogon caerulescens</i>



<b>Project Name: Dacian</b>		
<b>Date:</b> 13/07/2021	<b>Botanist:</b> JW/JJ	<b>Photo (NW corner):</b> 194-196
<b>Quadrat:</b> Q2	<b>Quadrat size:</b> 50m x 50m	<b>Waypoint (NW corner):</b> 37
<b>Coordinates (GDA94):</b> 51 J 358848 6857865		
<b>Aspect:</b> SW	<b>Fire (yrs):</b> >20	<b>Condition rating:</b> Very Good
<b>Landform:</b> Midslope		
<b>Coarse fragments on the surface:</b> Laterite/ 50-90%/ 6-20 mm		
<b>Rock outcrop (abundance/runoff):</b> Nil/ rapid		
<b>Soil (profile/field texture/soil surface):</b> Red-brown/ Clay Loam		
<b>Cover leaf litter:</b> 10%		
<b>Cover bare ground:</b> 60%		
<b>Upper stratum</b>	<b>Mid-stratum</b>	<b>Lower stratum</b>
<b>Growth form:</b> Tree	<b>Growth form:</b> Shrub	<b>Growth form:</b> Shrub
<b>Height:</b> 3-5 m	<b>Height:</b> 0.5-1 m	<b>Height:</b> 0.5-1 m
<b>Crown cover:</b> 30-70%	<b>Crown cover:</b> 10-30%	<b>Crown cover:</b> <10%
<b>Dominant taxa</b>		
<i>Acacia mulganeura</i>	<i>Calytrix erosipetala</i>	<i>Ptilotus obovatus</i> var. <i>obovatus</i>
<b>Other Taxa</b>		
<i>Acacia quadrimarginea</i>	<i>Dodonaea rigida</i>	<i>Aristida contorta</i>
<i>Casuarina pauper</i>	<i>Sida calyxhymenia</i>	<i>Cymbopogon ambiguus</i>
	<i>Acacia craspedocarpa</i>	<i>Ptilotus schwartzii</i>
	<i>Scaevola spinescens</i>	<i>Sida</i> sp. Golden calyces glabrous
	<i>Psyrax suaveolens</i>	<i>Cheilanthes sieberi</i>
	<i>Eremophila granitica</i>	<i>Marsdenia australis</i>





Project Name: Dacian		
Date: 13/07/2021	Botanist: JW/JJ	Photo (NW corner): 197-199
Quadrat: Q3	Quadrat size: 50m x 50m	Waypoint (NW corner): 43
Coordinates (GDA94): 51 J 359156 6857059		
Aspect: SW	Fire (yrs): >20	Condition rating: Very Good
Landform: Flat		
Coarse fragments on the surface: Quartz, ironstone/ 50-90%/ 20-60mm		
Rock outcrop (abundance/runoff): Nil/ slow		
Soil (profile/field texture/soil surface): Brown/ Clay Loam		
Cover leaf litter: 50%		
Cover bare ground: 50%		
Upper stratum	Mid-stratum	Lower stratum
Growth form: Tree	Growth form: Shrub	Growth form: Chenopod Shrub
Height: 5-12 m	Height: 0.5-1 m	Height: 0.5-1 m
Crown cover: 30-70%	Crown cover: 10-30%	Crown cover: 10-30%
Dominant taxa		
<i>Acacia caesaneura</i>	<i>Ptilotus obovatus</i> var. <i>obovatus</i>	<i>Maireana triptera</i>
Other Taxa		
<i>Acacia quadrimarginea</i>	<i>Eremophila platycalyx</i>	<i>Goodenia peacockiana</i>
<i>Acacia oswaldii</i>	<i>Eremophila longifolia</i>	<i>Maireana georgei</i>
	<i>Senna artemisioides</i> subsp. <i>filifolia</i>	<i>Ptilotus aevoides</i>
	<i>Hakea preissii</i>	<i>Ptilotus helipteroides</i>
	<i>Acacia tetragonophylla</i>	<i>Roepera eremaea</i>
	<i>Eremophila oldfieldii</i> subsp. <i>angustifolia</i>	<i>Ptilotus exaltatus</i>
		<i>Sclerolaena densiflora</i>
		<i>Sclerolaena diacantha</i>
		<i>Eriachne sclerioides</i>
		<i>Erodium crinitum</i>



Project Name: Dacian		
Date: 13/07/2021	Botanist: JW/JJ	Photo (NW corner): 200-202
Quadrat: Q4	Quadrat size: 50m x 50m	Waypoint (NW corner): 49
Coordinates (GDA94): 51 J 358754 6856686		
Aspect: SW	Fire (yrs): >20	Condition rating: Very Good
Landform: Flat		
Coarse fragments on the surface: Limestone/ 10-20%/ 6-20		
Rock outcrop (abundance/runoff): Nil/ Rapid		
Soil (profile/field texture/soil surface): Brown/ Clay Loam		
Cover leaf litter: 40%		
Cover bare ground: 60%		
Upper stratum	Mid-stratum	Lower stratum
Growth form: Tree	Growth form: Shrub	Growth form: Chenopod Shrub
Height: 5-12 m	Height: 0.5-1 m	Height: <0.25 m
Crown cover: 30-70%	Crown cover: 30-70%	Crown cover: <10%
Dominant taxa		
<i>Acacia incurvaneura</i>	<i>Ptilotus obovatus</i> var. <i>obovatus</i>	<i>Maireana georgei</i>
Other Taxa		
<i>Acacia quadrimarginea</i>	<i>Eremophila platycalyx</i>	<i>Maireana triptera</i>
<i>Acacia caesaneura</i>	<i>Sida calyxhymeria</i>	<i>Ptilotus exaltatus</i>
<i>Eremophila oldfieldii</i> subsp. <i>angustifolia</i>	<i>Rhagodia eremaea</i>	<i>Ptilotus aevroides</i>
	<i>Scaevola spinescens</i>	<i>Ptilotus helipteroides</i>
	<i>Acacia tetragonophylla</i>	<i>Roepera eremaea</i>
		<i>Solanum lasiophyllum</i>
		<i>Goodenia rosea</i>
		<i>Goodenia peacockiana</i>
		<i>Calotis multicaulis</i>





<b>Project Name: Dacian</b>		
<b>Date:</b> 13/07/2021	<b>Botanist:</b> JW/JJ	<b>Photo (NW corner):</b> 204-206
<b>Quadrat:</b> Q5	<b>Quadrat size:</b> 50m x 50m	<b>Waypoint (NW corner):</b> 54
<b>Coordinates (GDA94):</b> 51 J 359327 6856060		
<b>Aspect:</b> SW	<b>Fire (yrs):</b> >20	<b>Condition rating:</b> Very Good
<b>Landform:</b> Midslope		
<b>Coarse fragments on the surface:</b> Laterite/>90%/ 20-60mm		
<b>Rock outcrop (abundance/runoff):</b> Nil/ rapid		
<b>Soil (profile/field texture/soil surface):</b> Brown/ Clay Loam		
<b>Cover leaf litter:</b> 20%		
<b>Cover bare ground:</b> 80%		
<b>Upper stratum</b>	<b>Mid-stratum</b>	<b>Lower stratum</b>
<b>Growth form:</b> Tree	<b>Growth form:</b> Shrub	<b>Growth form:</b> Chenopod Shrub
<b>Height:</b> 3-5 m	<b>Height:</b> 0.5-1 m	<b>Height:</b> <0.25 m
<b>Crown cover:</b> 30-70%	<b>Crown cover:</b> 10-30%	<b>Crown cover:</b> <10%
<b>Dominant taxa</b>		
<i>Acacia mulganeura</i>	<i>Scaevola spinescens</i>	<i>Maireana triptera</i>
<b>Other Taxa</b>		
<i>Acacia quadrimarginea</i>	<i>Eremophila pantonii</i>	<i>Maireana georgei</i>
<i>Acacia burkittii</i>	<i>Sida calyxhymenia</i>	<i>Ptilotus obovatus</i> var. <i>obovatus</i>
<i>Eremophila oldfieldii</i> subsp. <i>angustifolia</i>	<i>Acacia tetragonophylla</i>	<i>Cheilanthes sieberi</i>
<i>Santalum lanceolatum</i>		



<b>Project Name: Dacian</b>		
<b>Date:</b> 13/07/2021	<b>Botanist:</b> JW/JJ	<b>Photo (NW corner):</b> 210-212
<b>Quadrat:</b> Q6	<b>Quadrat size:</b> 50m x 50m	<b>Waypoint (NW corner):</b> 62
<b>Coordinates (GDA94):</b> 51 J 358295 6855727		
<b>Aspect:</b> SW	<b>Fire (yrs):</b> >20	<b>Condition rating:</b> Very Good
<b>Landform:</b> Midslope		
<b>Coarse fragments on the surface:</b> Laterite/ >90%/ 20-60mm		
<b>Rock outcrop (abundance/runoff):</b> Nil/ rapid		
<b>Soil (profile/field texture/soil surface):</b> Red-brown/ Clay Loam		
<b>Cover leaf litter:</b> 20%		
<b>Cover bare ground:</b> 80%		
<b>Upper stratum</b>	<b>Mid-stratum</b>	<b>Lower stratum</b>
<b>Growth form:</b> Tree	<b>Growth form:</b> Shrub	<b>Growth form:</b> Chenopod Shrub
<b>Height:</b> 5-12 m	<b>Height:</b> 1-3 m	<b>Height:</b> 0.5-1 m
<b>Crown cover:</b> 10-30%	<b>Crown cover:</b> <10%	<b>Crown cover:</b> <10%
<b>Dominant taxa</b>		
<i>Eucalyptus carnei</i>	<i>Eremophila pantonii</i>	<i>Maireana georgei</i>
<b>Other Taxa</b>		
<i>Acacia quadrimarginea</i>	<i>Ptilotus obovatus</i> var. <i>obovatus</i>	<i>Maireana triptera</i>
<i>Acacia incurvaneura</i>	<i>Scaevola spinescens</i>	<i>Frankenia georgei</i>
		<i>Ptilotus exaltatus</i>
		<i>Olearia muelleri</i>
		<i>Sclerolaena densiflora</i>
		<i>Maireana trichoptera</i>





<b>Project Name: Dacian</b>		
<b>Date:</b> 14/07/2021	<b>Botanist:</b> JW/JJ	<b>Photo (NW corner):</b> 213-215
<b>Quadrat:</b> Q7	<b>Quadrat size:</b> 50m x 50m	<b>Waypoint (NW corner):</b> 69
<b>Coordinates (GDA94):</b> 51 J 358336 6854799		
<b>Aspect:</b> SW	<b>Fire (yrs):</b> >20	<b>Condition rating:</b> Very Good
<b>Landform:</b> Flat		
<b>Coarse fragments on the surface:</b> Quartz, ironstone/ 50-90%/ 20-60mm		
<b>Rock outcrop (abundance/runoff):</b> Nil/ very slow		
<b>Soil (profile/field texture/soil surface):</b> Red-brown/ Clay Loam		
<b>Cover leaf litter:</b> 20%		
<b>Cover bare ground:</b> 80%		
<b>Upper stratum</b>	<b>Mid-stratum</b>	<b>Lower stratum</b>
<b>Growth form:</b> Tree	<b>Growth form:</b> Shrub	<b>Growth form:</b> Shrub
<b>Height:</b> 3-5 m	<b>Height:</b> 1-3 m	<b>Height:</b> 0.5-1 m
<b>Crown cover:</b> 30-70%	<b>Crown cover:</b> <10%	<b>Crown cover:</b> <10%
<b>Dominant taxa</b>		
<i>Acacia incurvaneura</i>	<i>Eremophila platycalyx</i>	<i>Ptilotus schwartzii</i>
<b>Other Taxa</b>		
<i>Acacia quadrimarginea</i>	<i>Ptilotus obovatus</i> var. <i>obovatus</i>	<i>Cheilanthes sieberi</i>
<i>Acacia caesaneura</i>	<i>Dodonaea rigida</i>	<i>Maireana georgei</i>
	<i>Eremophila latrobei</i> subsp. <i>latrobei</i>	
	<i>Scaevola spinescens</i>	
	<i>Acacia tetragonophylla</i>	
	<i>Acacia ramulosa</i>	
	<i>Psyrdrax latifolia</i>	
	<i>Rhagodia eremaea</i>	





Project Name: Dacian		
Date: 13/07/2021	Botanist: JW/JJ	Photo (NW corner): 216-218
Quadrat: Q8	Quadrat size: 50m x 50m	Waypoint (NW corner): 73
Coordinates (GDA94): 51 J 359034 6854349		
Aspect: SW	Fire (yrs): >20	Condition rating: Very Good
Landform: Open Depression		
Coarse fragments on the surface: Quartz, ironstone/ 50-90%/ 20-60mm		
Rock outcrop (abundance/runoff): Nil/ slow		
Soil (profile/field texture/soil surface): Brown/ Clay Loam		
Cover leaf litter: 35%		
Cover bare ground: 65%		
Upper stratum	Mid-stratum	Lower stratum
Growth form: Tree	Growth form: Shrub	Growth form: Chenopod Shrub
Height: 5-12 m	Height: 1-3 m	Height: 0<.25 m
Crown cover: 30-70%	Crown cover: <10%	Crown cover: <10%
Dominant taxa		
<i>Acacia incurvaneura</i>	<i>Eremophila latrobei</i> subsp. <i>latrobei</i>	<i>Maireana triptera</i>
Other Taxa		
<i>Acacia quadrimarginea</i>	<i>Eremophila platycalyx</i>	<i>Dysphania kalpari</i>
<i>Acacia caesaneura</i>	<i>Sida calyxhymenia</i>	<i>Maireana georgei</i>
<i>Acacia burkittii</i>	<i>Senna artemisioides</i> subsp. <i>filifolia</i>	<i>Ptilotus exaltatus</i>
<i>Acacia tetragonophylla</i>	<i>Scaevola spinescens</i>	<i>Cheilanthes sieberi</i>
<i>Santalum spicatum</i>	<i>Eremophila alternifolia</i>	<i>Roepera eremaea</i>
	<i>Hakea preissii</i>	<i>Teucrium teucriiflorum</i>
	<i>Sida</i> sp. <i>Golden calyces glabrous</i>	<i>Marsdenia australis</i>
	<i>Amyema fitzgeraldii</i>	<i>Goodenia peacockiana</i>
	<i>Sclerolaena densiflora</i>	<i>Ptilotus obovatus</i> var. <i>obovatus</i>
		<i>Enneapogon caerulescens</i>



<b>Project Name: Dacian</b>		
<b>Date:</b> 14/07/2021	<b>Botanist:</b> JW/JJ	<b>Photo (NW corner):</b> 219-221
<b>Quadrat:</b> Q9	<b>Quadrat size:</b> 50m x 50m	<b>Waypoint (NW corner):</b> 77
<b>Coordinates (GDA94):</b> 51 J 359432 6853727		
<b>Aspect:</b> SW	<b>Fire (yrs):</b> >20	<b>Condition rating:</b> Very Good
<b>Landform:</b> Flat		
<b>Coarse fragments on the surface:</b> Quartz, ironstone/ 20-50%/ 20-60mm		
<b>Rock outcrop (abundance/runoff):</b> Nil/ very slow		
<b>Soil (profile/field texture/soil surface):</b> Brown/ Clay Loam		
<b>Cover leaf litter:</b> 20%		
<b>Cover bare ground:</b> 80%		
<b>Upper stratum</b>	<b>Mid-stratum</b>	<b>Lower stratum</b>
<b>Growth form:</b> Tree	<b>Growth form:</b> Shrub	<b>Growth form:</b> Shrub
<b>Height:</b> 5-12 m	<b>Height:</b> 1-3 m	<b>Height:</b> <0.25 m
<b>Crown cover:</b> 30-70%	<b>Crown cover:</b> 10-30%	<b>Crown cover:</b> <10%
<b>Dominant taxa</b>		
<i>Acacia incurvaneura</i>	<i>Eremophila alternifolia</i>	<i>Ptilotus schwartzii</i>
<b>Other Taxa</b>		
<i>Acacia ramulosa</i>	<i>Acacia tetragonophylla</i>	<i>Marsdenia australis</i>
	<i>Psyrdrax suaveolens</i>	<i>Teucrium teucriiflorum</i>
		<i>Dianella revoluta</i>





Project Name: Dacian		
Date: 14/07/2021	Botanist: JW/JJ	Photo (NW corner): 222-122487
Quadrat: Q10	Quadrat size: 50m x 50m	Waypoint (NW corner): 83
Coordinates (GDA94): 51 J 359317 6853249		
Aspect: SW	Fire (yrs): >20	Condition rating: Very Good
Landform: Flat		
Coarse fragments on the surface: Quartz, ironstone/ 20-50%/ 20-60mm		
Rock outcrop (abundance/runoff): Nil/ very slow		
Soil (profile/field texture/soil surface): Brown/ Clay Loam		
Cover leaf litter: 40%		
Cover bare ground: 60%		
Upper stratum	Mid-stratum	Lower stratum
Growth form: Tree	Growth form: Shrub	Growth form: Shrub
Height: 5-12 m	Height: 1-3 m	Height: 0.25-0.5 m
Crown cover: >70%	Crown cover: <10%	Crown cover: <10%
Dominant taxa		
<i>Acacia incurvaneura</i>	<i>Eremophila margarethae</i>	<i>Ptilotus obovatus</i> var. <i>obovatus</i>
Other Taxa		
<i>Acacia caesaneura</i>	<i>Scaevola spinescens</i>	<i>Cheilanthes sieberi</i>
<i>Acacia craspedocarpa</i>	<i>Rhagodia eremaea</i>	<i>Maireana georgei</i>
<i>Acacia tetragonophylla</i>	<i>Senna charlesiana</i>	<i>Teucrium teucriiflorum</i>
	<i>Psydrax suaveolens</i>	
	<i>Hakea kippistiana</i>	





<b>Project Name: Dacian</b>		
<b>Date:</b> 14/07/2021	<b>Botanist:</b> JW/JJ	<b>Photo (NW corner):</b> 226-228
<b>Quadrat:</b> Q11	<b>Quadrat size:</b> 50m x 50m	<b>Waypoint (NW corner):</b> 88
<b>Coordinates (GDA94):</b> 51 J 359295 6852544		
<b>Aspect:</b> SW	<b>Fire (yrs):</b> >20	<b>Condition rating:</b> Very Good
<b>Landform:</b> Flat		
<b>Coarse fragments on the surface:</b> Quartz, ironstone/ 50-90%/ 20-60mm		
<b>Rock outcrop (abundance/runoff):</b> Nil/ slow		
<b>Soil (profile/field texture/soil surface):</b> Red-brown/ Clay Loam		
<b>Cover leaf litter:</b> 20%		
<b>Cover bare ground:</b> 80%		
<b>Upper stratum</b>	<b>Mid-stratum</b>	<b>Lower stratum</b>
<b>Growth form:</b> Tree	<b>Growth form:</b> Shrub	<b>Growth form:</b> Chenopod Shrub
<b>Height:</b> 5-12 m	<b>Height:</b> 0.5-1 m	<b>Height:</b> 0.25-0.5 m
<b>Crown cover:</b> 30-70%	<b>Crown cover:</b> <10%	<b>Crown cover:</b> <10%
<b>Dominant taxa</b>		
<i>Acacia incurvaneura</i>	<i>Eremophila georgei</i>	<i>Maireana georgei</i>
<b>Other Taxa</b>		
<i>Acacia caesaneura</i>	<i>Maireana convexa</i>	<i>Ptilotus obovatus</i> var. <i>obovatus</i>
<i>Acacia ayersiana</i>	<i>Acacia tetragonophylla</i>	<i>Solanum lasiophyllum</i>
<i>Santalum lanceolatum</i>	<i>Acacia ramulosa</i>	
	<i>Eremophila margarethae</i>	



<b>Project Name: Dacian</b>		
<b>Date:</b> 14/07/2021	<b>Botanist:</b> JW/JJ	<b>Photo (NW corner):</b> 229-231
<b>Quadrat:</b> Q12	<b>Quadrat size:</b> 50m x 50m	<b>Waypoint (NW corner):</b> 93
<b>Coordinates (GDA94):</b> 51 J 358666 6851906		
<b>Aspect:</b> SW	<b>Fire (yrs):</b> >20	<b>Condition rating:</b> Very Good
<b>Landform:</b> Flat		
<b>Coarse fragments on the surface:</b> Quartz, ironstone/ 20-50%/ 20-60mm		
<b>Rock outcrop (abundance/runoff):</b> Nil/ very slow		
<b>Soil (profile/field texture/soil surface):</b> Brown/ Clay Loam		
<b>Cover leaf litter:</b> 20%		
<b>Cover bare ground:</b> 80%		
<b>Upper stratum</b>	<b>Mid-stratum</b>	<b>Lower stratum</b>
<b>Growth form:</b> Tree	<b>Growth form:</b> Shrub	<b>Growth form:</b> Chenopod Shrub
<b>Height:</b> 3-5 m	<b>Height:</b> 1-3 m	<b>Height:</b> 0.25-0.5 m
<b>Crown cover:</b> <10%	<b>Crown cover:</b> 10-30%	<b>Crown cover:</b> <10%
<b>Dominant taxa</b>		
<i>Acacia incurvaneura</i>	<i>Eremophila oldfieldii</i> subsp. <i>angustifolia</i>	<i>Maireana georgei</i>
<b>Other Taxa</b>		
<i>Acacia aptaneura</i>	<i>Acacia tetragonophylla</i>	<i>Maireana triptera</i>
<i>Acacia caesaneura</i>	<i>Sida calyxhymenia</i>	<i>Ptilotus obovatus</i> var. <i>obovatus</i>
<i>Psydrax suaveolens</i>	<i>Senna artemisioides</i> subsp. <i>filifolia</i>	<i>Marsdenia australis</i>
<i>Santalum spicatum</i>	<i>Scaevola spinescens</i>	<i>Roepera eremaea</i>
	<i>Hakea preissii</i>	<i>Sclerolaena densiflora</i>
		<i>Teucrium teucriiflorum</i>





Project Name: Dacian		
Date: 14/07/2021	Botanist: JW/JJ	Photo (NW corner): 232-234
Quadrat: Q13	Quadrat size: 50m x 50m	Waypoint (NW corner): 97
Coordinates (GDA94): 51 J 360091 6852450		
Aspect: SW	Fire (yrs): >20	Condition rating: Very Good
Landform: Flat		
Coarse fragments on the surface: Quartz, ironstone/ 50-90%/ 20-60mm		
Rock outcrop (abundance/runoff): Nil/ very slow		
Soil (profile/field texture/soil surface): Brown/ Clay Loam		
Cover leaf litter: 20%		
Cover bare ground: 80%		
Upper stratum	Mid-stratum	Lower stratum
Growth form: Tree	Growth form: Shrub	Growth form: Chenopod Shrub
Height: 3-5 m	Height: 1-3 m	Height: 0.25-0.5 m
Crown cover: 10-30%	Crown cover: 10-30%	Crown cover: <10%
Dominant taxa		
<i>Acacia caesaneura</i>	<i>Eremophila platycalyx</i>	<i>Maireana georgei</i>
Other Taxa		
<i>Acacia incurvaneura</i>	<i>Eremophila georgei</i>	<i>Dianella revoluta</i>
	<i>Eremophila margarethae</i>	<i>Maireana triptera</i>
	<i>Rhagodia eremaea</i>	<i>Enchylaena tomentosa</i>
	<i>Scaevola spinescens</i>	<i>Ptilotus obovatus</i> var. <i>obovatus</i>
	<i>Acacia tetragonophylla</i>	





<b>Project Name: Dacian</b>		
<b>Date:</b> 14/07/2021	<b>Botanist:</b> JW/JJ	<b>Photo (NW corner):</b> 235-237
<b>Quadrat:</b> Q14	<b>Quadrat size:</b> 50m x 50m	<b>Waypoint (NW corner):</b> 101
<b>Coordinates (GDA94):</b> 51 J 359131 6851272		
<b>Aspect:</b> SW	<b>Fire (yrs):</b> >20	<b>Condition rating:</b> Very Good
<b>Landform:</b> Flat		
<b>Coarse fragments on the surface:</b> Quartz, ironstone/ 20-50%/ 20-60mm		
<b>Rock outcrop (abundance/runoff):</b> Nil/ slow		
<b>Soil (profile/field texture/soil surface):</b> Brown/ Clay Loam		
<b>Cover leaf litter:</b> 15%		
<b>Cover bare ground:</b> 85%		
<b>Upper stratum</b>	<b>Mid-stratum</b>	<b>Lower stratum</b>
<b>Growth form:</b> Tree	<b>Growth form:</b> Shrub	<b>Growth form:</b> Chenopod Shrub
<b>Height:</b> 3-5-12 m	<b>Height:</b> 0.5-1 m	<b>Height:</b> 0.5-1 m
<b>Crown cover:</b> 30-70%	<b>Crown cover:</b> <10%	<b>Crown cover:</b> <10%
<b>Dominant taxa</b>		
<i>Acacia incurvaneura</i>	<i>Eremophila margarethae</i>	<i>Maireana convexa</i>
<b>Other Taxa</b>		
<i>Acacia caesaneura</i>	<i>Eremophila georgei</i>	<i>Dianella revoluta</i>
<i>Acacia tetragonophylla</i>	<i>Acacia ramulosa</i>	<i>Marsdenia australis</i>
<i>Santalum lanceolatum</i>	<i>Scaevola spinescens</i>	<i>Ptilotus obovatus</i> var. <i>obovatus</i>
		<i>Teucrium teucriiflorum</i>



<b>Project Name: Dacian</b>		
<b>Date:</b> 14/07/2021	<b>Botanist:</b> JW/JJ	<b>Photo (NW corner):</b> 238-240
<b>Quadrat:</b> Q15	<b>Quadrat size:</b> 50m x 50m	<b>Waypoint (NW corner):</b> 105
<b>Coordinates (GDA94):</b> 51 J 359161 6850654		
<b>Aspect:</b> SW	<b>Fire (yrs):</b> >20	<b>Condition rating:</b> Very Good
<b>Landform:</b> Flat		
<b>Coarse fragments on the surface:</b> Quartz, ironstone/ 2-10%/ 2-6mm		
<b>Rock outcrop (abundance/runoff):</b> Nil/ very slow		
<b>Soil (profile/field texture/soil surface):</b> Brown/ Clay Loam		
<b>Cover leaf litter:</b> 20%		
<b>Cover bare ground:</b> 80%		
<b>Upper stratum</b>	<b>Mid-stratum</b>	<b>Lower stratum</b>
<b>Growth form:</b> Tree	<b>Growth form:</b> Shrub	<b>Growth form:</b> Shrub
<b>Height:</b> 5-12 m	<b>Height:</b> 1-3 m	<b>Height:</b> 0.5-1 m
<b>Crown cover:</b> 30-70%	<b>Crown cover:</b> <10%	<b>Crown cover:</b> <10%
<b>Dominant taxa</b>		
<i>Acacia incurvaneura</i>	<i>Eremophila forrestii</i> subsp. <i>forrestii</i>	<i>Eremophila margarethae</i>
<b>Other Taxa</b>		
<i>Acacia caesaneura</i>	<i>Eremophila georgei</i>	<i>Dianella revoluta</i>
<i>Psyrax suaveolens</i>	<i>Rhagodia eremaea</i>	





<b>Project Name: Dacian</b>		
<b>Date:</b> 16/07/2021	<b>Botanist:</b> JW/JJ	<b>Photo (NW corner):</b> 241-243
<b>Quadrat:</b> Q16	<b>Quadrat size:</b> 50m x 50m	<b>Waypoint (NW corner):</b> 109
<b>Coordinates (GDA94):</b> 51 J 360077 6850161		
<b>Aspect:</b> SW	<b>Fire (yrs):</b> >20	<b>Condition rating:</b> Very Good
<b>Landform:</b> Flat		
<b>Coarse fragments on the surface:</b> Quartz, ironstone/ 10-20%/ 20-60mm		
<b>Rock outcrop (abundance/runoff):</b> Nil/ very slow		
<b>Soil (profile/field texture/soil surface):</b> Brown/ Clay Loam		
<b>Cover leaf litter:</b> 20%		
<b>Cover bare ground:</b> 80%		
<b>Upper stratum</b>	<b>Mid-stratum</b>	<b>Lower stratum</b>
<b>Growth form:</b> Tree	<b>Growth form:</b> Shrub	<b>Growth form:</b> Shrub
<b>Height:</b> 5-12 m	<b>Height:</b> 1-3 m	<b>Height:</b> <0.25 m
<b>Crown cover:</b> 30-70%	<b>Crown cover:</b> <10%	<b>Crown cover:</b> <1%
<b>Dominant taxa</b>		
<i>Acacia incurvaneura</i>	<i>Acacia tetragonophylla</i>	<i>Rhodanthe chlorocephala</i>
<b>Other Taxa</b>		
<i>Acacia caesaneura</i>	<i>Rhagodia eremaea</i>	<i>Cheilanthes sieberi</i>
<i>Santalum spicatum</i>		<i>Marsdenia australis</i>
		<i>Rhodanthe charsleyae</i>
		<i>Teucrium teucriiflorum</i>





Project Name: Dacian		
Date: 14/07/2021	Botanist: JW/JJ	Photo (NW corner): 244-246
Quadrat: Q17	Quadrat size: 50m x 50m	Waypoint (NW corner): 113
Coordinates (GDA94): 51 J 360183 6851072		
Aspect: SW	Fire (yrs): >20	Condition rating: Very Good
Landform: Flat		
Coarse fragments on the surface: Quartz/ 2-10%/ 6-20 mm		
Rock outcrop (abundance/runoff): Nil/ slow		
Soil (profile/field texture/soil surface): Brown/ Clay Loam		
Cover leaf litter: 15%		
Cover bare ground: 85%		
Upper stratum	Mid-stratum	Lower stratum
Growth form: Tree	Growth form: Shrub	Growth form: Chenopod Shrub
Height: 5-12 m	Height: 1-3 m	Height: 0.5-1 m
Crown cover: 30-70%	Crown cover: <10%	Crown cover: <10%
Dominant taxa		
<i>Acacia incurvaneura</i>	<i>Acacia tetragonophylla</i>	<i>Maireana georgei</i>
Other Taxa		
<i>Acacia caesaneura</i>	<i>Acacia ramulosa</i>	<i>Maireana convexa</i>
<i>Santalum lanceolatum</i>	<i>Eremophila margarethae</i>	<i>Ptilotus schwartzii</i>
	<i>Scaevola spinescens</i>	<i>Ptilotus obovatus</i> var. <i>obovatus</i>
		<i>Teucrium teucriiflorum</i>



Project Name: Dacian		
Date: 14/07/2021	Botanist: JW/JJ	Photo (NW corner): 247-249
Quadrat: Q18	Quadrat size: 50m x 50m	Waypoint (NW corner): 117
Coordinates (GDA94): 51 J 358975 6849765		
Aspect: SW	Fire (yrs): >20	Condition rating: Very Good
Landform: Open Depression		
Coarse fragments on the surface: Quartz, ironstone/ 20-50%/ 20-60mm		
Rock outcrop (abundance/runoff): Nil/ slow		
Soil (profile/field texture/soil surface): Brown/ Clay Loam		
Cover leaf litter: 20%		
Cover bare ground: 80%		
Upper stratum	Mid-stratum	Lower stratum
Growth form: Tree	Growth form: Shrub	Growth form: Shrub
Height: 3-5 m	Height: 1-3 m	Height: 0.5-1 m
Crown cover: 30-70%	Crown cover: <10%	Crown cover: <10%
Dominant taxa		
<i>Acacia incurvaneura</i>	<i>Acacia tetragonophylla</i>	<i>Eremophila gilesii</i>
Other Taxa		
<i>Acacia caesaneura</i>	<i>Acacia ramulosa</i>	<i>Brachyscome ciliaris</i>
<i>Santalum lanceolatum</i>	<i>Acacia burkittii</i>	<i>Dianella revoluta</i>
	<i>Eremophila margarethae</i>	<i>Goodenia rosea</i>
	<i>Hakea kippistiana</i>	<i>Rhodanthe charsleyae</i>
		<i>Teucrium teucriiflorum</i>





<b>Project Name: Dacian</b>		
<b>Date:</b> 13/07/2021	<b>Botanist:</b> JW/JJ	<b>Photo (NW corner):</b> 250-252
<b>Quadrat:</b> Q19	<b>Quadrat size:</b> 50m x 50m	<b>Waypoint (NW corner):</b> 121
<b>Coordinates (GDA94):</b> 51 J 360195 6849655		
<b>Aspect:</b> SW	<b>Fire (yrs):</b> >20	<b>Condition rating:</b> Very Good
<b>Landform:</b> Flat		
<b>Coarse fragments on the surface:</b> Ironstone/ 20-50%/ 2-6mm		
<b>Rock outcrop (abundance/runoff):</b> Nil/ very slow		
<b>Soil (profile/field texture/soil surface):</b> Sandy clay loam		
<b>Cover leaf litter:</b> 12%		
<b>Cover bare ground:</b> 85%		
<b>Upper stratum</b>	<b>Mid-stratum</b>	<b>Lower stratum</b>
<b>Growth form:</b> Tree	<b>Growth form:</b> Shrub	<b>Growth form:</b> Hummock Grass
<b>Height:</b> 3-5-12 m	<b>Height:</b> 1-3 m	<b>Height:</b> 0.5-1 m
<b>Crown cover:</b> <10%	<b>Crown cover:</b> <10%	<b>Crown cover:</b> 10-30%
<b>Dominant taxa</b>		
<i>Acacia caesaneura</i>	<i>Acacia ramulosa</i>	<i>Triodia rigidissima</i>
<b>Other Taxa</b>		
<i>Acacia incurvaneura</i>	<i>Eremophila margarethae</i>	<i>Dianella revoluta</i>
<i>Psydrax suaveolens</i>	<i>Eremophila homoplastica</i>	<i>Teucrium teucriiflorum</i>
	<i>Rhagodia eremaea</i>	





<b>Project Name: Dacian</b>		
<b>Date:</b> 14/07/2021	<b>Botanist:</b> JW/JJ	<b>Photo (NW corner):</b> 253-255
<b>Quadrat:</b> Q20	<b>Quadrat size:</b> 50m x 50m	<b>Waypoint (NW corner):</b> 125
<b>Coordinates (GDA94):</b> 51 J 359106 6849149		
<b>Aspect:</b> SW	<b>Fire (yrs):</b> >20	<b>Condition rating:</b> Good
<b>Landform:</b> Flat		
<b>Coarse fragments on the surface:</b> Quartz, ironstone/ 10-20%/ 2-6mm		
<b>Rock outcrop (abundance/runoff):</b> Nil/ very slow		
<b>Soil (profile/field texture/soil surface):</b> Brown/ Sandy Clay Loam		
<b>Cover leaf litter:</b> 15%		
<b>Cover bare ground:</b> 85%		
<b>Upper stratum</b>	<b>Mid-stratum</b>	<b>Lower stratum</b>
<b>Growth form:</b> Tree	<b>Growth form:</b> Shrub	<b>Growth form:</b> Hummock Grass
<b>Height:</b> 3-5 m	<b>Height:</b> 0.5-1 m	<b>Height:</b> 0.25-0.5 m
<b>Crown cover:</b> 30-70%	<b>Crown cover:</b> 10-30%	<b>Crown cover:</b> 30-70%
<b>Dominant taxa</b>		
<i>Acacia caesaneura</i>	<i>Eremophila margarethae</i>	<i>Triodia rigidissima</i>
<b>Other Taxa</b>		
<i>Acacia incurvaneura</i>	<i>Acacia ramulosa</i>	<i>Dianella revoluta</i>
	<i>Acacia tetragonophylla</i>	<i>Teucrium teucriiflorum</i>
	<i>Eremophila homoplastica</i>	<i>Thysanotus manglesii</i>



Project Name: Dacian		
Date: 14/07/2021	Botanist: JW/JJ	Photo (NW corner): 256-258
Quadrat: Q21	Quadrat size: 50m x 50m	Waypoint (NW corner): 132
Coordinates (GDA94): 51 J 359536 6848231		
Aspect: SW	Fire (yrs): >20	Condition rating: Good
Landform: Flat		
Coarse fragments on the surface: Ironstone/ 20-50-90%/ 2-6mm		
Rock outcrop (abundance/runoff): Nil/ very slow		
Soil (profile/field texture/soil surface): Brown/ Sandy Clay Loam		
Cover leaf litter: 20%		
Cover bare ground: 80%		
Upper stratum	Mid-stratum	Lower stratum
Growth form: Tree Mallee	Growth form: Shrub	Growth form: Hummock Grass
Height: 5-12 m	Height: 3-5 m	Height: 0.25-0.5 m
Crown cover: <10%	Crown cover: >70%	Crown cover: 30-70%
Dominant taxa		
<i>Acacia youngiana</i>	<i>Acacia effusifolia</i>	<i>Triodia rigidissima</i>
Other Taxa		
<i>Acacia incurvaneura</i>	<i>Eremophila margarethae</i>	<i>Goodenia xanthosperma</i>
	<i>Sida calyxhymenia</i>	Malvaceae yellow
		<i>Androcalva luteiflora</i>
		<i>Thysanotus manglesii</i>



Project Name: Dacian		
Date: 14/07/2021	Botanist: JW/JJ	Photo (NW corner): 259-261
Quadrat: Q22	Quadrat size: 50m x 50m	Waypoint (NW corner): 137
Coordinates (GDA94): 51 J 359447 6847149		
Aspect: SW	Fire (yrs): >20	Condition rating: Very Good
Landform: Flat		
Coarse fragments on the surface: Ironstone/ 10-20%/ 2-6mm		
Rock outcrop (abundance/runoff): Nil/ very slow		
Soil (profile/field texture/soil surface): Brown/ Clay Loam		
Cover leaf litter: 20%		
Cover bare ground: 80%		
Upper stratum	Mid-stratum	Lower stratum
Growth form: Tree	Growth form: Shrub	Growth form: Shrub
Height: 5-12 m	Height: 1-3 m	Height: 0.25-0.5 m
Crown cover: <10%	Crown cover: 30-70%	Crown cover: 10-30%
Dominant taxa		
<i>Acacia incurvaneura</i>	<i>Acacia ramulosa</i>	<i>Eremophila homoplastica</i>
Other Taxa		
	<i>Acacia effusifolia</i>	<i>Teucrium teucriiflorum</i>
	<i>Eremophila margarethae</i>	<i>Triodia rigidissima</i>
	<i>Rhagodia eremaea</i>	





<b>Project Name: Dacian</b>		
<b>Date:</b> 14/07/2021	<b>Botanist:</b> JW/JJ	<b>Photo (NW corner):</b> 262-264
<b>Quadrat:</b> Q23	<b>Quadrat size:</b> 50m x 50m	<b>Waypoint (NW corner):</b> 141
<b>Coordinates (GDA94):</b> 51 J 359409 6846651		
<b>Aspect:</b> SW	<b>Fire (yrs):</b> >20	<b>Condition rating:</b> Good
<b>Landform:</b> Flat		
<b>Coarse fragments on the surface:</b> Ironstone/ 2-10%/ 2-6mm		
<b>Rock outcrop (abundance/runoff):</b> Nil/ slow		
<b>Soil (profile/field texture/soil surface):</b> Brown/ Clay Loam Sandy		
<b>Cover leaf litter:</b> 20%		
<b>Cover bare ground:</b> 80%		
<b>Upper stratum</b>	<b>Mid-stratum</b>	<b>Lower stratum</b>
<b>Growth form:</b> Tree mallee	<b>Growth form:</b> Shrub	<b>Growth form:</b> Hummock Grass
<b>Height:</b> 5-12 m	<b>Height:</b> 1-3 m	<b>Height:</b> 0.25-0.5 m
<b>Crown cover:</b> <1%	<b>Crown cover:</b> <10%	<b>Crown cover:</b> >70%
<b>Dominant taxa</b>		
<i>Eucalyptus youngiana</i>	<i>Acacia effusifolia</i>	<i>Triodia rigidissima</i>
<b>Other Taxa</b>		
<i>Acacia incurvaneura</i>	<i>Psydrax suaveolens</i>	<i>Dianella revoluta</i>
	<i>Eremophila margarethae</i>	



<b>Project Name: Dacian</b>		
<b>Date:</b> 14/07/2021	<b>Botanist:</b> JW/JJ	<b>Photo (NW corner):</b> 265-267
<b>Quadrat:</b> Q24	<b>Quadrat size:</b> 50m x 50m	<b>Waypoint (NW corner):</b> 145
<b>Coordinates (GDA94):</b> 51 J 359354 6845993		
<b>Aspect:</b> SW	<b>Fire (yrs):</b> >20	<b>Condition rating:</b> Very Good
<b>Landform:</b> Flat		
<b>Coarse fragments on the surface:</b> Ironstone/ 10-20%/ 2-6mm		
<b>Rock outcrop (abundance/runoff):</b> Nil/ slow		
<b>Soil (profile/field texture/soil surface):</b> Brown/ Clay Loam		
<b>Cover leaf litter:</b> 20%		
<b>Cover bare ground:</b> 60%		
<b>Upper stratum</b>	<b>Mid-stratum</b>	<b>Lower stratum</b>
<b>Growth form:</b> Tree	<b>Growth form:</b> Shrub	<b>Growth form:</b> Hummock Grass
<b>Height:</b> 5-12 m	<b>Height:</b> 1-3 m	<b>Height:</b> 0.5-1 m
<b>Crown cover:</b> 10-30%	<b>Crown cover:</b> <10%	<b>Crown cover:</b> <10%
<b>Dominant taxa</b>		
<i>Eucalyptus youngiana</i>	<i>Acacia effusifolia</i>	<i>Triodia rigidissima</i>
<b>Other Taxa</b>		
<i>Acacia incurvaneura</i>		<i>Goodenia xanthosperma</i>
		<i>Goodenia rosea</i>
		<i>Brunonia australis</i>





<b>Project Name: Dacian</b>		
<b>Date:</b> 14/07/2021	<b>Botanist:</b> JW/JJ	<b>Photo (NW corner):</b> 268-270
<b>Quadrat:</b> Q25	<b>Quadrat size:</b> 50m x 50m	<b>Waypoint (NW corner):</b> 149
<b>Coordinates (GDA94):</b> 51 J 359203 6845373		
<b>Aspect:</b> SW	<b>Fire (yrs):</b> >20	<b>Condition rating:</b> Good
<b>Landform:</b> Flat		
<b>Coarse fragments on the surface:</b> Ironstone/ 10-20%/ 2-6mm		
<b>Rock outcrop (abundance/runoff):</b> Nil/ very slow		
<b>Soil (profile/field texture/soil surface):</b> Brown/ Clay Loam Sandy		
<b>Cover leaf litter:</b> 20%		
<b>Cover bare ground:</b> 30%		
<b>Upper stratum</b>	<b>Mid-stratum</b>	<b>Lower stratum</b>
<b>Growth form:</b> Tree Mallee	<b>Growth form:</b> Shrub	<b>Growth form:</b> Hummock grass
<b>Height:</b> 5-12 m	<b>Height:</b> 1-3 m	<b>Height:</b> 0.5-1 m
<b>Crown cover:</b> <1%	<b>Crown cover:</b> 30-70%	<b>Crown cover:</b> <10%
<b>Dominant taxa</b>		
<i>Eucalyptus youngiana</i>	<i>Acacia effusifolia</i>	<i>Triodia rigidissima</i>
<b>Other Taxa</b>		
<i>Acacia caesaneura</i>	<i>Acacia ramulosa</i>	
<i>Acacia incurvaneura</i>	<i>Eremophila margarethae</i>	





Project Name: Dacian		
Date: 14/07/2021	Botanist: JW/JJ	Photo (NW corner): 271-273
Quadrat: Q26	Quadrat size: 50m x 50m	Waypoint (NW corner): 153
Coordinates (GDA94): 51 J 358996 6844609		
Aspect: SW	Fire (yrs): >20	Condition rating: Good
Landform: Flat		
Coarse fragments on the surface: Ironstone/ 10-20%/ 2-6mm		
Rock outcrop (abundance/runoff): Nil/ very slow		
Soil (profile/field texture/soil surface): Brown/ Clay Loam Sandy		
Cover leaf litter: 15%		
Cover bare ground: 70%		
Upper stratum	Mid-stratum	Lower stratum
Growth form: Tree	Growth form: Shrub	Growth form: Hummock grass
Height: 5-12 m	Height: 1-3 m	Height: 0.25-0.5 m
Crown cover: <10%	Crown cover: 10-30%	Crown cover: 30-70%
Dominant taxa		
<i>Acacia incurvaneura</i>	<i>Acacia ramulosa</i>	<i>Triodia rigidissima</i>
Other Taxa		
<i>Acacia caesaneura</i>	<i>Eremophila margarethae</i>	<i>Teucrium teucriiflorum</i>
<i>Eucalyptus youngiana</i>	<i>Eremophila homoplastica</i>	
	<i>Psyrax suaveolens</i>	



Project Name: Dacian		
Date: 14/07/2021	Botanist: JW/JJ	Photo (NW corner): 274-276
Quadrat: Q27	Quadrat size: 50m x 50m	Waypoint (NW corner): 157
Coordinates (GDA94): 51 J 358718 6843946		
Aspect: SW	Fire (yrs): >20	Condition rating: Very Good
Landform: Flat		
arse fragments on the surface: Ironstone/ 2-10%/ 2-6mm		
Rock outcrop (abundance/runoff): Nil/ very slow		
Soil (profile/field texture/soil surface): Brown/ Clay Loam		
Cover leaf litter: 25%		
Cover bare ground: 65%		
Upper stratum	Mid-stratum	Lower stratum
Growth form: Tree	Growth form: Shrub	Growth form: Shrub
Height: 3-5 m	Height: 1-3 m	Height: 0.25-0.5 m
Crown cover: >70%	Crown cover: <10%	Crown cover: <10%
Dominant taxa		
<i>Acacia caesaneura</i>	<i>Acacia ramulosa</i>	<i>Eremophila homoplastica</i>
Other Taxa		
<i>Acacia incurvaneura</i>	<i>Psydrax suaveolens</i>	<i>Teucrium teucriiflorum</i>
<i>Eucalyptus kingii</i>		<i>Triodia rigidissima</i>





<b>Project Name: Dacian</b>		
<b>Date:</b> 14/07/2021	<b>Botanist:</b> JW/JJ	<b>Photo (NW corner):</b> 277-279
<b>Quadrat:</b> Q28	<b>Quadrat size:</b> 50m x 50m	<b>Waypoint (NW corner):</b> 161
<b>Coordinates (GDA94):</b> 51 J 358519 6842658		
<b>Aspect:</b> SW	<b>Fire (yrs):</b> >20	<b>Condition rating:</b> Good
<b>Landform:</b> Flat		
<b>Coarse fragments on the surface:</b> Ironstone/ 20-50%/ -6-20 mm		
<b>Rock outcrop (abundance/runoff):</b> Nil/ slow		
<b>Soil (profile/field texture/soil surface):</b> Brown/ Clay Loam		
<b>Cover leaf litter:</b> 25%		
<b>Cover bare ground:</b> 70%		
<b>Upper stratum</b>	<b>Mid-stratum</b>	<b>Lower stratum</b>
<b>Growth form:</b> Tree	<b>Growth form:</b> Shrub	<b>Growth form:</b> -
<b>Height:</b> 3-5 m	<b>Height:</b> 0.5-1 m	<b>Height:</b> -
<b>Crown cover:</b> 30-70%	<b>Crown cover:</b> <10%	<b>Crown cover:</b> -
<b>Dominant taxa</b>		
<i>Acacia caesaneura</i>	<i>Eremophila forrestii</i> subsp. <i>forrestii</i>	-
<b>Other Taxa</b>		
<i>Acacia incurvaneura</i>	<i>Dodonaea rigida</i>	
<i>Eucalyptus kingsmillii</i>	<i>Psydrax suaveolens</i>	
	<i>Thryptomene decussata</i>	





<b>Project Name: Dacian</b>		
<b>Date:</b> 15/07/2021	<b>Botanist:</b> JW/JJ	<b>Photo (NW corner):</b> 280-282
<b>Quadrat:</b> Q29	<b>Quadrat size:</b> 50m x 50m	<b>Waypoint (NW corner):</b> 165
<b>Coordinates (GDA94):</b> 51 J 359229 6843002		
<b>Aspect:</b> SW	<b>Fire (yrs):</b> >20	<b>Condition rating:</b> Very Good
<b>Landform:</b> Midslope		
<b>Coarse fragments on the surface:</b> Quartz, ironstone/ 50-90%/ 20-60mm		
<b>Rock outcrop (abundance/runoff):</b> Nil/ moderate		
<b>Soil (profile/field texture/soil surface):</b> Brown/ Clay Loam		
<b>Cover leaf litter:</b> 10%		
<b>Cover bare ground:</b> 90%		
<b>Upper stratum</b>	<b>Mid-stratum</b>	<b>Lower stratum</b>
<b>Growth form:</b> Tree	<b>Growth form:</b> Shrub	<b>Growth form:</b> Shrub
<b>Height:</b> 3-5 m	<b>Height:</b> 1-3 m	<b>Height:</b> 0.25-0.5 m
<b>Crown cover:</b> 10-30%	<b>Crown cover:</b> <10%	<b>Crown cover:</b> <10%
<b>Dominant taxa</b>		
<i>Acacia mulganeura</i>	<i>Eremophila latrobei</i> subsp. <i>latrobei</i>	<i>Ptilotus schwartzii</i>
<b>Other Taxa</b>		
<i>Acacia quadrimarginea</i>	<i>Acacia ramulosa</i>	<i>Eriachne maculata</i>
<i>Acacia incurvaneura</i>	<i>Acacia tetragonophylla</i>	<i>Ptilotus obovatus</i> var. <i>obovatus</i>
	<i>Dodonaea rigida</i>	
	<i>Eremophila georgei</i>	
	<i>Psydrax suaveolens</i>	



Project Name: Dacian		
Date: 15/07/2021	Botanist: JW/JJ	Photo (NW corner): 283-285
Quadrat: Q30	Quadrat size: 50m x 50m	Waypoint (NW corner): 169
Coordinates (GDA94): 51 J 359309 6842776		
Aspect: SW	Fire (yrs): >20	Condition rating: Very Good
Landform: Flat		
Coarse fragments on the surface: Quartz, ironstone, laterite/ 20-50%/ 6-20mm		
Rock outcrop (abundance/runoff): Nil/ slow		
Soil (profile/field texture/soil surface): Brown/ Clay Loam		
Cover leaf litter: 25%		
Cover bare ground: 70%		
Upper stratum	Mid-stratum	Lower stratum
Growth form: Tree	Growth form: Shrub	Growth form: Shrub
Height: 5-12 m	Height: 1-3 m	Height: <0.25 m
Crown cover: 30-70%	Crown cover: 10-30%	Crown cover: <10%
Dominant taxa		
<i>Acacia caesaneura</i>	<i>Eremophila latrobei</i> subsp. <i>latrobei</i>	<i>Pododtheca wilsonii</i>
Other Taxa		
<i>Acacia incurvaneura</i>	<i>Acacia ramulosa</i>	<i>Angianthus milnei</i>
<i>Brachychiton gregorii</i>	<i>Acacia tetragonophylla</i>	<i>Cheilanthes sieberi</i>
<i>Santalum spicatum</i>	<i>Eremophila clarkei</i>	<i>Marsdenia australis</i>
	<i>Ptilotus obovatus</i> var. <i>obovatus</i>	<i>Ptilotus helipteroides</i>
	<i>Sida calyxhymeria</i>	<i>Roepera eremaea</i>
	<i>Scaevola spinescens</i>	





Project Name: Dacian		
Date: 15/07/2021	Botanist: JW/JJ	Photo (NW corner): 286-288
Quadrat: Q31	Quadrat size: 50m x 50m	Waypoint (NW corner): 173
Coordinates (GDA94): 51 J 359506 6842463		
Aspect: SW	Fire (yrs): >20	Condition rating: Very Good
Landform: Flat		
Coarse fragments on the surface: Limestone/ 50-90%/ 20-60mm		
Rock outcrop (abundance/runoff): Nil/ slow		
Soil (profile/field texture/soil surface): Brown/ Clay Loam		
Cover leaf litter: 25%		
Cover bare ground: 75%		
Upper stratum	Mid-stratum	Lower stratum
Growth form: Tree	Growth form: Shrub	Growth form: Shrub
Height: 5-12 m	Height: 1-3 m	Height: 0.5-1 m
Crown cover: 30-70%	Crown cover: 10-30%	Crown cover: <10%
Dominant taxa		
<i>Casuarina pauper</i>	<i>Eremophila oldfieldii</i> subsp. <i>angustifolia</i>	<i>Ptilotus obovatus</i> var. <i>obovatus</i>
Other Taxa		
<i>Acacia incurvaneura</i>	<i>Eremophila pantonii</i>	<i>Maireana triptera</i>
<i>Acacia kempeana</i>	<i>Sida calyxhymenia</i>	<i>Maireana georgei</i>
<i>Acacia ayersiana</i>	<i>Sida</i> sp. <i>Excedentifolia</i> (J.L. Egan 1925)	<i>Ptilotus helipteroides</i>
<i>Acacia burkittii</i>	<i>Senna artemisioides</i> subsp. <i>filifolia</i>	<i>Roepera eremaea</i>
	<i>Scaevola spinescens</i>	





Project Name: Dacian		
Date: 15/07/2021	Botanist: JW/JJ	Photo (NW corner): 289-291
Quadrat: Q32	Quadrat size: 50m x 50m	Waypoint (NW corner): 177
Coordinates (GDA94): 51 J 359611 6842709		
Aspect: SW	Fire (yrs): >20	Condition rating: Very Good
Landform: Crest (BIF)		
Coarse fragments on the surface: Ironstone, laterite/ 50-90%/ 20-60mm		
Rock outcrop (abundance/runoff): 2-10%/ moderate		
Soil (profile/field texture/soil surface): Brown/ Clay Loam		
Cover leaf litter: 10%		
Cover bare ground: 90%		
Upper stratum	Mid-stratum	Lower stratum
Growth form: Tree	Growth form: Shrub	Growth form: Shrub
Height: 3-5 m	Height: 1-3 m	Height: 0.5-1 m
Crown cover: 10-30%	Crown cover: 10-30%	Crown cover: 10-30%
Dominant taxa		
<i>Acacia incurvaneura</i>	<i>Eremophila latrobei</i> subsp. <i>latrobei</i>	<i>Eremophila ericalyx</i>
Other Taxa		
<i>Acacia ayersiana</i>	<i>Acacia ramulosa</i>	<i>Rhodanthe chlorocephala</i> subsp. <i>rosea</i>
	<i>Dodonaea rigida</i>	<i>Marsdenia australis</i>
	<i>Eremophila georgei</i>	<i>Goodenia macroplectra</i>
	<i>Psydrax suaveolens</i>	
	<i>Scaevola spinescens</i>	
	<i>Sida calyxhymenia</i>	



<b>Project Name: Dacian</b>		
<b>Date:</b> 15/07/2021	<b>Botanist:</b> JW/JJ	<b>Photo (NW corner):</b> 292-294
<b>Quadrat:</b> Q33	<b>Quadrat size:</b> 50m x 50m	<b>Waypoint (NW corner):</b> 182
<b>Coordinates (GDA94):</b> 51 J 359026 6842609		
<b>Aspect:</b> SW	<b>Fire (yrs):</b> >20	<b>Condition rating:</b> Very Good
<b>Landform:</b> Flat		
<b>Coarse fragments on the surface:</b> Quartz, ironstone/ 50-90%/ 6-20mm		
<b>Rock outcrop (abundance/runoff):</b> Nil/ slow		
<b>Soil (profile/field texture/soil surface):</b> Brown/ Clay Loam		
<b>Cover leaf litter:</b> 25%		
<b>Cover bare ground:</b> 75%		
<b>Upper stratum</b>	<b>Mid-stratum</b>	<b>Lower stratum</b>
<b>Growth form:</b> Tree	<b>Growth form:</b> Shrub	<b>Growth form:</b> Shrub
<b>Height:</b> 5-12 m	<b>Height:</b> 1-3 m	<b>Height:</b> 0.25-0.5 m
<b>Crown cover:</b> 10-30%	<b>Crown cover:</b> <10%	<b>Crown cover:</b> <10%
<b>Dominant taxa</b>		
<i>Acacia caesaneura</i>	<i>Acacia tetragonophylla</i>	<i>Cheilanthes sieberi</i>
<b>Other Taxa</b>		
<i>Acacia incurvaneura</i>	<i>Eremophila forrestii</i> subsp. <i>forrestii</i>	<i>Marsdenia australis</i>
	<i>Eremophila margarethae</i>	<i>Teucrium teucriiflorum</i>





Project Name: Dacian		
Date: 15/07/2021	Botanist: JW/JJ	Photo (NW corner): 295-297
Quadrat: Q34	Quadrat size: 50m x 50m	Waypoint (NW corner): 186
Coordinates (GDA94): 51 J 359002 6842890		
Aspect: SW	Fire (yrs): >20	Condition rating: Very Good
Landform: Flat		
Coarse fragments on the surface: Quartz, ironstone/ 50-90%/ 20-60mm		
Rock outcrop (abundance/runoff): Nil/ slow		
Soil (profile/field texture/soil surface): Brown/ Clay Loam		
Cover leaf litter:		
Cover bare ground:		
Upper stratum	Mid-stratum	Lower stratum
Growth form: Tree	Growth form: Shrub	Growth form: Shrub
Height: 3-5 m	Height: 1-3 m	Height: 0.25-0.5 m
Crown cover: 10-30%	Crown cover: 10-30%	Crown cover: <1%
Dominant taxa		
<i>Acacia incurvaneura</i>	<i>Acacia quadrimarginea</i>	<i>Ptilotus schwartzii</i>
Other Taxa		
<i>Acacia ayersiana</i>	<i>Dodonaea rigida</i>	
<i>Acacia caesaneura</i>	<i>Eremophila forrestii</i> subsp. <i>forrestii</i>	
<i>Brachychiton gregorii</i>	<i>Eremophila georgei</i>	
<i>Eucalyptus lucasii</i>	<i>Eremophila latrobei</i> subsp. <i>latrobei</i>	
	<i>Sida calyxhymenia</i>	





Project Name: Dacian		
Date: 15/07/2021	Botanist: JW/JJ	Photo (NW corner): 298-300
Quadrat: Q35	Quadrat size: 50m x 50m	Waypoint (NW corner): 190
Coordinates (GDA94): 51 J 358616 6842949		
Aspect: SW	Fire (yrs): >20	Condition rating: Very Good
Landform: Flat		
Coarse fragments on the surface: Ironstone/ 50-90%/ 6-20mm		
Rock outcrop (abundance/runoff): Nil/ very slow		
Soil (profile/field texture/soil surface): Brown/ Clay Loam		
Cover leaf litter: 20%		
Cover bare ground: 80%		
Upper stratum	Mid-stratum	Lower stratum
Growth form: Tree	Growth form: Shrub	Growth form: Shrub
Height: 3-5 m	Height: 1-3 m	Height: 0.25-0.5 m
Crown cover: 10-30%	Crown cover: <10%	Crown cover: <1%
Dominant taxa		
<i>Acacia caesaneura</i>	<i>Acacia ramulosa</i>	<i>Ptilotus schwartzii</i>
Other Taxa		
<i>Acacia incurvaneura</i>	<i>Dodonaea rigida</i>	<i>Cheilanthes sieberi</i>
<i>Brachychiton gregorii</i>	<i>Eremophila forrestii</i> subsp. <i>forrestii</i>	<i>Ptilotus obovatus</i> var. <i>obovatus</i>
	<i>Eremophila georgei</i>	<i>Teucrium teucriiflorum</i>
	<i>Eremophila margarethae</i>	
	<i>Eremophila latrobei</i> subsp. <i>latrobei</i>	



Project Name: Dacian		
Date: 15/07/2021	Botanist: JW/JJ	Photo (NW corner): 301-303
Quadrat: Q36	Quadrat size: 50m x 50m	Waypoint (NW corner): 194
Coordinates (GDA94): 51 J 357855 6839039		
Aspect: SW	Fire (yrs): >20	Condition rating: Very Good
Landform: Flat		
Coarse fragments on the surface: Quartz, ironstone, limestone		
Rock outcrop (abundance/runoff): 10-20%/ slow		
Soil (profile/field texture/soil surface): Brown/ Sandy Loam		
Cover leaf litter:		
Cover bare ground:		
Upper stratum	Mid-stratum	Lower stratum
Growth form: Tree	Growth form: Shrub	Growth form: Shrub
Height: 5-12 m	Height: 1-3 m	Height: 0.25 m
Crown cover: <10%	Crown cover: 10-30%	Crown cover: <10%
Dominant taxa		
<i>Eucalyptus lucasii</i>	<i>Acacia tetragonophylla</i>	<i>Roepera eremaea</i>
Other Taxa		
<i>Acacia ayersiana</i>	<i>Acacia burkittii</i>	<i>Maireana convexa</i>
<i>Acacia caesaneura</i>	<i>Acacia ramulosa</i>	<i>Maireana triptera</i>
<i>Acacia incurvaneura</i>	<i>Eremophila forrestii</i> subsp. <i>forrestii</i>	<i>Cephalopterum drummondii</i>
	<i>Eremophila margarethae</i>	<i>Calandrinia eremaea</i>
	<i>Maireana pyramidata</i>	<i>Plantago drummondii</i>
	<i>Lemooria burkittii</i>	<i>Duperreya commixta</i>
	<i>Senna artemisioides</i> subsp. <i>artemisioides</i>	<i>Teucrium teucriiflorum</i>
	<i>Senna artemisioides</i> subsp. <i>filifolia</i>	<i>Goodenia rosea</i>
		<i>Helipterum craspedioides</i>





Project Name: Dacian		
Date: 15/07/2021	Botanist: JW/JJ	Photo (NW corner): 304-306
Quadrat: Q37	Quadrat size: 50m x 50m	Waypoint (NW corner): 198
Coordinates (GDA94): 51 J 357587 6838836		
Aspect: SW	Fire (yrs): >20	Condition rating: Very Good
Landform: Open depression		
Coarse fragments on the surface: Mixed/ 50-90%/ 6-20mm		
Rock outcrop (abundance/runoff): Sandstone (creek)/ moderate		
Soil (profile/field texture/soil surface): Brown/ Clay Loam Sandy		
Cover leaf litter: 35%		
Cover bare ground: 60%		
Upper stratum	Mid-stratum	Lower stratum
Growth form: Tree	Growth form: Shrub	Growth form: Shrub
Height: 5-12 m	Height: 1-3 m	Height: 0.25-0.5 m
Crown cover: <10%	Crown cover: 30-70%	Crown cover: <1%
Dominant taxa		
<i>Eucalyptus lucasii</i>	<i>Acacia tetragonophylla</i>	<i>Enchylaena tomentosa</i>
Other Taxa		
<i>Acacia ayersiana</i>	<i>Acacia burkittii</i>	<i>Erodium crinitum</i>
<i>Acacia incurvaneura</i>	<i>Eremophila citrina</i>	<i>Lepidium platypetalum</i>
	<i>Eremophila clarkei</i>	<i>Maireana georgei</i>
	<i>Eremophila margarethae</i>	<i>Marsdenia australis</i>
	<i>Grevillea berryana</i>	<i>Rhodanthe charsleyae</i>
	<i>Grevillea deflexa</i>	<i>Rhodanthe chlorocephala</i>
	<i>Senna artemisioides</i> subsp. <i>artemisioides</i>	<i>Roepera eremaea</i>
	<i>Senna artemisioides</i> subsp. <i>filifolia</i>	





<b>Project Name: Dacian</b>		
<b>Date:</b> 15/07/2021	<b>Botanist:</b> JW/JJ	<b>Photo (NW corner):</b> 309-311
<b>Quadrat:</b> Q38	<b>Quadrat size:</b> 50m x 50m	<b>Waypoint (NW corner):</b> 202
<b>Coordinates (GDA94):</b> 51 J 357441 6839178		
<b>Aspect:</b> SW	<b>Fire (yrs):</b> >20	<b>Condition rating:</b> Very Good
<b>Landform:</b> Flat		
<b>Coarse fragments on the surface:</b> Ironstone/ 50-90%/ 20-60mm		
<b>Rock outcrop (abundance/runoff):</b> Nil/ very slow		
<b>Soil (profile/field texture/soil surface):</b> Brown/ Clay Loam		
<b>Cover leaf litter:</b> 10%		
<b>Cover bare ground:</b> 90%		
<b>Upper stratum</b>	<b>Mid-stratum</b>	<b>Lower stratum</b>
<b>Growth form:</b> Tree	<b>Growth form:</b> Shrub	<b>Growth form:</b> Chenopod Shrub
<b>Height:</b> 3-5 m	<b>Height:</b> 0.5-1 m	<b>Height:</b> 0.25-0.5 m
<b>Crown cover:</b> 10-30%	<b>Crown cover:</b> 10-30%	<b>Crown cover:</b> 10-30%
<b>Dominant taxa</b>		
<i>Acacia incurvaneura</i>	<i>Ptilotus obovatus</i> var. <i>obovatus</i>	<i>Maireana triptera</i>
<b>Other Taxa</b>		
<i>Acacia aptaneura</i>	<i>Acacia tetragonophylla</i>	<i>Enchylaena tomentosa</i>
<i>Acacia caesaneura</i>	<i>Eremophila georgei</i>	<i>Maireana georgei</i>
<i>Santalum lanceolatum</i>	<i>Eremophila margarethae</i>	<i>Leichardtia australis</i>
	<i>Eremophila platycalyx</i> subsp. <i>Leonora</i>	<i>Ptilotus helipteroides</i>
	<i>Scaevola spinescens</i>	<i>Ptilotus schwartzii</i>
	<i>Sida calyxhymenia</i>	<i>Teucrium teucriiflorum</i>



Project Name: Dacian		
Date: 15/07/2021	Botanist: JW/JJ	Photo (NW corner): 312-314
Quadrat: Q39	Quadrat size: 50m x 50m	Waypoint (NW corner): 206
Coordinates (GDA94): 51 J 357392 6838576		
Aspect: SW	Fire (yrs): >20	Condition rating: Good
Landform: Open depression		
Coarse fragments on the surface: Ironstone/ 50-90%/ 20-60mm		
Rock outcrop (abundance/runoff): 2-10%/ moderate		
Soil (profile/field texture/soil surface): Brown/ Clay Loam		
Cover leaf litter: 35%		
Cover bare ground: 65%		
Upper stratum	Mid-stratum	Lower stratum
Growth form: Tree	Growth form: Shrub	Growth form: Shrub
Height: 5-12 m	Height: 1-3 m	Height: 0.25-0.5 m
Crown cover: <10%	Crown cover: 10-30%	Crown cover: <10%
Dominant taxa		
<i>Eucalyptus lucasii</i>	<i>Acacia tetragonophylla</i>	<i>Ptilotus obovatus</i> var. <i>obovatus</i>
Other Taxa		
<i>Acacia burkittii</i>	<i>Eremophila citrina</i>	<i>Goodenia peacockiana</i>
<i>Acacia caesaneura</i>	<i>Eremophila pantonii</i>	<i>Rhodanthe charsleyae</i>
<i>Acacia incurvaneura</i>	<i>Grevillea deflexa</i>	<i>Haloragis odontocarpa</i>
	<i>Psydrax suaveolens</i>	<i>Roepera eremaea</i>
	<i>Senna artemisioides</i> subsp. <i>artemisioides</i>	<i>Convolvulus remotus</i>
		<i>Bulbine semibarbata</i>
		<i>Goodenia rosea</i>





Project Name: Dacian		
Date: 15/07/2021	Botanist: JW/JJ	Photo (NW corner): 315-317
Quadrat: Q40	Quadrat size: 50m x 50m	Waypoint (NW corner): 210
Coordinates (GDA94): 51 J 357840 6838583		
Aspect: SW	Fire (yrs): >20	Condition rating: Good
Landform: Flat		
Coarse fragments on the surface: Quartz, ironstone/ 20-50%/ 20-60mm		
Rock outcrop (abundance/runoff): Nil/ slow		
Soil (profile/field texture/soil surface): Brown/ Clay Loam		
Cover leaf litter: 30%		
Cover bare ground: 70%		
Upper stratum	Mid-stratum	Lower stratum
Growth form: Tree	Growth form: Shrub	Growth form: Shrub
Height: 3-5 m	Height: 1-3 m	Height: 0.5-1 m
Crown cover: 30-70%	Crown cover: 10-30%	Crown cover: 10-30%
Dominant taxa		
<i>Acacia caesaneura</i>	<i>Acacia tetragonophylla</i>	<i>Ptilotus obovatus</i> var. <i>obovatus</i>
Other Taxa		
<i>Acacia ayersiana</i>	<i>Eremophila forrestii</i> subsp. <i>forrestii</i>	<i>Cheilanthes sieberi</i>
<i>Acacia incurvaneura</i>	<i>Eremophila margarethae</i>	<i>Goodenia rosea</i>
<i>Hakea kippistiana</i>	<i>Eremophila georgei</i>	<i>Goodenia xanthosperma</i>
<i>Psyrax suaveolens</i>	<i>Eremophila latrobei</i> subsp. <i>latrobei</i>	<i>Ptilotus schwartzii</i>
<i>Santalum lanceolatum</i>	<i>Eremophila platycalyx</i> subsp. <i>Leonora</i>	<i>Podotroche wilsonii</i>
	<i>Rhagodia eremaea</i>	<i>Lemooria burkittii</i>
	<i>Scaevola spinescens</i>	<i>Rhodanthe charsleyae</i>
	<i>Senna charlesiana</i>	<i>Teucrium teucriiflorum</i>
		<i>Solanum lasiophyllum</i>





<b>Project Name: Dacian</b>		
<b>Date:</b> 15/07/2021	<b>Botanist:</b> JW/JJ	<b>Photo (NW corner):</b> 318-320
<b>Quadrat:</b> Q41	<b>Quadrat size:</b> 50m x 50m	<b>Waypoint (NW corner):</b> 214
<b>Coordinates (GDA94):</b> 51 J 357813 6838381		
<b>Aspect:</b> SW	<b>Fire (yrs):</b> >20	<b>Condition rating:</b> Good
<b>Landform:</b> Flat		
<b>Coarse fragments on the surface:</b> Quartz, ironstone/ 50-90%/ 20-60mm		
<b>Rock outcrop (abundance/runoff):</b> Nil/ slow		
<b>Soil (profile/field texture/soil surface):</b> Brown/ Clay Loam		
<b>Cover leaf litter:</b> 10%		
<b>Cover bare ground:</b> 90%		
<b>Upper stratum</b>	<b>Mid-stratum</b>	<b>Lower stratum</b>
<b>Growth form:</b> Tree	<b>Growth form:</b> Shrub	<b>Growth form:</b> Shrub
<b>Height:</b> 3-5 m	<b>Height:</b> 1-3 m	<b>Height:</b> 0.25-0.5 m
<b>Crown cover:</b> 10-30%	<b>Crown cover:</b> 10-30%	<b>Crown cover:</b> 10-30%
<b>Dominant taxa</b>		
<i>Acacia caesaneura</i>	<i>Maireana sedifolia</i>	<i>Maireana triptera</i>
<b>Other Taxa</b>		
<i>Acacia mulganeura</i>	<i>Acacia tetragonophylla</i>	<i>Maireana georgei</i>
<i>Santalum lanceolatum</i>	<i>Eremophila citrina</i>	<i>Lemooria burkittii</i>
	<i>Eremophila longifolia</i>	<i>Cephalopterum drummondii</i>
	<i>Eremophila malacoides</i>	<i>Goodenia xanthosperma</i>
	<i>Eremophila platycalyx</i> subsp. <i>Leonora</i>	<i>Ptilotus helipteroides</i>
	<i>Calandrinia balonensis</i>	<i>Ptilotus exaltatus</i>
	<i>Calandrinia eremaea</i>	<i>Ptilotus aevoides</i>
	<i>Enneapogon caerulescens</i>	<i>Ptilotus obovatus</i> var. <i>obovatus</i>
	<i>Roepera eremaea</i>	<i>Solanum lasiophyllum</i>
		<i>Sclerolaena densiflora</i>



Project Name: Dacian		
Date: 15/07/2021	Botanist: JW/JJ	Photo (NW corner): 321-323
Quadrat: Q42	Quadrat size: 50m x 50m	Waypoint (NW corner): 218
Coordinates (GDA94): 51 J 357549 6837978		
Aspect: SW	Fire (yrs): >20	Condition rating: Good
Landform: Flat		
Coarse fragments on the surface: Quartz/ 50-90%/ 20-60mm		
Rock outcrop (abundance/runoff): Nil/ slow		
Soil (profile/field texture/soil surface): Brown/ Clay Loam		
Cover leaf litter: 10%		
Cover bare ground: 90%		
Upper stratum	Mid-stratum	Lower stratum
Growth form: Tree	Growth form: Shrub	Growth form: Shrub
Height: 5-12 m	Height: 1-3 m	Height: 0.25-0.5 m
Crown cover: 10-30%	Crown cover: <10%	Crown cover: <10%
Dominant taxa		
<i>Acacia caesaneura</i>	<i>Acacia tetragonophylla</i>	<i>Maireana georgei</i>
Other Taxa		
<i>Acacia incurvaneura</i>	<i>Eremophila platycalyx</i> subsp. <i>Leonora</i>	<i>Leichardtia australis</i>
<i>Acacia mulganeura</i>	<i>Eremophila margarethae</i>	<i>Ptilotus obovatus</i> var. <i>obovatus</i>
<i>Santalum lanceolatum</i>	<i>Sida calyxhymenia</i>	<i>Roepera eremaea</i>
	<i>Sida</i> sp. <i>Excedentifolia</i> (J.L. Egan 1925)	<i>Cephalopterum drummondii</i>
		<i>Ptilotus helipteroides</i>
		<i>Duperreya commixta</i>
		<i>Podotheca wilsonii</i>
		<i>Helipterum craspedioides</i>





<b>Project Name: Dacian</b>		
<b>Date:</b> 15/07/2021	<b>Botanist:</b> JW/JJ	<b>Photo (NW corner):</b> 324-326
<b>Quadrat:</b> Q43	<b>Quadrat size:</b> 50m x 50m	<b>Waypoint (NW corner):</b> 222
<b>Coordinates (GDA94):</b> 51 J 357757 6837753		
<b>Aspect:</b> SW	<b>Fire (yrs):</b> >20	<b>Condition rating:</b> Good
<b>Landform:</b> Mid-slope		
<b>Coarse fragments on the surface:</b> Quartz/ 50-90%/ 20-60mm		
<b>Rock outcrop (abundance/runoff):</b> Nil/ slow		
<b>Soil (profile/field texture/soil surface):</b> Brown/ Clay Loam		
<b>Cover leaf litter:</b> 10%		
<b>Cover bare ground:</b> 90%		
<b>Upper stratum</b>	<b>Mid-stratum</b>	<b>Lower stratum</b>
<b>Growth form:</b> Tree	<b>Growth form:</b> Shrub	<b>Growth form:</b> Shrub
<b>Height:</b> 3-5 m	<b>Height:</b> 1-3 m	<b>Height:</b> 0.5-1 m
<b>Crown cover:</b> <10%	<b>Crown cover:</b> <10%	<b>Crown cover:</b> 10-30%
<b>Dominant taxa</b>		
<i>Acacia mulganeura</i>	<i>Acacia ramulosa</i>	<i>Ptilotus obovatus</i> var. <i>obovatus</i>
<b>Other Taxa</b>		
<i>Acacia incurvaneura</i>	<i>Eremophila latrobei</i> subsp. <i>latrobei</i>	<i>Brachyscome ciliaris</i>
<i>Acacia quadrimarginea</i>	<i>Eremophila georgei</i>	<i>Maireana triptera</i>
	<i>Eremophila platycalyx</i> subsp. <i>Leonora</i>	<i>Ptilotus helipteroides</i>
	<i>Dodonaea rigida</i>	<i>Roepera eremaea</i>
	<i>Scaevola spinescens</i>	<i>Solanum lasiophyllum</i>
	<i>Sida calyxhymenia</i>	<i>Teucrium teucriiflorum</i>
	<i>Rhagodia eremaea</i>	
	<i>Hakea preissii</i>	





Project Name: Dacian		
Date: 15/07/2021	Botanist: JW/JJ	Photo (NW corner): 327-329
Quadrat: Q44	Quadrat size: 50m x 50m	Waypoint (NW corner): 226
Coordinates (GDA94): 51 J 358357 6841293		
Aspect: SW	Fire (yrs): >20	Condition rating: Good
Landform: Open depression		
Coarse fragments on the surface: Ironstone/ 20-50%/ 20-60 mm		
Rock outcrop (abundance/runoff): Nil/ slow		
Soil (profile/field texture/soil surface): Brown/ Clay Loam		
Cover leaf litter: 35%		
Cover bare ground: 65%		
Upper stratum	Mid-stratum	Lower stratum
Growth form: Tree	Growth form: Shrub	Growth form: Shrub
Height: 5-12 m	Height: 1-3 m	Height: 0.5-1 m
Crown cover: >70%	Crown cover: 10-30%	Crown cover: <10%
Dominant taxa		
<i>Acacia incurvaneura</i>	<i>Acacia tetragonophylla</i>	<i>Rhagodia eremaea</i>
Other Taxa		
<i>Acacia burkittii</i>	<i>Eremophila latrobei</i> subsp. <i>latrobei</i>	<i>Cheilanthes sieberi</i>
<i>Acacia caesaneura</i>	<i>Eremophila georgei</i>	<i>Calandrinia balonensis</i>
<i>Eremophila longifolia</i>	<i>Senna artemisioides</i> subsp. <i>artemisioides</i>	<i>Maireana georgei</i>
<i>Grevillea berryana</i>	<i>Senna artemisioides</i> subsp. <i>filifolia</i>	<i>Maireana triptera</i>
		<i>Ptilotus obovatus</i> var. <i>obovatus</i>

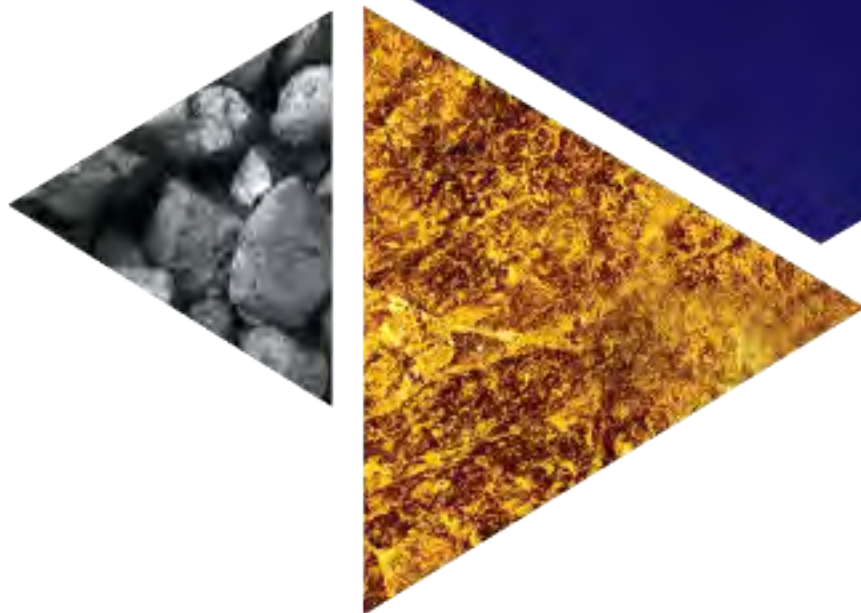


## Appendix 9: NatureMap Species List (40km buffer)

## Appendix 10: EPBC Protected Matters Search (40km buffer)



# Appendix D. Fauna and Habitat Survey





# PHOENIX

ENVIRONMENTAL SCIENCES

## Fauna and habitat survey for the Redcliffe Gold Project

Prepared for Dacian Gold Limited

December 2021

Final



Fauna and habitat survey for the Redcliffe Gold Project  
Prepared for Dacian Gold Limited

#### Version history

Author/s	Reviewer/s	Version	Version number	Date submitted	Submitted to
J. Scanlon, C. Nagle, J. Larkman	S. Pynt	Draft for client comments	0.1	08-Dec-21	P. Dunstan
J. Scanlon, C. Nagle, J. Larkman	C. Nagle	Final, client comments addressed	1.0	10-Dec-21	P. Dunstan

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Project code: 1440



## EXECUTIVE SUMMARY

Dacian Gold Limited (Dacian) is seeking to develop the Redcliffe Gold Project (the Project), located 45-60 km northeast of Leonora, Western Australia, comprising 1730.6 ha on tenements M37/1286, M37/1348 and M37/1276. Phoenix Environmental Sciences Pty Ltd (Phoenix) was commissioned by Dacian to undertake a desktop review, basic vertebrate fauna and short-range endemic (SRE) invertebrate survey (Winter-Spring, 30 August – 5 September 2021) and additional targeted searches for conservation significant vertebrates (late Spring, 22-26 November 2021).

A search of relevant databases combined with information from reports of other surveys in the Eastern Murchison bioregion were used to determine the significant fauna potentially occurring in the study area and thus to design the field survey. The identified regional fauna assemblage included 277 vertebrate species; 27 of these are listed as conservation significant, only one of which (Peregrine Falcon *Falco peregrinus*, listed as OS 'other specially protected' under Western Australia's Biodiversity Conservation Act) has previously been recorded within the study area.

The field survey included an assessment of vertebrate fauna, SRE invertebrate and Malleefowl habitat as well as active searches at sites throughout the study area, and targeted search transects for evidence of Malleefowl in suitable habitat. Recording devices were used to target Night Parrot and echolocating bats, and motion-activated cameras were used where suitable locations were identified. The survey recorded 70 vertebrate species, approximately 25% of those identified as potentially occurring.

Apart from a few low rocky hills and areas previously cleared/disturbed by earlier mining operations, fauna habitats in the study area mostly comprise mulga woodland and shrubland on undulating plains of clay loam soils. Based on attributes relevant to significant fauna species, the following habitat types were delineated and mapped:

1. Breakaway and upper slope with open shrubland
2. Open/sparse shrubland on slopes and stony plains
3. Open shrubland on lower slopes and plains
4. Groved mulga on lower slopes, minor drainages and plain
5. Mulga woodland/tall shrubland on drainage
6. Mulga tall shrubland on sandplain
7. Mallee over mulga shrubland with hummock grass on sandplain
8. Mine pit with deep pool
9. Other cleared/disturbed

Habitat types 6 and 7 were assessed as highly suitable foraging and potential breeding habitat for Malleefowl *Leipoa ocellata* (Vulnerable), and types 3, 4 and 5 as Medium suitability (dispersal and possible foraging). Evidence of this species (tracks and foraging signs) was recorded in habitat types 6 and 7. High intensity targeted searches along transects were conducted in 'High' and 'Medium' suitability habitats in November, and found no evidence of either active or inactive Malleefowl nest mounds.

Habitat type 1 was assessed as highly suitable foraging, dispersal and possible denning habitat for Chuditch *Dasyurus geoffroyi* (Vulnerable), and types 7, 8 and 9 as Medium suitability. Searches along several kilometres of breakaway (habitat type 1) recorded skeletal remains of indeterminate age, and two recent (but not fresh) scats of this species. It is concluded that both Malleefowl and Chuditch use the study area intermittently for dispersal and foraging, but the evidence does not indicate resident or breeding populations.

Habitat types 1 and 8 contain suitable nesting cliffs for the previously recorded Peregrine Falcon (OS), and all types are suitable for foraging by this species. Scats of a small dasyurid marsupial were indeterminate to species but possibly represent Long-tailed Dunnart *Sminthopsis longicaudata*

(Priority 4), which is considered likely to occur in the study area (with similar habitat requirements to Chuditch). The survey also found evidence of current and former presence of Brushtail Possum *Trichosurus vulpecula*, not conservation listed but previously unrecorded in the area and thought to be extinct in most of the arid region; this is a regionally significant species record. A likelihood of occurrence assessment found that six Migratory or nomadic bird species may occur as occasional visitors.

The invertebrate fauna desktop review identified no records of confirmed SRE taxa and 27 potential SRE taxa from within the SRE desktop search area. A further 36 taxa of uncertain SRE status were identified. The majority of desktop records were mygalomorphs, followed by pseudoscorpions. The desktop records indicate three SRE taxa have previously been recorded within the study area:

- *Antichiropus* 'sp. indet.' (uncertain SRE status)
- *Aname* 'sp. indet.' (uncertain SRE status)
- *Idiosoma* 'sp. indet.' (uncertain SRE status)

Only one habitat type within the study area was deemed as having High potential to support SRE taxa. This was described as hills capped with weathered volcanic rock forming breakaway with overhangs, caves and/or boulder piles, with open mid shrubland of mulga, other *Acacia* and mixed shrubs. This habitat primarily occurs in the north of the study area and extends out of the study area to the west. The remaining eight habitats were deemed as having Low potential to support SRE taxa.

Three previously unknown species of mygalomorph spider and one previously unknown species of centipede were collected from the study area:

- *Aname* 'Phoenix0077'
- *Kwonkan* 'Phoenix0078'
- *Idiosoma* 'Phoenix0079'
- *Mecistocephalus* 'Phoenix0075'

Five of the taxa collected are potential SREs, including all four of the previously unknown taxa. Of the potential SREs, three were recorded in mulga shrubland habitat on plains, slopes or drainage deemed to have Low potential to support SREs (*Aname* 'Phoenix007', *Kwonkan* 'Phoenix0078' and *Idiosoma* 'WAM T110336'). The remaining two potential SRE taxa were recorded from rocky breakaways and upper slopes deemed to have High potential to support SREs (*Idiosoma* 'Phoenix0079' and *Mecistocephalus* 'Phoenix0075').

Poor representation or absence of some groups may be due to dry environmental conditions in the years preceding the survey. The region has been receiving substantially lower than average rainfall since 2019. Millipede, snail and isopod activity mostly requires humid conditions, and no members of these groups were collected.

It is considered likely that the discovery of previously unknown species is a result of the lack of surveys having been carried out in the region, rather than these taxa being true SREs. All specimens from SRE groups were obtained from habitats either widespread within the study area or habitats that are limited within the study area but are connected to similar and extensive habitat outside the study area.

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# 1 INTRODUCTION

Dacian Gold Limited (Dacian) is seeking to develop the Redcliffe Gold Project (the Project), located 45-60 km northeast of Leonora, Western Australia (WA; Figure 1-1). The initial stages of the Project development comprise the following deposits:

- Nambi deposit - situated on M37/1286
- Hub deposit – situated on M37/1348
- Gold Terrace South (GTS) deposit – situated on M37/1276.

Dacian proposes to develop the Nambi, Hub and GTS mining areas as one Mining Proposal (MP).

In August 2021, Phoenix Environmental Sciences Pty Ltd (Phoenix) was commissioned by Dacian to undertake a basic fauna and habitat survey for the Project, followed by Detailed or targeted surveys as deemed necessary.

The purpose of the surveys was to support the submission of the MP by updating existing survey works, confirming existing results, filling in any gaps and increasing knowledge of the survey area.

The study area is located in the Shire of Leonora and Shire of Laverton, and the Eremaean Botanical Province as defined by EPA (2016b).

## 1.1 BACKGROUND

Previous terrestrial fauna work completed for the Project includes:

- Short-range Endemic (SRE) invertebrate surveys in the Golden Terrace North and 727 prospects (Phoenix 2010b, c)
  - a number of Mygalomorphae Trapdoor spiders identified, although none considered to be SREs
  - no evidence that SRE species were present or likely to be present in the study area
- level 2 vertebrate fauna survey over part of the survey area (Phoenix 2010a)
  - two species of conservation significance recorded in the study area: the Peregrine Falcon (*Falco peregrinus*) and the Migratory Rainbow Bee-eater (*Merops ornatus*)
- reconnaissance fauna survey over part of the survey area (Botanica 2019)
  - no species of conservation significance recorded

## 1.2 SCOPE OF WORK

The scope of work for the basic fauna and habitat survey was as follows:

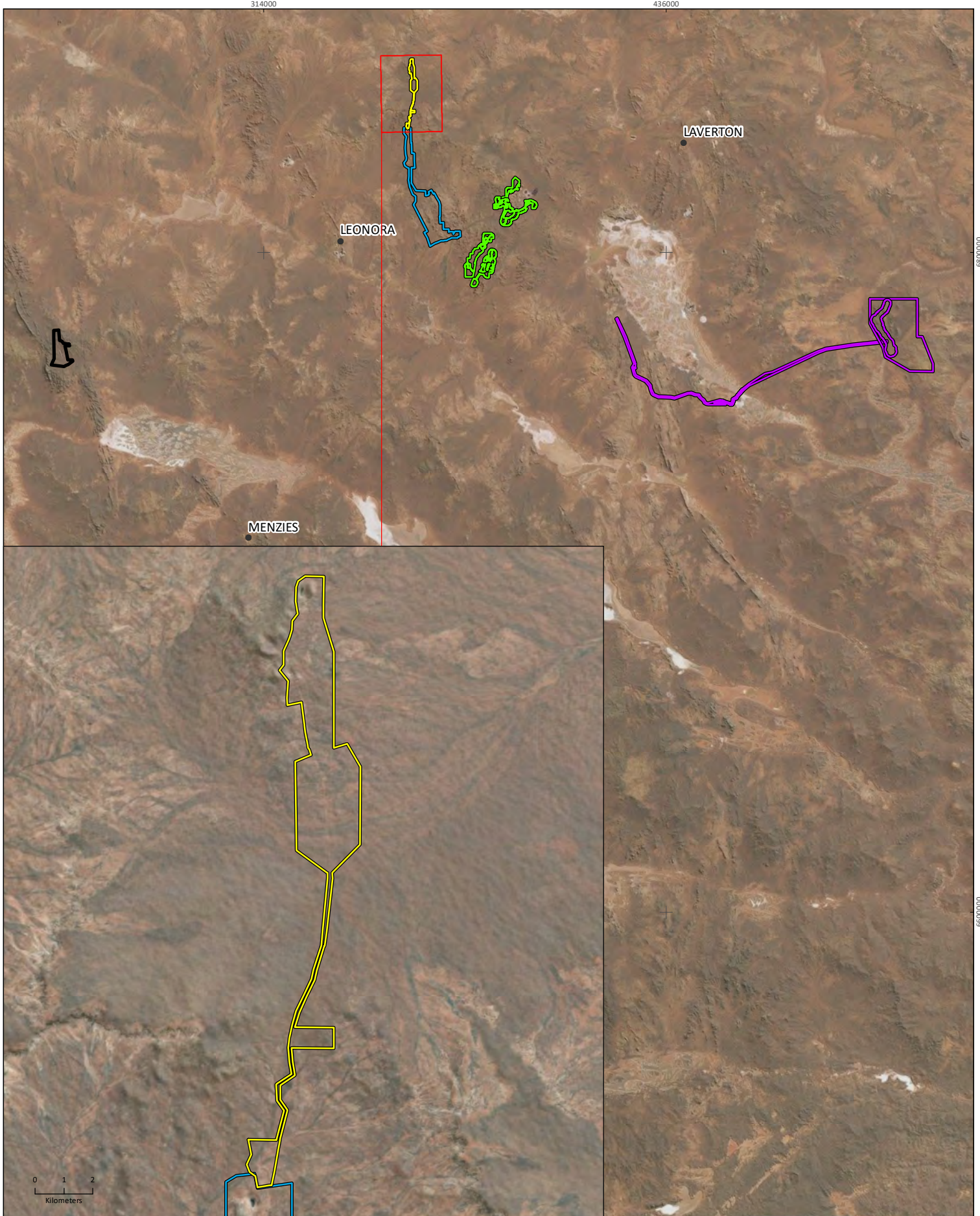
- Conduct a desktop review to identify likely and significant habitats, communities, and conservation significant species within and near M37/1348, M37/1286, M37/127
- undertake a basic fauna survey of the study area during the appropriate season(s) to delineate fauna species, habitats and determine requirements for follow-up Detailed or targeted surveys (if required)
- complete targeted surveys for conservation significant species as deemed necessary at completion of the Basic fauna survey
- conduct a desktop review of the area including potential habitats present to support SREs, database searches and literature review of locally relevant surveys and their results
- sampling of areas identified as having the potential to support SREs
- preparation of a report suitable for use to support Environmental Approval Applications to government


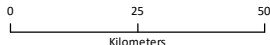
- Provision of IBSA standard GIS data.






### **1.3 STUDY AREA**

The study area was approximately 1730.5 ha in area, extending 21.25 km north-south and less than 2.0 km in width, and encompasses historic mining areas (Figure 1-1).






Dacian Gold Limited Redcliffe Gold Project	
Project No	1440-RGP-DGL-VER
Date	8/12/2021
Drawn by	IN
Map author	JS
	
	
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-  Study area
-  Leonora Gold Project study area
-  Murrin Murrin Operations study area
-  Irwin Hills study area
-  Mt Ida Gold Project study area

**Figure 1-1**  
**Project location and study area**



**PHOENIX**  
ENVIRONMENTAL SCIENCES

## 2 LEGISLATIVE CONTEXT

The protection of fauna in WA is principally governed by three acts:

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

The BC Act came into full effect on 1 January 2019 and replaced the functions of the *Wildlife Conservation Act 1950* (WC Act).

### 2.1 COMMONWEALTH

The EPBC Act is administered by the Federal Department of Agriculture, Water and the Environment (DAWE). The EPBC Act provides for the listing of Threatened fauna as matters of National Environmental Significance (NES). Under the EPBC Act, actions that have, or are likely to have, a significant impact on a matter of NES, require approval from the Australian Government Minister for the Environment through a formal referral process.

Conservation categories applicable to Threatened fauna species under the EPBC Act are as follows:

- Extinct (EX)<sup>1</sup> – there is no reasonable doubt that the last individual has died
- Extinct in the Wild (EW) – taxa known to survive only in captivity
- Critically Endangered (CR) – taxa facing an extremely high risk of extinction in the wild in the immediate future
- Endangered (EN) – taxa facing a very high risk of extinction in the wild in the near future
- Vulnerable (VU) – taxa facing a high risk of extinction in the wild in the medium term
- Conservation Dependent (CD)<sup>1</sup> – taxa whose survival depends upon ongoing conservation measures; without these measures, a conservation dependent taxon would be classified as Vulnerable, Endangered or Critically Endangered.

Ecological communities are defined as ‘naturally occurring biological assemblages that occur in a particular type of habitat’ (English & Blyth 1997). There are three categories under which ecological communities can be listed as TECs under the EPBC Act: Critically Endangered, Endangered and Vulnerable.

The EPBC Act is also the enabling legislation for protection of Migratory species as matters of NES under several international agreements:

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

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<sup>1</sup> Species listed as Extinct and Conservation Dependent are not matters of NES and therefore do not trigger the EPBC Act.



## 2.2 STATE

### 2.2.1 Threatened and Priority species

In WA, the BC Act provides for the listing of Threatened fauna species (Government of Western Australia 2018a, b)<sup>2</sup> in the following categories:

- Critically Endangered (CR) – species facing an extremely high risk of extinction in the wild in the immediate future<sup>3</sup>
- Endangered (EN) – species facing a very high risk of extinction in the wild in the near future<sup>3</sup>
- Vulnerable (VU) – species facing a high risk of extinction in the wild in the medium term future<sup>3</sup>.

Species may also be listed as specially protected under the BC Act in one or more of the following categories:

- species of special conservation interest (conservation dependent fauna, CD) – species with a naturally low population, restricted natural range, of special interest to science, or subject to or recovering from a significant population decline or reduction in natural range
- Migratory species (Mig.), including birds subject to international agreement
- species otherwise in need of special protection (OS).

The Department of Biodiversity, Conservation and Attractions (DBCA) administers the BC Act and also maintains a non-statutory list of Priority fauna. Priority species are still considered to be of conservation significance – that is they may be Threatened – but cannot be considered for listing under the BC Act until there is adequate understanding of threat levels imposed on them. Species on the Priority fauna list are assigned to one of four Priority (P) categories, P1 (highest) – P4 (lowest), based on level of knowledge/concern.

### 2.2.2 Critical habitat

Under the BC Act, habitat is eligible for listing as critical habitat if it is critical to the survival of a Threatened species or a TEC and its listing is otherwise in accordance with the ministerial guidelines.

### 2.2.3 Threatened and Priority Ecological Communities

The BC Act provides for the listing of TECs in the following categories:

- Critically Endangered – facing an extremely high risk of becoming eligible for listing as a collapsed ecological community in the immediate future<sup>3</sup>
- Endangered – facing a very high risk of becoming eligible for listing as a collapsed ecological community in the near future<sup>3</sup>
- Vulnerable – facing a high risk of becoming eligible for listing as a collapsed ecological community in the medium term future<sup>3</sup>.

An ecological community may be listed as a collapsed ecological community under the BC Act if there is no reasonable doubt that the last occurrence of the ecological community has collapsed or the

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<sup>2</sup> 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 BC Act.

<sup>3</sup> As determined in accordance with criteria set out in the ministerial guidelines.



ecological community has been so extensively modified throughout its range that no occurrence of it is likely to recover its species composition and/or structure.

The DBCA also maintains a non-statutory list of Priority Ecological Communities (PECs), which may become TECs in the future; however, do not currently meet survey criteria or that are not adequately defined. PECs are assigned to one of five categories depending on their priority for survey or definition, with Priority 1 of highest concern and Priority 5 of lowest concern.

## 2.2.4 Other significant fauna

Under the EPA's environmental factor guidelines, fauna may be considered significant for a range of reasons other than listing as a Threatened or Priority species or ecological community.

In addition to listing as Threatened or Priority, EPA (2016a) identifies the following attributes that constitute significant fauna:

- species with restricted distribution (see also section 2.2.5)
- species subject to a degree of historical impact from threatening processes
- providing an important function required to maintain the ecological integrity of a significant ecosystem.

## 2.2.5 Short-range endemic invertebrates

SRE fauna are defined as animals that display restricted geographic distributions, nominally less than 10,000 km<sup>2</sup>, that may also be disjunct and highly localised (Harvey 2002). EPA (2016a) identifies species with restricted distributions as being significant fauna in the context of environmental impact assessments (EIA). SRE fauna need to be considered in EIA as localised, small populations of species that are generally at greater risk of changes in conservation status due to environmental change than other, more widely distributed taxa.

Short-range endemism in terrestrial invertebrates is believed to have evolved through two primary processes (Harvey 2002):

Relictual – where the drying climate reduced the area of suitable habitat available to a species, forcing a range contraction. Such habitats typically maintain historic mesic conditions (e.g. south-facing rock faces or slopes of mountains or gullies)

Habitat speciality – where species settled in particular isolated habitat types (e.g. rocky outcrops) by means of dispersal and evolved in isolation into distinct species.

However, SRE invertebrates have also been reported in more widespread habitats such as spinifex plains or woodlands, mainly in groups with low dispersal capabilities, for example mygalomorph spiders and millipedes (see for example Car & Harvey 2014; Rix *et al.* 2018).

There can be uncertainty in categorising a specimen as an SRE due to several factors including poor regional survey density, lack of taxonomic research and problems of identification, i.e. specimens that may represent SREs cannot be identified to species level based on the life stage at hand. For example, in contrast to mature males, juvenile and female millipedes, mygalomorph spiders and scorpions cannot be identified to species level. Molecular techniques such as 'barcoding' (Hebert *et al.* 2003a; Hebert *et al.* 2003b) are routinely employed to overcome taxonomic or identification problems.

Currently, there is no accepted system to determine the likelihood that a species is an SRE. The WA Museum applies four categories which were adopted in this assessment: confirmed, potential, uncertain and not SRE. Confirmed SREs are taxa for which the distribution is known to be less than 10,000 km<sup>2</sup>, the taxonomy is well known and the group is well represented in collections and/ or via comprehensive sampling (WAM 2013). Potential SREs include those taxa for which there is incomplete knowledge of the geographic distribution of the group and its taxonomy, and the group is not well represented in collections.

### 3 EXISTING ENVIRONMENT

#### 3.1 INTERIM BIOGEOGRAPHIC REGIONALISATION OF AUSTRALIA

The Interim Biogeographic Regionalisation of Australia (IBRA) classifies Australia’s landscapes into large ‘bioregions’ and ‘subregions’ based on climate, geology, landform, native vegetation and species information (DoEE 2016). The study area is located in the Eastern Murchison subregion (MUR1) of the Murchison bioregion (Figure 3-1) which is characterised by

- internal drainage, and extensive areas of elevated red desert sandplains with minimal dune development
- salt lake systems associated with the occluded Paleodrainage system
- broad plains of red-brown soils and breakaway complexes as well as red sandplains
- vegetation is dominated by Mulga Woodlands often rich in ephemerals; hummock grasslands, saltbush shrublands and *Halosarcia* [i.e. *Tecticornia*] shrublands.

#### 3.2 LAND SYSTEMS AND SURFACE GEOLOGY

DPIRD undertakes land system mapping for WA using a nesting soil-landscape mapping hierarchy (Schoknecht & Payne 2011). While the primary purpose of the mapping is to inform pastoral and agricultural land capability, it is also useful for informing biological assessments. Under this hierarchy, land systems are defined as areas with recurring patterns of landforms, soils, vegetation and drainage (Payne & Leighton 2004).

The study area intersects eight land systems (Table 3-1; Figure 3-2). The Jundee System dominates the study area at 44.4%, Violet System occupies 25.8%, and the other six systems comprise the remaining 29.8% of the area.

**Table 3-1 Land systems and extent in study area**

Land system	Description	Area (ha)	% of study area
Bevon System	Irregular low ironstone hills with stony lower slopes supporting mulga shrublands.	144.4	8.3
Bullimore System	Gently undulating sandplain with occasional linear dunes and stripped surfaces supporting spinifex grasslands with mallees and <i>Acacia</i> shrubs.	27.7	1.6
Desdemona System	Plains with deep sandy or loamy soils supporting mulga tall shrublands and wanderrie grasses.	30.0	1.7
Jundee System	Hardpan plains with variable gravelly mantles and minor sandy banks supporting weakly groved mulga shrublands.	768.4	44.4
Monk System	Hardpan plains with occasional sandy banks supporting mulga tall shrublands and wanderrie grasses.	245.3	14.2
Nubev System	Gently undulating stony plains, minor limonitic low rises and drainage floors supporting mulga and halophytic shrublands.	35.4	2.0
Violet System	Gently undulating gravelly plains on greenstone, laterite and hardpan, with low stony rises and minor saline plains;	446.7	25.8

Land system	Description	Area (ha)	% of study area
	supporting groved mulga and bowgada shrublands and occasionally chenopod shrublands.		
Wyarri System	Granite domes, hills and tor fields with gritty-surfaced fringing plains supporting mulga and granite wattle shrublands.	32.7	1.9
<b>Total</b>		<b>1,730.5</b>	<b>100</b>


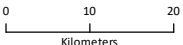
According to the Surface Geology of Australia 1:1,000,000 scale, Western Australia database (Stewart *et al.* 2008), the study area intersects five geological formations (Table 3-2; Figure 3-2). The study area is dominated by Quaternary colluvium (63.5% by area) flanking weathered outcrops of granite and mafic rocks in the northern part (30.1%) and sedimentary rocks in the south (6.4%).




**Table 3-2 Surface geology of the study area, extent by deposit type**

Surface geology	Abbreviation	Description	Area (ha)	% of study area
colluvium 38491	Qrc	Colluvium, sheetwash, talus; gravel piedmonts and aprons over and around bedrock; clay-silt-sand with sheet and nodular kankar; alluvial and aeolian sand-silt-gravel in depressions and broad valleys in Canning Basin; local calcrete, reworked laterite	1,099.2	63.5
hi-Ca granite 74296	Agh	Monzogranite, granodiorite, tonalite, quartz monzonite; in places recrystallised and foliated; some mixed granite and country rock assemblages; high-Ca granite	6.5	0.4
mafic extrusive rocks 74248	Abe	Basalt, high-Mg basalt, minor mafic intrusive rocks; some andesite; agglomerate; mafic schist; amphibolite; dolerite; komatiitic basalt; carbonated basalt; basaltic andesite; mafic rock interleaved with minor granitic rock	512.2	29.6
mafic intrusive rocks 74263	Ade	Mafic intrusive rocks, medium to coarse-grained; layered mafic to ultramafic intrusions - dolerite, gabbro, olivine gabbro, peridotite, pyroxenite, leucogabbro, quartz dolerite, quartz gabbro, gabbronorite	1.3	<0.1
sedimentary rocks 74322	Ase	Phyllitic schist, siltstone, sandstone, greywacke, pelite, conglomerate, quartzite, phyllite, shale, slate, claystone, chert, minor felsic volcanic and volcanoclastic rocks; arkose, para- and orthoamphibolites; rare banded iron formation	111.2	6.4
<b>Total</b>			<b>1,730.5</b>	<b>100</b>





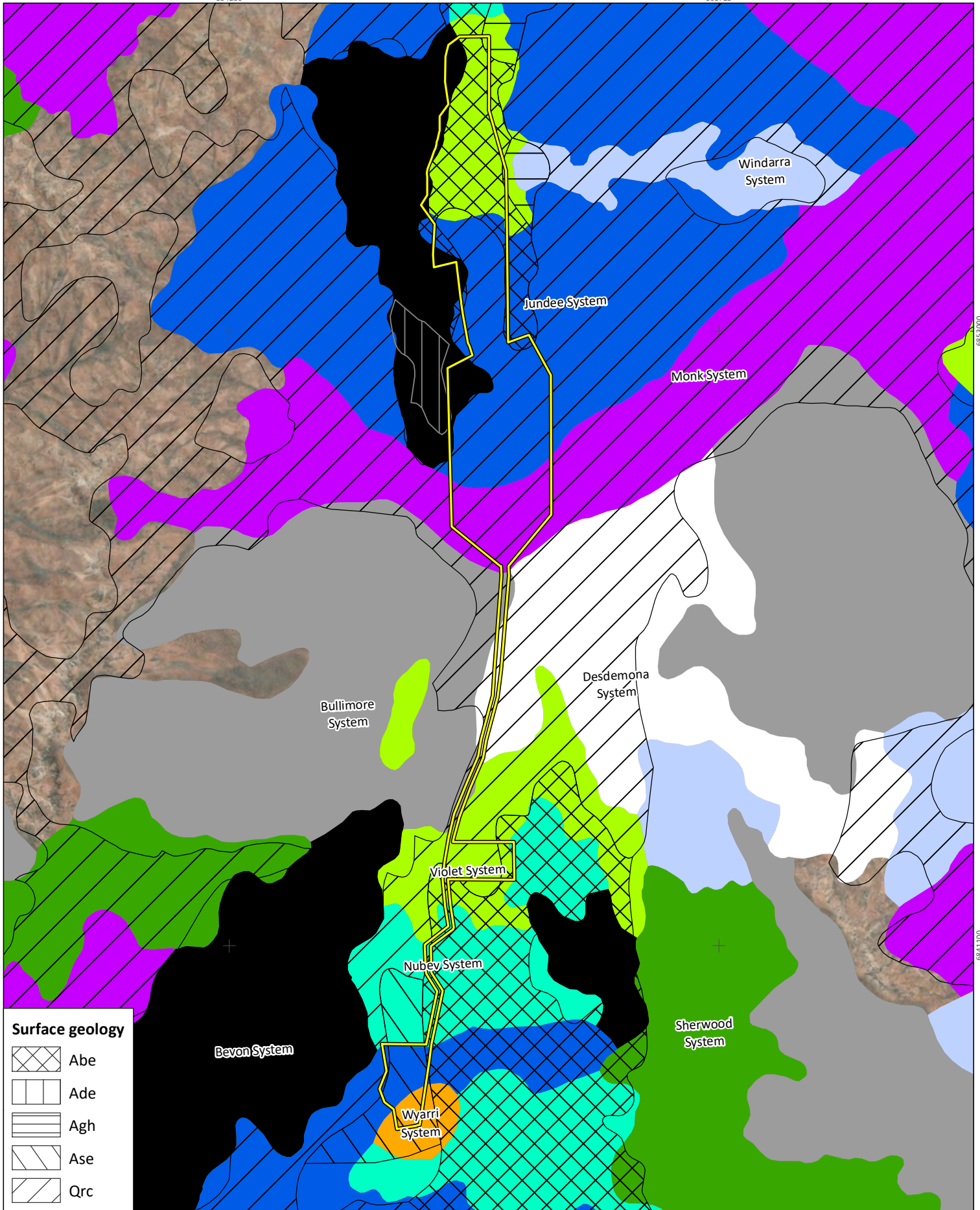
Dacian Gold Limited Redcliffe Gold Project		
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Date	8/12/2021	
Drawn by	IN	
Map author	JS	
		
1:900,000 (at A4)		GDA 1994 MGA Zone 51

-  Study area
- IBRA region and subregion**
-  Murchison, Eastern Murchison
-  Great Victoria Desert, Shield

**Figure 3-1**  
**Study area in relation to IBRA bioregions and subregions**



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**Surface geology**

- Abe
- Ade
- Agh
- Ase
- Qrc



Dacian Gold Limited  
Redcliffe Gold Project

Project No	1440-RGP-DGL-VER
Date	8/12/2021
Drawn by	IN
Map author	JS

0 1 2  
Kilometers

1:94,900 (at A4) GDA 1994 MGA Zone 51

Study area

**Land system**

- Bevon System
- Bullimore System
- Desdemona System
- Jundee System
- Monk System
- Nubev System
- Sherwood System
- Violet System
- Windarra System
- Wyarri System

**Figure 3-2**

**Land systems and surface geology in the study area**



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### 3.3 CLIMATE AND WEATHER

The climate of the Eastern Murchison subregion is described as arid with mainly winter rainfall (Cowan 2001). The nearest Bureau of Meteorology (BoM) weather station with comprehensive data collection and recent historic climate data is Leonora (no. 012241), Latitude: 28.89°S Longitude 121.33°E, located 52km SW of the study area.

Leonora records the highest mean maximum monthly temperature (37°C) in January (lowest in July, 18.5°C) and the lowest minimum mean monthly temperature (6.1°C) in July (highest in January, 21.8°C) (BoM 2021b) (Figure 3-3). Average annual rainfall is 236.4mm with February and March recording the highest monthly averages (30.9 and 29 mm respectively; Figure 3-3). Rainfall is highly variable between seasons and years, influenced by northwest cloudbands in the winter months, and occasionally by tropical cyclones (BoM 2021a).

Daily mean temperatures at Leonora preceding the survey were generally warmer than long-term averages, however January, February and June were cooler than expected. In the three months prior to the survey, the mean maximum and minimum temperatures were higher than average for July and August. Temperatures were likely slightly warmer than expected during the month of the survey (Figure 3-3).

Records from Leonora show rainfall levels were much lower than average for most months. February experienced the highest rainfall levels at 49.6mm (18.7mm above the long-term average). September, April and January received the lowest amounts of rain throughout the year (0, 1.4 and 2mm respectively). Even though June had low levels of rain, July received a substantial amount, 7.9mm above average. (Figure 3-3).



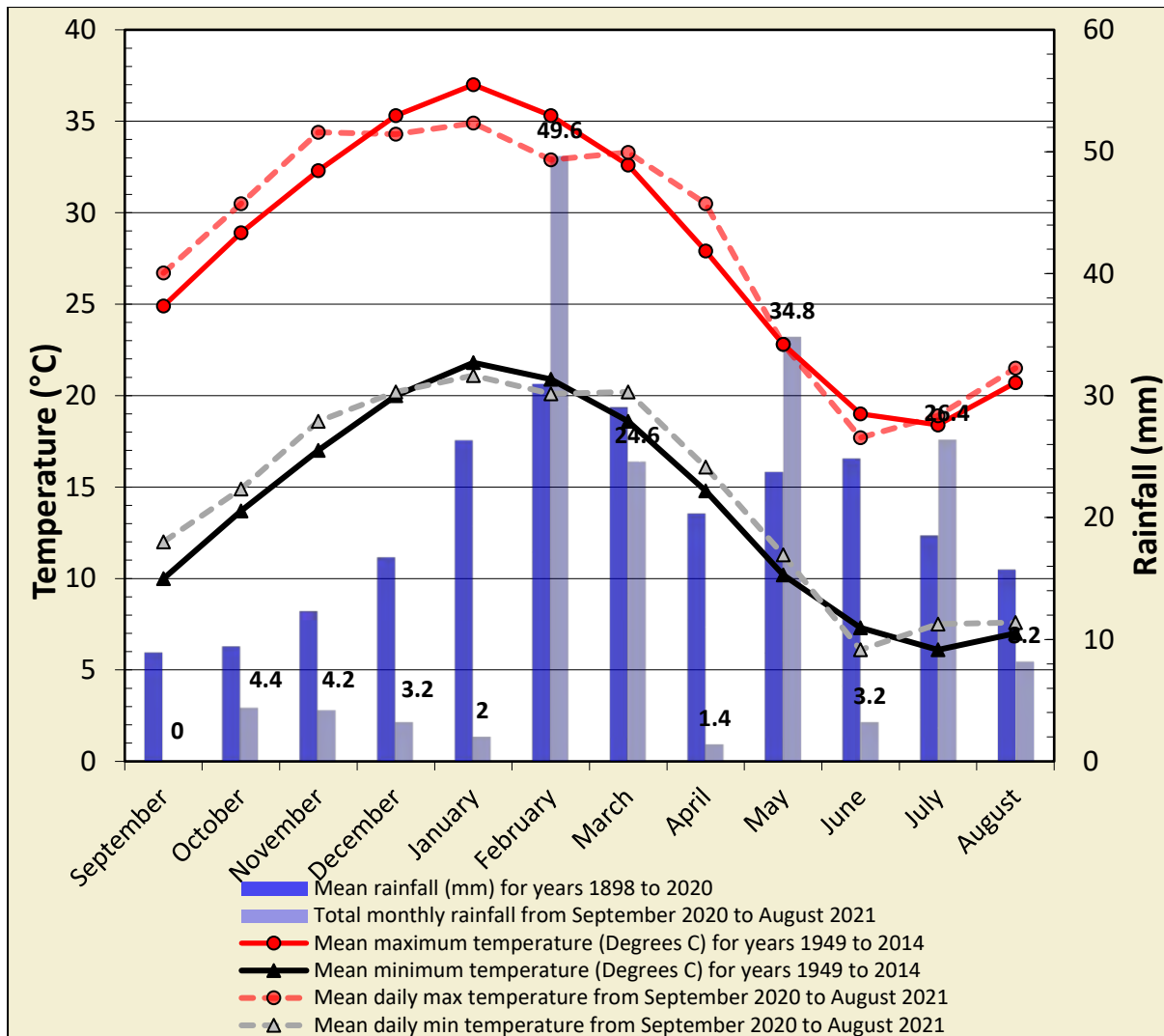


Figure 3-3 Annual climate and weather data for Leonora (no. 012241) and mean monthly data for the 12 months preceding the survey (BoM 2021b)

### 3.4 LAND USE

The dominant land uses of the East Murchison subregion are grazing, UCL and Crown Reserves, mining and conservation (Cowan 2001). The study area includes disused mine pits, and extends across two pastoral stations, Mertondale and Nambi (DAFWA 2019).

### 3.5 CONSERVATION RESERVES AND ESAS

The nearest Environmentally Sensitive Area is located approximately 107 km southwest of the study area. The study area does not intersect any current or proposed conservation reserves (Figure 1-1).

## 4 METHODS

The basic fauna and habitat survey was conducted in accordance with relevant survey guidelines and guidance, including:

- EPA Environmental Factor Guideline: Terrestrial fauna (EPA 2016a)
- EPA Technical Guidance: Terrestrial vertebrate fauna surveys for environmental impact assessment (EPA 2020)
- EPA Technical Guidance: Sampling of short-range endemic invertebrate fauna (EPA 2016d)

### 4.1 DESKTOP REVIEW

Searches of several biological databases were undertaken to identify and prepare lists of significant fauna that may occur within the study area (Table 4-1). A literature search was conducted for accessible reports for biological surveys conducted within 150 km of the study area to build on the lists developed from the database searches (Table 4-2).

**Table 4-1 Database searches conducted for the desktop review**

Database	Target group/s	Search coordinates and extent
Protected Matters Search Tool (DAWE 2021a)	EPBC Act Threatened flora, fauna and ecological communities	Approximate centre point of study area (28.46239°S, 121.55953°E) with 55 km buffer
DBCA Threatened and Priority Fauna Database (DBCA 2021b)	Threatened and Priority fauna	Study area plus a 100 km buffer
DBCA NatureMap Database (DBCA 2021a)	Flora and fauna records	Study area plus a 40 km buffer
Atlas of Living Australia (ALA 2021)	Fauna records	Study area plus a 55 km buffer
WA Museum Arachnid and Myriapod Database, Mollusca Database	Arachnid, myriapod and mollusc SREs	100 km <sup>2</sup> search area encompassing the study area between -27.639 °S, 120.577°E (northwest corner) and -29.449°S, 122.592°E (southeast corner)

**Table 4-2 Survey reports included in the desktop review**

Report author	Survey description	Project
McKenzie <i>et al.</i> (1994)	Vertebrate fauna surveys (Eristoun only, Wanjarri excluded)	Biological Survey of the Eastern Goldfields of WA
Phoenix (2010a)	Level 2 fauna survey	Redcliffe Gold Project
Phoenix (2010b, 2010c)	SRE invertebrate surveys	Redcliffe Gold Project
MWH Australia (2017)	Flora, vegetation and fauna surveys	Leonora Gold Project
MWH Australia (2018)	Flora, vegetation and fauna surveys	Leonora Gold Project
Phoenix (2019b)	Level 1 fauna survey	Leonora Gold Project
Ecosmart Ecology (2012)	Level 2 fauna survey	Murrin Murrin Nickel-Cobalt Project
Phoenix (2019a, 2021a)	Basic and Detailed fauna surveys	Murrin Murrin Nickel-Cobalt Project

## 4.2 FIELD SURVEY

### 4.2.1 Survey timing

Field survey dates are provided in Table 4-3.

**Table 4-3 Survey dates**

Survey type	Season	Dates
Basic fauna and habitat survey	Winter/Spring	30 August – 5 September 2021
Targeted Malleefowl and Chuditch survey	Spring	22 – 26 November 2021

### 4.2.2 Terrestrial fauna

Field methods for the fauna survey included:

- habitat assessment (4.2.2.1)
- mammal/reptile foraging (4.2.2.2)
- avifauna surveys and Night Parrot habitat assessment (4.2.2.3)
- bat echolocation recordings (4.2.2.4)
- camera trapping (4.2.2.5)
- Malleefowl habitat assessment (4.2.2.6)
- targeted Malleefowl surveys (4.2.2.7)
- targeted Chuditch surveys (4.2.2.8)
- SRE invertebrate sampling (4.2.2.9)

A total of 32 survey sites were sampled in the basic fauna and habitat survey (Figure 4-1; Appendix 1).

#### 4.2.2.1 Habitat assessment

Initial habitat characterisation was undertaken using various remote geographical tools, including aerial photography (Google Earth®), land system maps and topographic maps. Habitats with the potential to support significant terrestrial fauna species were identified based on known habitats of such species within the Murchison bioregion. Tentative sites were selected for the terrestrial fauna survey to represent all habitat types. Final survey site selection was conducted after ground-truthing of site characteristics.

At the broadest scale, site selection considered aspect, topography and land systems. At the finer scale, consideration was given to proximity to water bodies (drainage lines and creek), vegetation complexes and condition and soil type. Sites were primarily chosen to represent the best example of distinct habitats within the broader habitat associations of the study area with a focus on species of conservation significance identified in the desktop review. Habitat descriptions and characteristics were recorded at all basic fauna and targeted survey sites (Figure 4-1; Table 4-4; Appendix 2).

Habitat types are distinguished and mapped based on various aspects of topography, substrate, vegetation structure, and/or presence of distinct landscape features relevant to significant fauna species potentially present.



**Table 4-4 Terrestrial fauna survey effort**

Site	Site type	Audio recording (nights)	Birding (hrs)	Camera trap (nights)	Foraging (hrs)	Litter sieve (#)	Opp. Sighting (#)	SRE foraging (hrs)	Transect (hrs)	Ultrasonic recording (nights)
RCG001	Fauna site		2.3	5	2.3	3		2.3		4
RCG002	Fauna site		1.3		2		1	2		2
RCG003	Fauna site		1.3		2.5	3		2.5		
RCG004	Fauna site		0.7		1.2			1.2		
RCG005	Fauna site		0.7		0.9			0.9		
RCG006	Fauna site				2	3	1	2		
RCG007	Fauna site		0.7		2.4	3		2.4		
RCG008	Fauna site		0.7		3.6			3.6		
RCG009	Fauna site								6	
RCG010	Fauna site				2		7	2		4
RCG011	Fauna site		0.7		3.2	3		3.2		
RCG013	Fauna site		0.7		2			2		
RCG014	Fauna site		0.7		2		1	2		
RCG016	Fauna site						1			
RCG017	Fauna site		1		4	3		4		
RCG018	Fauna site		0.7		1	3	1	1		
RCG019	Fauna site				1.2			1.2		
RCG020	Fauna site		1.7		1.6			1.6		
RCG021	Fauna site		0.7		2	3		2		
RCG022	Fauna site		0.7							
RCG023	Fauna site		0.7		1			1		
RCG024	Fauna site		0.7		2			2		
RCG025	Fauna site				1.1			1.1	2	
RCG026	Fauna site		1.4		3.4			3.4		2
RCG027	Fauna site		0.7		2	3		2		
RCG028	Fauna site		0.7		2	3		2		

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Site	Site type	Audio recording (nights)	Birding (hrs)	Camera trap (nights)	Foraging (hrs)	Litter sieve (#)	Opp. Sighting (#)	SRE foraging (hrs)	Transect (hrs)	Ultrasonic recording (nights)
RCG029	Fauna site		0.7		4			4	2	
RCG030	Fauna site								2	
RCG031	Fauna site				2					
RCG-NP01	Fauna site	6	2.3			3			0.9	
<b>Total</b>		<b>6</b>	<b>15.9</b>	<b>5</b>	<b>53.4</b>	<b>33</b>	<b>12</b>	<b>53.4</b>	<b>12.9</b>	<b>12</b>

#### 4.2.2.2 Mammal/reptile foraging

Foraging was undertaken at 25 sites throughout the study area (Figure 4-1). Foraging primarily targeted diurnal herpetofauna and mammals from direct sightings and secondary evidence. Searches focused primarily on significant species identified in the desktop review as potentially occurring within the study area, including Chuditch and Long-tailed Dunnart.

Searches were undertaken in any observable microhabitats considered likely to support mammals, reptiles and amphibians. Techniques included: raking leaf and bark litter, overturning logs, searching beneath the bark of trees, investigating dead trees and logs, investigating burrows, crevices and overhangs and identifying any secondary evidence including tracks, diggings, scats, fur or sloughs (shed skins), predation or feeding sites, and fauna constructed structures such as nests.

A minimum of one person hour was spent active searching at each site for a total of 53.4 hours over the duration of the field survey (Table 4-4).

#### 4.2.2.3 Avifauna surveys

A minimum of twenty-minute avifauna surveys were undertaken at each fauna site (Figure 4-1; Table 4-4). Avifauna surveys were confined to the habitat type (up to 2 ha) represented by each site to collect assemblage data for each habitat. Avifauna surveys were undertaken throughout the day with a focus on periods of higher activity around sunrise and sunset. Surveys consisted of bird recordings from visual sightings and call recognition. A total of 15.9 person hours of avifauna census was undertaken during the field survey (Table 4-4).

Additional avifauna observations were also recorded at opportunistically while other field work was being completed, including observations made during travel and active searches.

A SongMeter SM4 recording device was deployed at one site to record bird calls and activity over a longer period outside of disturbance periods during the field survey (RCG-NP01, six nights; Figure 4-1). This location was targeted as potential habitat for significant species identified in the desktop review, in particular Night Parrot.

#### 4.2.2.4 Bat echolocation recordings

Song Meter SM4 recording devices were used to record bat echolocation calls at four sites during the field survey (RCG001, RCG002, RCG010, RCG026; Figure 4-1). Recording devices were deployed at each site for two to four nights of recording between sunset and sunrise (Table 4-4). Devices were aimed at a 45° angle to the ground. The SongMeters were positioned in areas of habitat likely to have increased insect activity and to attract bats (i.e. likely foraging areas or movement corridors) and/or potential roosting sites.

#### 4.2.2.5 Camera trapping

One motion-activated camera was deployed for five days and nights at a rocky breakaway site (RCG001) considered potential habitat for significant fauna (e.g. Chuditch), where evidence of fauna presence had been detected, and fauna movements would be constrained by a gap between rocks. No other highly suitable locations for camera trapping were identified.

#### 4.2.2.6 Malleefowl habitat assessment

Malleefowl habitat was assessed in the field using a set of environmental variables based on features of critical Malleefowl habitat in Western and Central Australia, as described in the National Recovery



Plan (Benshemesh 2007). Individual sites were assessed with a numerical score as a basis for mapping areas of suitable habitat in the study area. The score used is an unweighted sum of binary values (0 absent, one present) for the following attributes:

- sandy substrate (sand/sandy loam/sandy clay)
- litter (leaf litter forming distinct patches under trees/shrubs or - rarely in this area - continuous blanket over soil)
- canopy (tall shrubs or trees forming more or less continuous canopy, contributing to suitable ground microclimates and screen from aerial predators)
- level (ground approximately level, tending to prevent disturbance of soil and litter by rainfall runoff)
- mallee (presence of any mallee-form *Eucalyptus* sp.)
- *Melaleuca* (presence of any *Melaleuca* sp.)
- mulga s.l. (presence of any *Acacia* sp. of subgenus *Juliflorae*)
- *Triodia* (presence of any *Triodia* sp.).

Scores of four or greater (meaning a site contained at least 50% of features that comprise critical Malleefowl habitat) were considered to represent potential Malleefowl habitat. Sites that attained a value of four or greater were applied to vegetation type polygons and the entire polygon (usually) assigned as potential Malleefowl habitat. Where two or more sites were assessed within a single polygon, the higher score was applied unless features of the lower-scored site(s) were more representative. Where no site occurred within a polygon, polygons were classified based on scores for similar vegetation nearby and inspection of relative vegetation density.

#### 4.2.2.7 Targeted Malleefowl surveys

During the basic survey, low intensity searches were conducted for Malleefowl in areas identified as being suitable habitat based on the Malleefowl habitat assessment scores (see 4.2.2.6). In these areas, transects were walked to search for nest mounds, tracks, foraging traces or other signs of this species. Transects were spaced approximately 100m apart and covered approximately 1 km sq. of the highest quality Malleefowl habitat in the project area.

The transects conducted during the basic fauna survey indicated the need for additional targeted surveys for Malleefowl nest mounds to ensure none are destroyed or disturbed by the proposed works. These additional surveys were conducted using aerial imagery review and high intensity ground searches.

##### 4.2.2.7.1 Aerial imagery review

High quality aerial imagery of the project area was provided to Phoenix by Dacian. The imagery was broken into grid sections and each section was thoroughly checked in a bid to detect any potential mounds. The aerial imagery was deemed insufficient to allow for detection of mounds in areas that were heavily vegetated, so further ground searches were deemed necessary.

##### 4.2.2.7.2 Ground searches

High intensity ground searches were conducted within the proposed disturbance footprint (including a buffer provided by Dacian) in areas of habitat deemed as being of Medium or High suitability for Malleefowl. Systematic transects were traversed on foot by four personnel spaced 20 m apart. Areas that were too sparse to provide adequate canopy cover for a mound, and areas of major drainage were excluded from the ground searches. Areas that had been extensively drilled were also excluded as the drill lines were as little as 10m apart and these areas have been well explored.

#### 4.2.2.8 Targeted Chuditch surveys

Active foraging for mammals during the basic fauna survey indicated the need for further targeted surveys for Chuditch. As such, further searches were conducted along the breakaway to the west of the study area, which was identified as potential Chuditch habitat. Searches were conducted by a team of two people who walked sections of the breakaway that were deemed most suitable and were in close proximity to the study area. Searchers investigated crevices, caves, the base and walls of the breakaway, and the vegetation near the breakaway looking for Chuditch scats. Any scats found that were deemed as potential Chuditch scats were collected for morphological identification and genetic sequencing.

Chuditch scats are identified based on characteristic shape, size, composition (almost always containing abundant insect remains in a matrix of fibrous plant material and seeds), lack of associated urates (usually found with reptile and bird scats), and smell (faint or undetectable in older samples until moistened; cf. stronger characteristic odours of goanna, snake, cat, dog or fox) (Triggs 1996). The only items visually confusable with Chuditch scat would be pellets regurgitated by Currawongs (e.g. *Strepera versicolor*, recorded in the survey), but this is a woodland species unlikely to occur in (e.g.) breakaway overhangs, and although omnivorous, pellets rarely contain obvious insect remains.

After morphological identifications were complete, remaining samples were sent to Genotyping Australia for genetic sequencing.

#### 4.2.2.9 SRE invertebrate sampling

Sampling for SRE invertebrates was conducted at 25 sites (Figure 4-1), in areas identified as suitable habitat for SREs. Potential SRE habitat was rated as follows:

- Low - vegetation is widespread, does not contain landforms, soils or vegetation likely to give rise to short-range endemism in the terrestrial invertebrate assemblage, may or may not have recorded Potential or Confirmed SRE taxa
- High – vegetation is locally restricted or regionally significant, contains landforms, soils or vegetation that acts to hold water in the landscape or is associated with surface water, likely to have recorded numerous Confirmed SRE taxa.

Sampling comprised the following methods:

- active foraging
- litter/soil sieving.

Active foraging for SRE invertebrate groups comprised inspection of logs, larger plant debris, the underside of bark of larger trees and the underside of rocks. Methodical searches were conducted amongst the leaf litter of shade-bearing tall shrubs and trees, including raking of litter, and spinifex bases were inspected thoroughly. Rocks and rock crevices were inspected, particularly for pseudoscorpions.

Active foraging for SREs were undertaken concurrently with active searches for vertebrate fauna, with a total search effort of approximately 53.4 hours (Table 4-4). Trapdoor spider burrows identified during the searches were excavated if they were considered inhabited. Excavation involved removing soil from around the burrow to carefully expose the burrow chamber and remove the spider.

Combined litter/soil sifts were undertaken at 11 sites, with up to three sifts conducted at each site dependent on abundance of leaf litter. In total, 33 sifts were undertaken (Table 4-4). The collection of leaf litter samples was standardised volumetrically by the diameter and height (310 mm x 50 mm = 1.55 L) of the sieves which were completely filled with compressed litter and the upper layers of underlying soil. Samples were sieved through three stages of decreasing mesh size over a round tray and invertebrates were picked from the sieves and tray with forceps. These samples particularly

targeted small spiders (Araneomorphae), pseudoscorpions, buthid scorpions, millipedes, centipedes (in particular Geophilomorpha and Cryptopidae), smaller species of molluscs (e.g. Pupillidae) and isopods.

#### 4.2.2.10 Likelihood of occurrence assessment

Following the field survey, the likelihood of occurrence for each significant fauna species identified in the desktop review was assessed and assigned to one of four ratings:

- recorded – species recorded within the study area by previous or current survey
- likely – study area within current known range of species, suitable habitat within the study area and home range of species intersects study area based on known records
- possible – study area within current known range of species, suitable habitat within the study area and home range of species does not intersect study area based on known records
- unlikely – study area outside current known range of species or no suitable habitat present in study area.

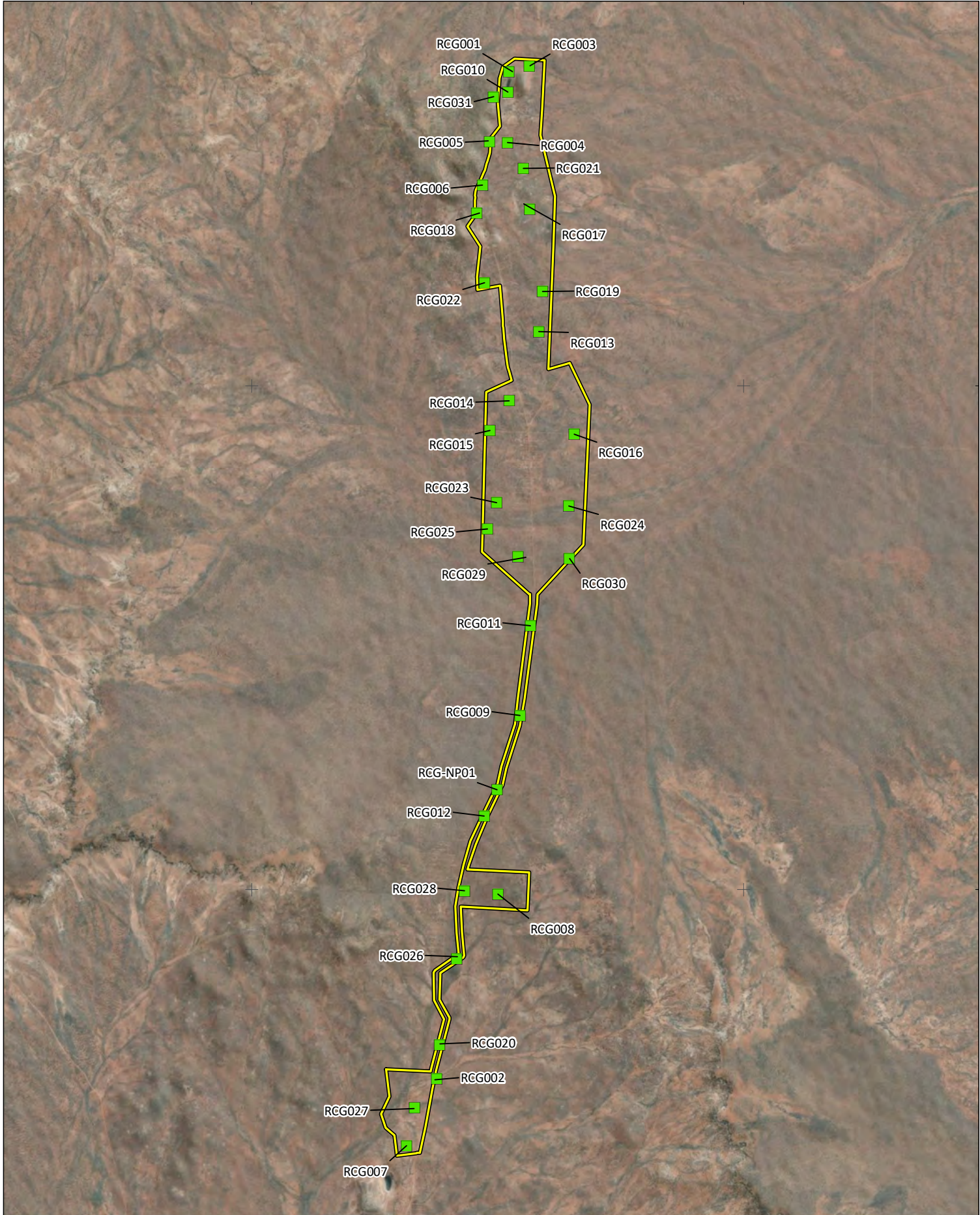
#### 4.2.3 Survey personnel

The personnel involved in the surveys are listed in Table 4-5. All survey work was carried out under relevant licences issued by DBCA under the BC Act (Table 4-5).

**Table 4-5 Survey personnel**

Name	Permit	Qualifications	Role/s
Jarrad Clark	N/A	B.Sc. (Environmental Management)	Project oversight
Dr John Scanlon	Fauna taking (biological assessment) licence no. BA27000478	Ph.D. (Zoology)	Field survey, reporting
Caitlin Nagle		M. Sc. (Conservation Biology)	Project Manager, field survey, reporting
Paula Strickland	N/A	MSc (Cons. Biol)	Field survey
Jade Larkman	N/A	B.Sc. (Environmental Management)	Reporting





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Dacian Gold Limited Redcliffe Gold Project		
Project No	1440-RGP-DGL-VER	
Date	8/12/2021	
Drawn by Map author	IN JS	
1:94,900 (at A4)		GDA 1994 MGA Zone 50

- Study area
- Site

**Figure 4-1**  
**Terrestrial fauna survey sites**



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## 5 RESULTS

### 5.1 DESKTOP REVIEW

#### 5.1.1 Threatened and Priority Ecological Communities

The desktop review identified one PEC, the Nambi calcrete groundwater assemblage type on Carey paleodrainage on Nambi Station. This PEC is a subterranean fauna community located approximately 34km north of the study area. No TECs or terrestrial PECs were identified within 55km of the study area.

#### 5.1.2 Vertebrate fauna

The desktop review identified records of 277 vertebrate taxa within the desktop search extent, and a further six species (from DAWE 2021a) where potential presence is predicted based on habitat models. The list comprised six frogs, 74 reptiles, 176 birds including two naturalised species, and 39 mammals including 11 introduced (Table 5-1; Appendix 3). A previous survey overlapping the southern end of the present study area recorded 86 vertebrate species comprising two frogs, 23 reptiles, 47 birds and 14 mammals (Phoenix 2010a).

Twenty-seven conservation significant vertebrate species were identified in the desktop review, comprising nine species listed as Threatened, Conservation Dependent or Specially Protected under the EPBC Act and/or BC Act (Table 5-2). Fifteen bird species are listed as Migratory under the EPBC Act and BC Act, and a further two species are listed as Priority by DBCA (Table 5-2). Several mammals are listed that are considered regionally or totally extinct (Boodie and both species of Stick-nest Rat); evidence of their former presence would contribute to understanding of the existing habitats and fauna assemblage.

One significant vertebrate species has previously been recorded within the study area (Figure 5-1):

- *Falco peregrinus* (OS), recorded by (Phoenix 2010a).

**Table 5-1 Summary of terrestrial fauna desktop results**

Class	Native	Introduced	Total
Amphibians	6	0	6
Reptiles	74	0	74
Birds	174	2	176
Mammals	28	11	39
<b>Total</b>	<b>270</b>	<b>13</b>	<b>283</b>



**Table 5-2 Significant vertebrate fauna identified in the desktop review**

Species	Status	Proximity to study area	Habitat
<b>Birds</b>			
<i>Leipoa ocellata</i> Malleefowl	VU (EPBC & BC Acts)	26 km E	Malleefowl occur mainly in scrubs and thickets of mallee ( <i>Eucalyptus</i> spp.), boree ( <i>Melaleuca lanceolata</i> ) and bowgada ( <i>Acacia linophylla</i> ), and other dense litter forming shrublands including mulga shrublands (Johnstone and Storr, 2004). Nest mounds require sandy soil as well as abundant litter (Benshemesh 2007).
<i>Apus pacificus</i> Fork-tailed Swift	Mig. (EPBC & BC Acts)	*	Widespread Migratory species that does not breed in Australia, typically present from October to April. It occurs in a wide range of dry or open habitats across most of WA (DoEE 2020).
<i>Plegadis falcinellus</i> Glossy Ibis	Mig. (EPBC & BC Acts)	64 km ESE	This bird has a nearly global distribution, and in Australia mostly occurs in eastern and northeastern areas, but also patchily in most of WA. It usually occurs in freshwater marshes, floodplains and artificial wetlands, but also uses coastal wetlands including saltmarsh and estuary habitats (DAWE 2021b).
<i>Falco hypoleucos</i> Grey Falcon	VU (BC Act)	*	The Grey Falcon is a widespread but rare species inhabiting much of the hot, semi-arid and arid interior of Australia. Occurs in a wide variety of arid habitats including open woodlands and open <i>Acacia</i> shrubland, hummock and tussock grasslands and low shrublands, particularly where crossed by tree-lined water courses (Schoenjahn <i>et al.</i> 2019; Threatened Species Scientific Committee 2020). Range has contracted northwards in WA, now rarely occurs south of 26°S (Johnstone & Storr 1998).
<i>Falco peregrinus</i> Peregrine Falcon	OS (BC Act)	Within study area	Preferred habitat includes cliffs and wooded watercourses. Nesting occurs mainly on cliff ledges, granite outcrops, quarries and in trees with old raven or Wedge-tailed Eagle nests (Johnstone & Storr 1998).
<i>Charadrius veredus</i> Oriental Plover	Mig. (EPBC & BC Acts)	*	Non-breeding migrant (Sep-Mar) in northern Australia, uses inland habitats including flat, open, semi-arid or arid grasslands, particularly locations with short, sparse grass interspersed with hard, bare ground, such as claypans, dry paddocks, lawns, cattle camps, or recently burnt grasslands (DAWE 2021c).
<i>Pluvialis fulva</i> Pacific Golden Plover	Mig. (EPBC & BC Acts)	39 km SSW	Most Australian sightings are on coastal beaches and rocky shorelines, but also inland on major river systems and lakes;



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Species	Status	Proximity to study area	Habitat
			occasionally forages on low saltmarsh vegetation (DAWE 2021d).
<i>Thinornis rubricollis</i> Hooded Plover	P4 (DBCA list)	34 km SSW	The Hooded Plover population extends from coastal New South Wales to the west coast of WA. Most of the West Australian population is found on the coast from Jurien to the east of Esperance, and a part of the population nests inland (Prószyński 2017). Nesting pairs of Hooded Plovers can be found on the shore of inland salt lakes, freshwater marshes, inlets and coastal sandy beaches.
<i>Actitis hypoleucos</i> Common Sandpiper	Mig. (EPBC & BC Acts)	39 km SSW	Breeds in Eurasia, a small population winters in Australia. Found across all Australian states, they never occur in large flocks, mostly singly. In WA the species is mostly coastal with some inland records (Geering <i>et al.</i> 2007). They are found across a wide range of wetlands: small ponds, large inlets and mudflats where they forage on the shore usually close to the vegetation.
<i>Calidris acuminata</i> Sharp-tailed Sandpiper	Mig. (EPBC & BC Acts)	39 km SSW	One of the most common Australian shorebirds. They breed in Arctic north-east Siberia and a large population winters in Australia. The distribution of the species in Australia depends on water quantity conditions; some large wetlands may be available inland after important rainfall, but only occasionally. The distribution on the coast is more regular, the conditions being more consistent. The species is semi-gregarious and occurs in scattered flocks, mainly on non-tidal flats, often inland.
<i>Calidris canutus</i> Red Knot	EN/Mig. (EPBC Act; BC Act)	6 km W	Non-breeding visitor along coast, adults mostly Aug-Apr (Johnstone <i>et al.</i> 2013); only occasionally recorded inland.
<i>Calidris melanotos</i> Pectoral Sandpiper	Mig. (EPBC & BC Acts)	*	Uncommon solitary shorebird that breeds in the Arctic tundra of North America and eastern Siberia. Only a fractional part of the population winters in Australia. Found in wetlands, inland as well as on the coast. The species typically uses shallow fresh to saline wetlands such as coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands.
<i>Calidris ruficollis</i> Red-necked Stint	Mig. (EPBC & BC Acts)	87 km SE	Non-breeding migrant present on Australian coasts from August to April, first-year birds also present in winter; recorded inland where they may forage in samphire or around pools on salt flats (DAWE 2021b).
<i>Limosa lapponica</i> Bar-tailed Godwit	Mig. (EPBC & BC Acts)	*	Non-breeding migrant, in Australia found mainly in coastal habitats including intertidal

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Species	Status	Proximity to study area	Habitat
			sand and mudflats, estuaries, saltmarshes etc. (DAWE 2021b).
<i>Tringa glareola</i> Wood Sandpiper	Mig. (EPBC & BC Acts)	6 km W	Non-breeding migrant, only a small proportion of the global population reaching Australia; typically uses well-vegetated, shallow freshwater wetlands, rarely in brackish wetlands or saltmarsh (DAWE 2021b).
<i>Tringa nebularia</i> Common Greenshank	Mig. (EPBC & BC Acts)	6 km W	The species is present in summer across all Australian states, mostly on the coast but sometimes inland. The species is not gregarious. Small groups can sometimes be seen when roosting at high tide (Geering <i>et al.</i> 2007). They prefer coastal open mudflats.
<i>Tringa stagnatilis</i> Marsh Sandpiper	Mig. (EPBC & BC Acts)	*	Non-breeding migrant, found on coastal and inland wetlands throughout Australia; usually forages in shallow water at the edge of wetlands, and recorded roosting around low saltmarsh vegetation and swamps (DAWE 2021b).
<i>Gelochelidon nilotica</i> Gull-billed Tern	Mig. (BC Act)	63 km E	This taxon comprises non-breeding migrants of an Asian subspecies ( <i>G. nilotica affinis</i> ) on the northwestern coasts, and a larger-bodied Australian resident population now considered a distinct species <i>G. macrotarsa</i> (Johnstone <i>et al.</i> 2021; Rogers <i>et al.</i> 2005). Nomadic inland distribution, foraging and breeding around temporary water on mudflats, claypans, salt marsh etc.
<i>Pezoporus occidentalis</i> Night Parrot	CR (BC Act), EN (EPBC Act)	*	Night Parrot appears to favour areas of dense vegetation comprising old-growth (often > 50 years unburnt) spinifex ( <i>Triodia</i> spp.) especially hummocks that are ring-forming for roosting and nesting. Such areas may also be associated with dense chenopod shrubs. It is thought that spinifex hummocks that are <40-50 cm in height are not likely to provide adequate shelter for roosting and nesting (DPaW 2017a). Foraging appears to take place in habitats containing various native grasses and herbs in addition to spinifex, and these areas may or may not contain shrubs or low trees.  Favoured sites may vary with the season and local conditions, and may not necessarily occur within or adjacent to roosting areas, as they have been observed to fly up to 40 km in a night (DPaW 2017b). <i>Triodia</i> species are thought to provide a food resource while flowering and seeding. The succulent genus <i>Sclerolaena</i> has also been shown to be a source of food and moisture and other

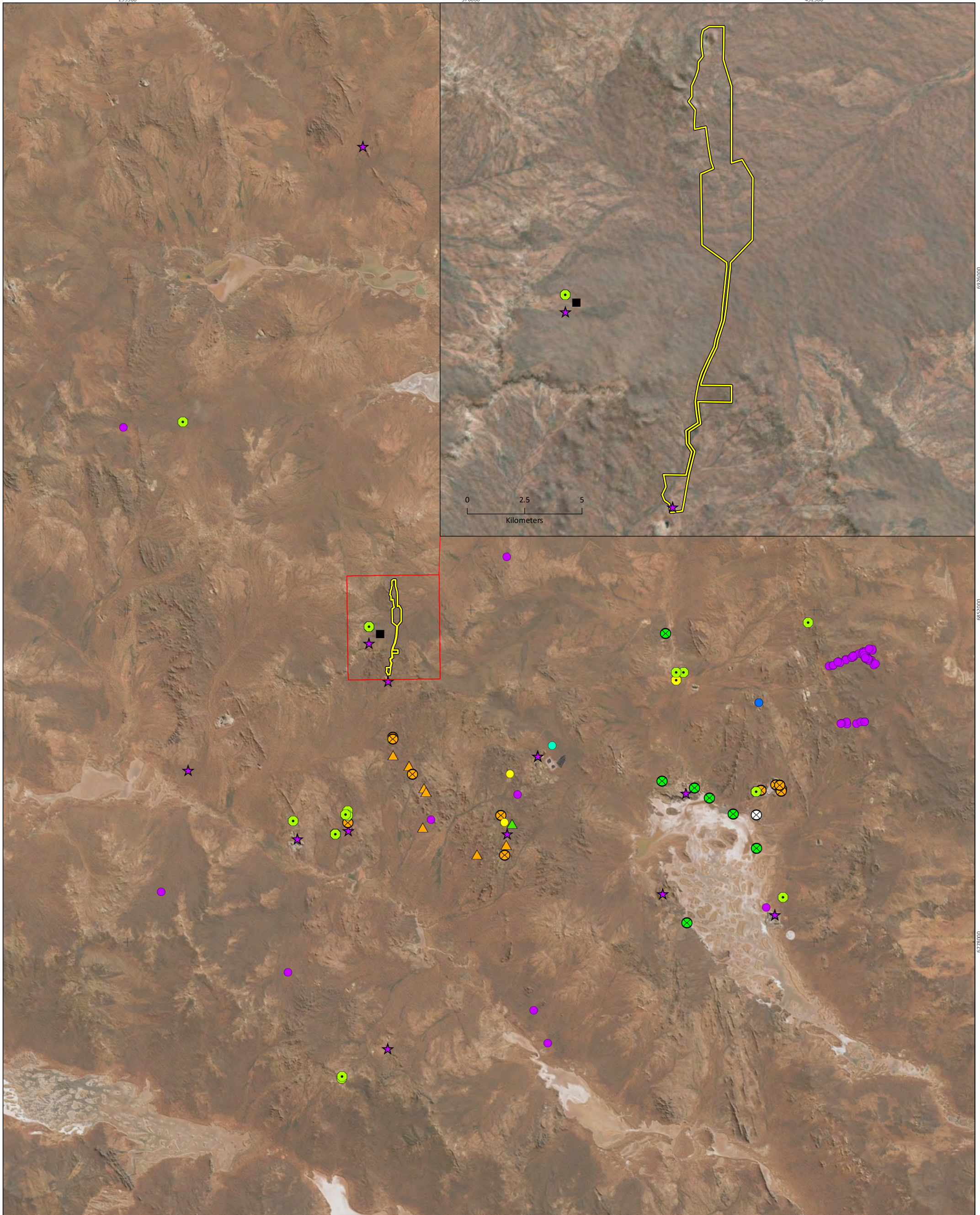
Species	Status	Proximity to study area	Habitat
			succulent chenopods species are also considered likely to be important. Foraging habitat is likely to be more important if it is adjacent to or within about 10 km of patches of <i>Triodia</i> deemed suitable as roosting habitat. Home ranges are up to 3,000 ha (Murphy <i>et al.</i> 2017).
<i>Polytelis alexandrae</i> Princess Parrot	(VU EPBC Act; P4 DBCA list)	82 km ESE	The Princess Parrot is one of the most elusive, unknown Australian parrots. They are only found in the arid inland desert of central Australia with most of their range extending between the Great Victoria Desert and the Great Sandy Desert, in WA. Princess Parrots inhabit sandy deserts where they feed on seeds and flowers (Garnett & Crowley 2000). The species is highly irruptive and after important rainfall, can occur in numbers in areas previously unoccupied.
<i>Motacilla cinerea</i> Grey Wagtail	Mig. (EPBC & BC Acts)	*	A vagrant visitor to Australia that inhabits fast flowing streams and rivers (IUCN 2019).
<i>Motacilla flava</i> Yellow Wagtail	Mig. (EPBC & BC Acts)	*	Migratory species that breeds in northeastern Asia and Alaska; non-breeding range in South-East Asia extends regularly to northwestern Australia and occasionally to other parts of the continent. Australian records are mostly now referred to <i>M. tschutschensis simillima</i> . Occurs in open country near swamps, saltmarshes, and occasionally dry inland plains.
<b>Mammals</b>			
<i>Dasyurus geoffroii</i> Chuditch	VU (EPBC & BC Acts)	*	The Chuditch is now confined to south-WA, occurring in only 5% of its former range. Prior to European settlement the species occupied approximately 70% of continental Australia (Smith <i>et al.</i> 2004; Van Dyck & Strahan 2008). They are now mostly found in woodland, heath and mallee habitats.
<i>Sminthopsis longicaudata</i> Long-tailed Dunnart	P4 (DBCA list)	40 km SE	The Long-tailed Dunnart is found in WA and the Northern Territory. In WA, the species seems to occur across a large portion of the State, mostly in arid and semi-arid rocky inland deserts, typically rugged rocky landscapes and occasionally in more open countries with a stony substrate. The species is generally rare or uncommon and often present in low densities (Van Dyck & Strahan 2008).
<i>Bettongia lesueur graii</i> Burrowing Bettong, Boodie	EX (EPBC & BC Acts)	17.9 km SSE	Formerly occurred at high abundance in much of the semi-arid and southern arid zone of Australia, but extinct on the mainland by about 1960. Other populations extant at Shark Bay, some offshore islands



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**Prepared for Dacian Gold Limited**

Species	Status	Proximity to study area	Habitat
			and mainland reintroduction sites are considered distinct subspecies (DAWE 2021b). Burrow complexes (warrens) and spoil mounds commonly persist in calcrete, clay or laterite soils, often still in use by rabbits and large varanid lizards (Burbidge <i>et al.</i> 2007).
<i>Leporillus apicalis</i> Lesser Stick-nest Rat	EX (EPBC & BC Acts)	*	Formerly inhabited much of the semi-arid and southern arid zone of Australia; last known to be extant in 1933, now completely extinct (Copley 1999).
<i>Leporillus conditor</i> Greater Stick-nest Rat	VU (EPBC Act), CD (BC Act)	*	Formerly inhabited much of the semi-arid and southern arid zone of Australia, but disappeared from the mainland by the 1930s (Copley 1999); the only natural extant population is on Franklin Island in the Nuyts Archipelago, South Australia, but has been reintroduced to other islands and fenced reserves on the mainland (DSEWPac 2008).  Both <i>Leporillus</i> species constructed nests of tightly interwoven sticks either around the base of a tree or shrub, or in caves and overhangs of breakaways and rock outcrops; open-air nests have now completely disappeared, but nests in sheltered sites can persist for thousands of years and preserve valuable information on the local vegetation and fauna (Pearson <i>et al.</i> 1999). Stick nests previously recorded in the vicinity (Phoenix 2019a, b) could represent either or both species.




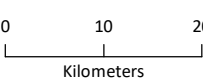













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Project No	1440-RGP-DGL-VER
Date	8/12/2021
Drawn by	IN
Map author	JS
	
	
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 Study area	 EX (EPBC Act, BC Act)
<b>Status</b>	 Mig. (BC Act)
 EN/Mig./EN (EPBC Act, BC Act)	 Mig. (EPBC Act, BC Act)
 VU (EPBC Act); P4 (DBC list)	 OS (BC Act)
 VU (BC Act)	 P1 (DBC list)
 VU (EPBC Act, BC Act)	 P3 (DBC list)
VU/CD (EPBC Act, BC Act)	P4 (DBC list)
EX (BC Act)	

**Figure 5-1**

**Desktop records of significant vertebrate fauna**



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### 5.1.3 SRE invertebrate fauna

The desktop review identified no records of confirmed SRE taxa and 27 potential SRE taxa from within the SRE desktop search area (Table 5-4; Figure 5-2). A further 36 taxa of uncertain SRE status were identified. The majority of desktop records were mygalomorphs, followed by pseudoscorpions.

The desktop records indicate three SRE taxa have previously been recorded within the study area (Figure 5-2):

- *Antichiropus* 'sp. indet.' (uncertain SRE status), recorded by J. Clark as an opportunistic sighting in 2009. Not reported in the literature.
- *Aname* 'sp. indet.' (uncertain SRE status), recorded by J. Clark in 2015. Reported as unlikely to be an SRE based on its morphology (long legged, agile) (Phoenix 2010b, c).
- *Idiosoma* 'sp. indet.' (uncertain SRE status), recorded by J. Clark in 2015. Reported as unlikely to be an SRE based on distribution within the study area and no apparent habitat specialisation (Phoenix 2010b, c). Known range is less than 100 km sq.

Of the potential SRE taxa, one is a named species (*Kwonkan goongarriensis*). The remaining 26 comprise taxa named only to morphospecies codes as applied by the WA Museum or are not identified to confirmed species level (i.e. "sp." or "cf."). The majority of taxa records of uncertain SRE status are unidentifiable ("sp. indet.", i.e. female or juvenile specimens) or could not be identified to species or morphospecies and may represent new species or other species listed in the same genus where records exist (Table 5-4).

**Table 5-3 Summary of SRE taxa identified in the desktop review**

Higher taxon	Families	Genera	Taxa	% of taxa
Mygalomorphs (trapdoor spiders)	7	16	36	59
Pseudoscorpions	4	10	11	18
Scorpions	3	4	10	16
Isopods (slaters)	0	0	0	0
Centipedes	3	3	3	5
Millipedes	1	1	1	2
<b>Total</b>	<b>18</b>	<b>34</b>	<b>61</b>	<b>100</b>



Table 5-4 SRE taxa identified in the desktop review. Taxa highlighted in grey were recorded within the study area.

Higher taxon, family	Species	SRE category	Proximity to study area	Habitat records	Notes
<b>Class Arachnida, infraorder Mygalomorphae (trapdoor spiders)</b>					
Actinopodidae (mouse spiders)	<i>Missulena</i> `sp. indet.`	Uncertain	Outside (39 - 99km)	Nil	May represent more than one species
Anamidae	<i>Aname</i> `glenorn sp. 2`	Potential	Outside (58km)	Nil	
	<i>Aname</i> `Goldfields sp. 1`	Potential	Outside (66-68km)	Mulga/ <i>Triodia</i>	
	<i>Aname</i> `Goldfields sp. 2`	Potential	Outside (66km)	Mallee, mulga/ <i>Triodia</i>	
	<i>Aname</i> `mellosa group?`	Potential	Outside (45-85km)	Nil	
	<i>Aname</i> `MYG216`	Potential	Outside (40-97km)	Nil	
	<i>Aname</i> `sp. indet. (?MYG216)`	Uncertain	Outside (96km)	Nil	
	<i>Aname</i> `Phoenix0055`	Potential	Outside (46km)	<i>Acacia</i> shrubland on calcrete undulating plain	
	<i>Aname</i> `Phoenix0056`	Potential	Outside (47km)	<i>Acacia</i> shrubland	
	<i>Aname</i> `Phoenix0058`	Potential	Outside (48km)	Calcrete hill slope with mulga	
	<i>Aname</i> `river wishbone group`	Potential	Outside (68km)	Dune <i>Triodia</i>	
	<i>Aname</i> `sp. indet.`	Uncertain	Inside, outside (63 - 113km)	Samphire, dune <i>Triodia</i> , mulga woodland, lignum	Likely represents more than one species
	<i>Aname</i> `sp. with chevrons`	Uncertain	Outside (99km)	Nil	
	<i>Anamidae</i> `sp. indet.`	Uncertain	Outside (36-126km)	Mulga, lignum	May represent more than one species
	<i>Kwonkan</i> `MYG719`	Potential	Outside (43km)	Open mulga woodland	
	<i>Kwonkan</i> `sp. indet.`	Uncertain	Outside (66-126km)	Mulga/shrubs	May represent more than one species
	<i>Kwonkan goongarriensis</i>	Potential	Outside (67km)	Nil	
<i>Proshermacha</i> `MYG504`	Potential	Outside (64km)	Nil		
<i>Proshermacha</i> `sp. indet.`	Uncertain	Outside (64-98km)	Nil		

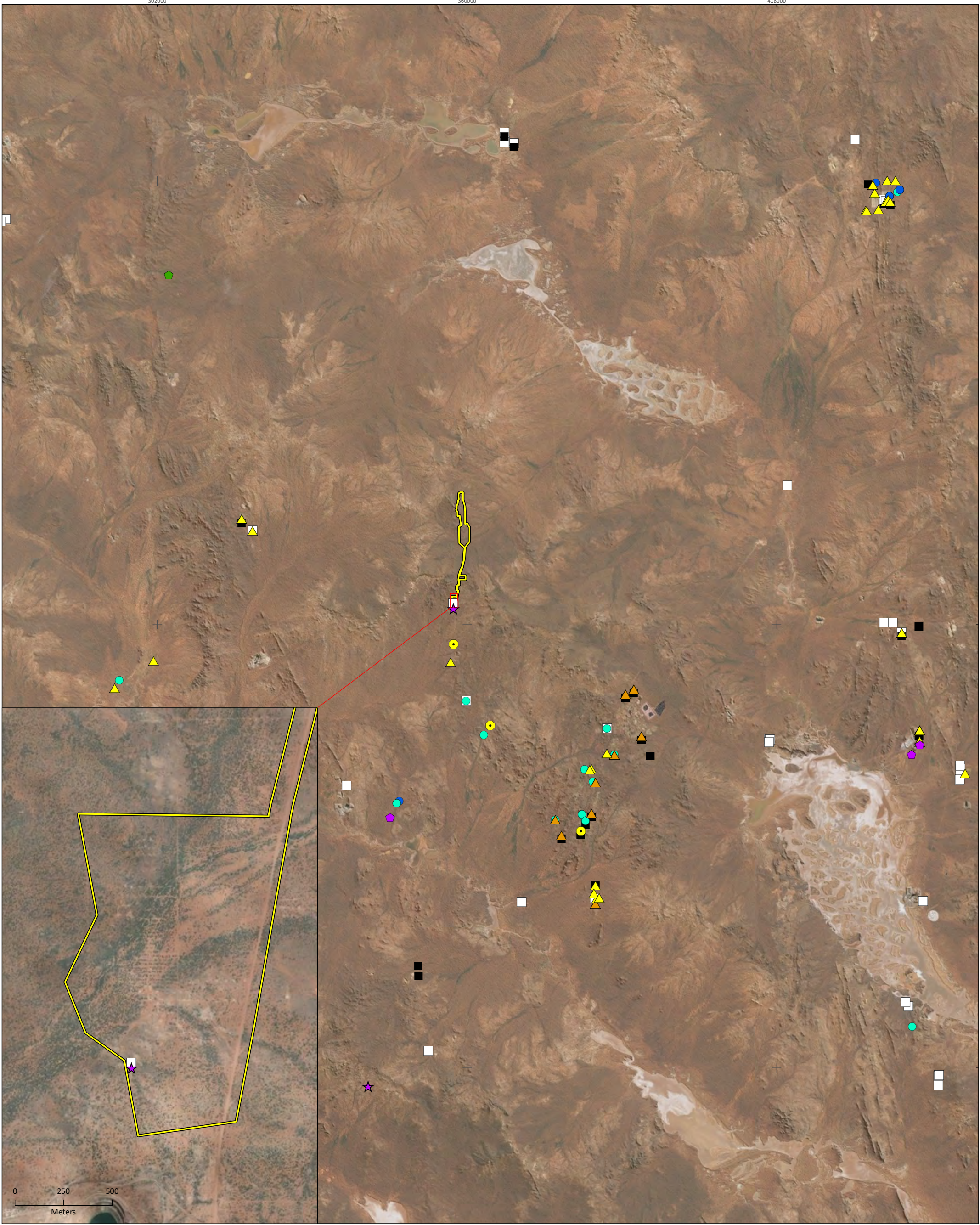
Higher taxon, family	Species	SRE category	Proximity to study area	Habitat records	Notes
	<i>Teyl</i> `MYG444`	Potential	Outside (64km)	Nil	
	`Teyl?` `sp. indet.`	Uncertain	Outside (63-66km)	Mallee, mulga/ <i>Triodia</i>	
Barychelidae	<i>Barychelidae</i> `sp. indet.`	Uncertain	Outside (61km)	Nil	
	<i>Idiommata</i> `sp. indet.`	Uncertain	Outside (18-64km)	Nil	
	<i>Trittame</i> `sp. indet.`	Uncertain	Outside (38km)	Nil	
Euagridae	<i>Cethegus</i> `sp. indet.`	Uncertain	Outside (66-100km)	Samphire	May represent more than one species
Halonoproctidae	<i>Conothele</i> `Phoenix0057`	Potential	Outside (36km)	Mulga woodland in low drainage area	
	<i>Conothele</i> `sp. indet.`	Uncertain	Outside (79km)	Nil	
Idiopidae	<i>Eucyrtops</i> `sp. indet.`	Uncertain	Outside (96-128km)	Mallee, mulga/ <i>Triodia</i>	
	<i>Euoplos</i> `sp. indet.`	Uncertain	Outside (64km)	Nil	
	<i>Euoplos</i> `WAM T110336`	Potential	Outside (36-43km)	Mulga woodland	
	<i>Idiosoma</i> `MYG014`	Potential	Outside (47km)	Mulga woodland at base of hill slope	
	<i>Idiosoma</i> `MYG017`	Potential	Outside (90km)	Nil	
	<i>Idiosoma</i> `occidentalis sp. group`	Uncertain	Outside (57km)	Nil	
	<i>Idiosoma</i> `sp. indet.`	Uncertain	Inside, outside (60 - 126km)	Mulga woodland	Likely represents more than one species
Theraphosidae	<i>Selenocosmia</i> `sp. indet.`	Uncertain	Outside (82-126)	Nil	
	<i>Selenocosmia</i> `wacarina`	Potential	Outside (68-82km)	Nil	
<b>Class Arachnida, order Pseudoscorpions</b>					
Atemnidae	Atemnidae `sp. indet.`	Uncertain	Outside (44km)	Dense mulga woodland in drainage	
Chernetidae	`PSEAAF` `sp. indet.`	Uncertain	Outside (99km)	Under bark	
	Chernetidae `sp. indet.`	Uncertain	Outside (25-42km)	Mulga woodland at top of mesa	

Higher taxon, family	Species	SRE category	Proximity to study area	Habitat records	Notes
	<i>Nesidiochernes</i> `sp. indet.`	Uncertain	Outside (46km)	Mixed <i>Acacia</i> woodland	
Garypidae	<i>Synsphyronus</i> `PSE115`	Potential	Outside (97-99km)	Under bark	
Olpiidae	<i>Austrohorus</i> `sp. indet.`	Uncertain	Outside (39-64km)	Nil	
	<i>Beierolpium</i> `sp. 8/2`	Potential	Outside (96-97km)	Under bark	
	<i>Beierolpium</i> `sp. 8/3`	Potential	Outside (39km)	Nil	
	<i>Euryolpium</i> `sp. indet.`	Uncertain	Outside (46-47km)	Mixed <i>Acacia</i> woodland, mulga woodland at base of hill slope	
	<i>Indolpium</i> `sp. indet.`	Uncertain	Outside (37-41km)	Mulga woodland	
	Olpiidae `sp. indet.`	Uncertain	Outside (18-116km)	Nil	
<b>Class Arachnida, order Scorpiones (scorpions)</b>					
Bothriuridae	<i>Cercophonius</i> `sp. indet.`	Uncertain	Outside (65km)	Nil	
Buthidae	<i>Isometroides</i> `MM1`	Potential	Outside (37-44km)	Mulga woodland	
	<i>Isometroides</i> `sp. indet.`	Uncertain	Outside (11-96km)	Nil	
	<i>Lychas</i> `cf. jonesae`	Potential	Outside (35-47km)	Mulga woodland, side of breakaway with scattered mulga, <i>Acacia</i> shrubland on calcrete undulating plain	
	<i>Lychas</i> `pilbara 1`	Potential	Outside (90km)	Nil	
	<i>Lychas</i> `sp. indet.`	Uncertain	Outside (38-100km)	Nil	Likely represents more than one species
Urodacidae	<i>Urodacus</i> `GD`	Potential	Outside (90km)	Nil	
	<i>Urodacus</i> `gibson 1?`	Potential	Outside (62km)	Nil	
	<i>Urodacus</i> `sp. indet.`	Uncertain	Outside (40-100km)	Mulga woodland	May represent more than one species
	<i>Urodacus</i> `yeelirrie?`	Uncertain	Outside (60-61km)	Nil	
<b>Class Chilopoda, order Geophilida (centipedes)</b>					



Higher taxon, family	Species	SRE category	Proximity to study area	Habitat records	Notes
Chilenophilidae	Chilenophilidae `sp. indet.`	Uncertain	Outside (7km)	Nil	
Mecistocephalidae	Mecistocephalidae `sp. indet.`	Uncertain	Outside (48km)	Calcrete hill slope with mulga	
<b>Class Chilopoda, order Scutigera (centipedes)</b>					
Scutigera	<i>Pilbarascutigera</i> `sp. indet.`	Uncertain	Outside (24km)	Nil	
<b>Class Diplopoda, order Polydesmida (millipedes)</b>					
Paradoxosomatidae	<i>Antichiropus</i> `sp. indet.`	Uncertain	Inside, outside (90km)	Nil	May represent more than one species
<b>Class Gastropoda, order Littorinimorpha (snails)</b>					
Bithyniidae	<i>Gabbia</i> cf. <i>kendricki</i>	Potential	Outside (68km)	Nil	
<b>Class Gastropoda, order Stylommatophora (snails)</b>					
Succineidae	<i>Succinea</i> sp.	Uncertain	Outside (41-90km)	Nil	





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Drawn by	IN	
Map author	JS	1:650,000 (at A3)
		GDA 1994 MGA Zone 51

Study area

**Species**

**Potential**

- Mygalomorphae
- Pseudoscorpion
- Scorpion
- Snail

**Uncertain**

- Centipede
- Millipede
- Mygalomorphae
- Pseudoscorpion
- Scorpion
- Snail

**Figure 5-2**

**Desktop records of SRE invertebrates**



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## 5.2 FIELD SURVEY

### 5.2.1 Vertebrate fauna



#### 5.2.1.1 Habitats

Habitats in the study area can be described generally as ‘mulga shrublands on undulating plain’, but variation within this broad type is relevant to significant fauna species known or potentially occurring. Fauna habitat types are therefore distinguished and mapped based on topographic position, rock outcrop, soil, vegetation structure, and hydrological features (Table 5-5; Figure 5-3). Five habitat types refer to natural vegetation on clay loam and stony soils along a catenary from hill-tops to colluvial/alluvial plains and ephemeral drainage channels (types 1-5 in Table 5-5), two others (6-7) occur on sandplain. Areas previously cleared, excavated or buried by mining activities (8-9) include several significant water sources used by vertebrate fauna.





The most restricted and potentially significant fauna habitats are breakaways with caves and overhangs (type 1); large persistent pools located within old mine pits (8); and mallee-mulga-*Triodia* vegetation on sandplain (7; Table 5-5).



Narrow areas of disturbance such as unsealed access tracks and drill pads are not distinguished from adjacent natural vegetation, due to the coarse scale of mapping and the fact that they are used by fauna for dispersal and foraging.

**Table 5-5 Extent and description of each fauna habitat in the study area**

Habitat type	Site/s*	Description	Extent in study area and % of study area	Representative photograph
1. Breakaway and upper slope with open shrubland	RCG001 RCG005 RCG017 RCG018 RCG031	Hills capped with weathered volcanic rock forming breakaway with overhangs, caves and/or boulder piles, with open mid shrubland of mulga, other <i>Acacia</i> and mixed shrubs  MF: Low suitability	9.8 ha 0.57%	
2. Open/sparse shrubland on slopes and stony plains	RCG001 RCG007 RCG014 RCG015 RCG017 RCG020 RCG021	Slopes, low hills and plains with clay loam soils and some low outcrop, mantle of rock fragments usually present (volcanic rocks, quartz, ironstone and/or calcrete), with open to very sparse shrubland including mulga and often <i>Casuarina</i>  MF: Low suitability	324.6 ha 18.8%	



Habitat type	Site/s*	Description	Extent in study area and % of study area	Representative photograph
3. Open shrubland on lower slopes and plains	RCG013 RCG014 RCG015 RCG016 RCG023	Nearly level ground with open mid to tall mulga shrubland (mostly without grove structure) on clay loam soils with quartz and ironstone pebble mantle MF: Medium suitability	330.6 ha 19.1%	
4. Groved mulga on lower slopes, minor drainages and plain	RCG003 RCG004 RCG006 RCG008 RCG013 RCG015 RCG016 RCG018 RCG028	Mulga woodland and tall shrubland forming dense stands interspersed with open areas, on clay loam soils usually with quartz and ironstone mantle; minor drainage lines without distinct channel MF: Medium suitability	637.2 ha 36.8%	
5. Mulga woodland/tall shrubland on drainage	RCG002 RCG019 RCG024 RCG026 RCG027	Mulga woodland and tall shrubland (mallees variably present) over patchy dense low to mid shrubs, along drainage lines with distinct channels MF: Medium suitability	147.7 ha 8.5%	
6. Mulga tall shrubland on sandplain	RCG025, RCG029, RCG030	Mulga woodland and tall shrubland (scattered mallees variably present) over patchy dense low to mid shrubs, on deep sandy soils with ironstone pebbles MF: High suitability	177.5 ha 10.2%	

Habitat type	Site/s*	Description	Extent in study area and % of study area	Representative photograph
7. Mallee over mulga shrubland with hummock grass on sandplain	RCG009, RCG011, RCG-NP01	Scattered mallees over mulga mid-tall shrubland over <i>Triodia</i> (stage 3-5, i.e. ring-forming hummocks) on level sandy loam with few or no pebbles MF: High suitability	44.9 ha 2.6%	
8. Mine pit with deep pool	RCG010 RCG022	Disused mine pits with permanent pools, sparse low-mid shrub vegetation on walls MF: Low suitability	13.4 ha 0.8%	
9. Other cleared/disturbed	n/a	Mine pits, spoil heaps, and former infrastructure sites totally cleared of original vegetation; sparse low shrubland or herbland MF: Low suitability	44.8 ha 2.6%	

\* Sites may be listed more than once where adjacent habitats sampled

MF = Malleefowl

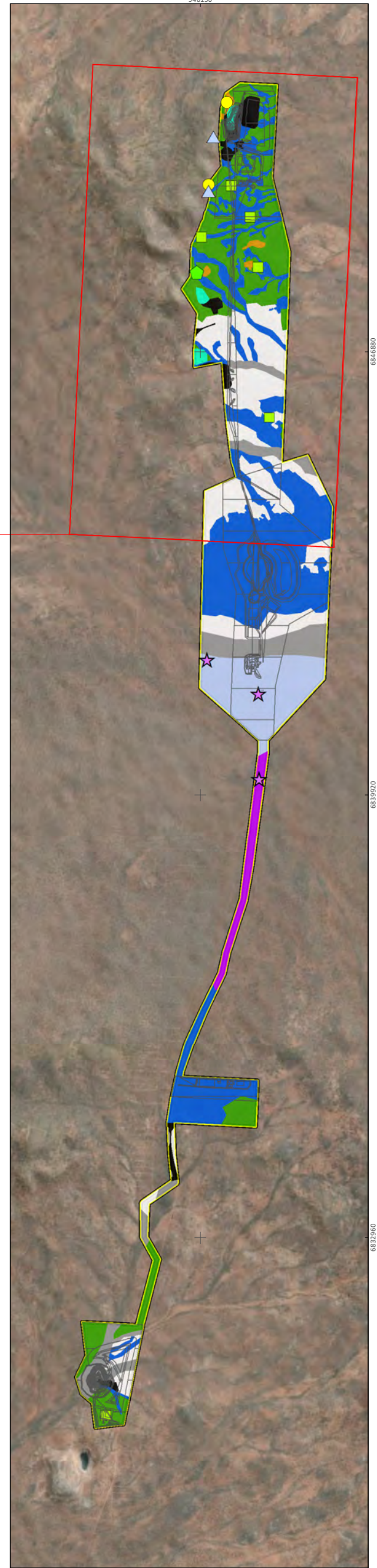
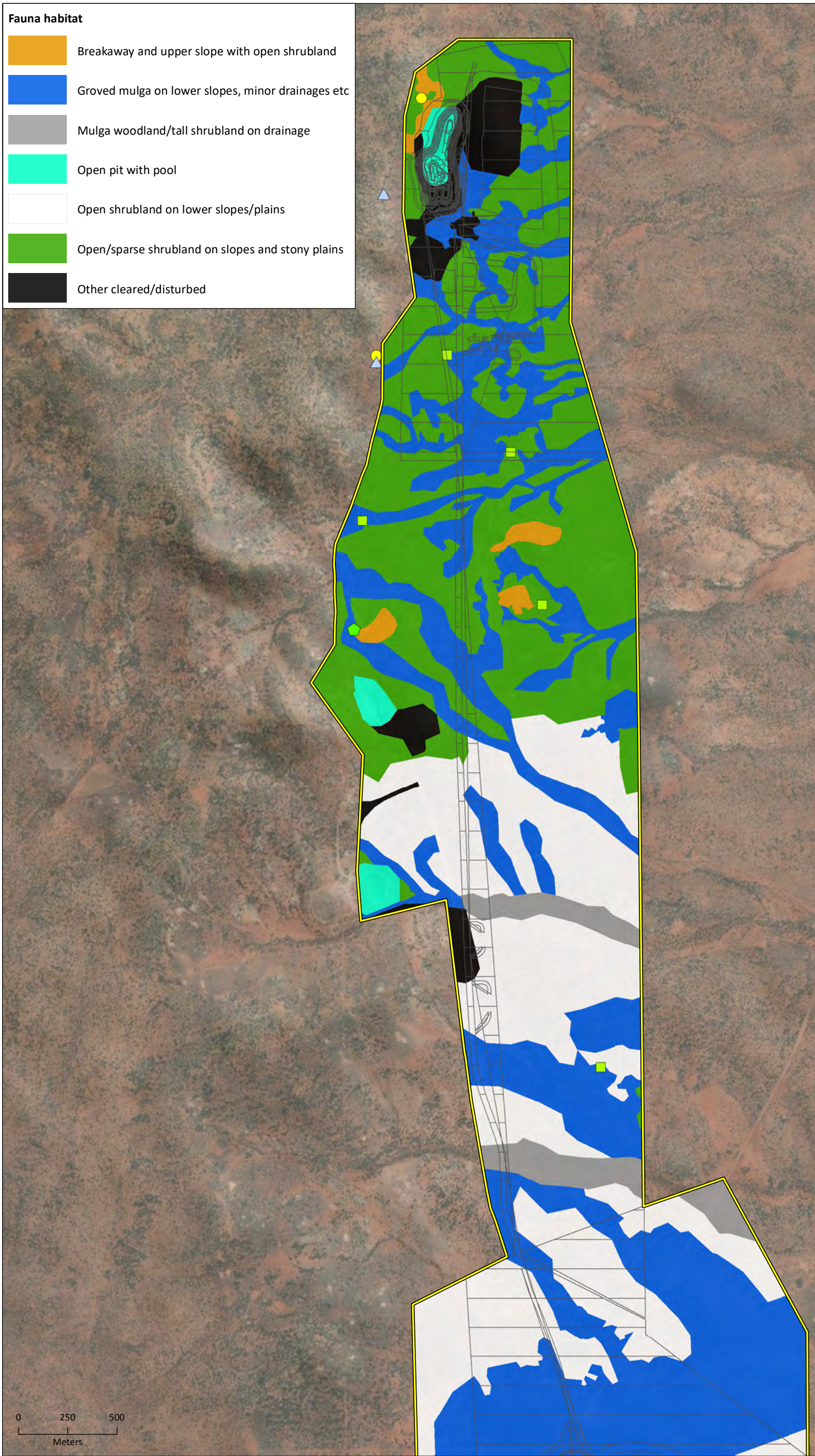
### 5.2.1.2 Malleefowl habitat assessments

The suitability for habitat to support Malleefowl was assessed at 32 locations (Table 5-6). The habitat was found to be suitable to support the species in 22 (68.8%) of the sites assessed, with approximately 1/3 of suitable sites being classified as High suitability (score of six or more). The remaining suitable sites were classified as Medium. The High suitability sites were located in mulga shrubland, often featuring scattered mallee and *Triodia*, in areas where the vegetation provided a consistent canopy cover. Malleefowl habitat suitability scores from assessed sites were used to extrapolate suitability for the entirety of the study area (Figure 5-4).

**Table 5-6 Malleefowl habitat assessment scores**

Malleefowl habitat	Score	Sites	Total	Total % (Malleefowl habitat %)
<b>No</b>	0	RCG010	1	3.1%
	1	RCG022	1	3.1%
	2	RCG005, RCG007, RCG021	3	9.4%
	3	RCG001, RCG004, RCG014, RCG018, RCG020	5	15.6%
<b>Yes</b>	4	RCG003, RCG015, RCG016, RCG019, RCG024, RCG027, RCG031	7	21.8% (31.8%)
	5	RCG002, RCG006, RCG008, RCG012, RCG013, RCG017, RCG023, RCG026	8	25.0% (36.4%)
	6	RCG028, RCG029, RCG030, RCG-NP01	4	12.5% (18.2%)
	7	RCG009, RCG011, RCG025	3	9.4% (13.6%)
	8	Nil	0	0.0
<b>Total</b>			<b>32</b>	<b>100</b>





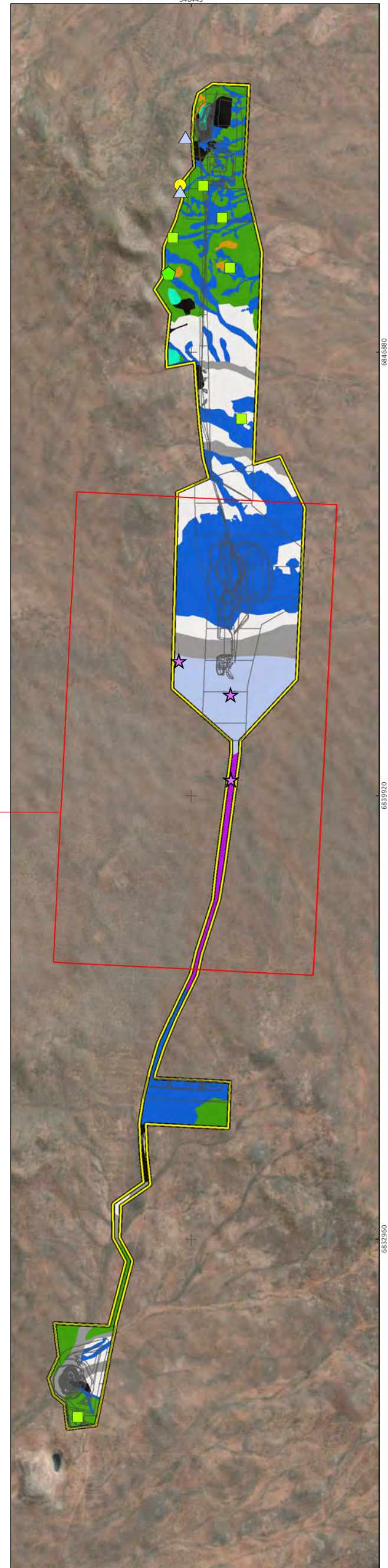
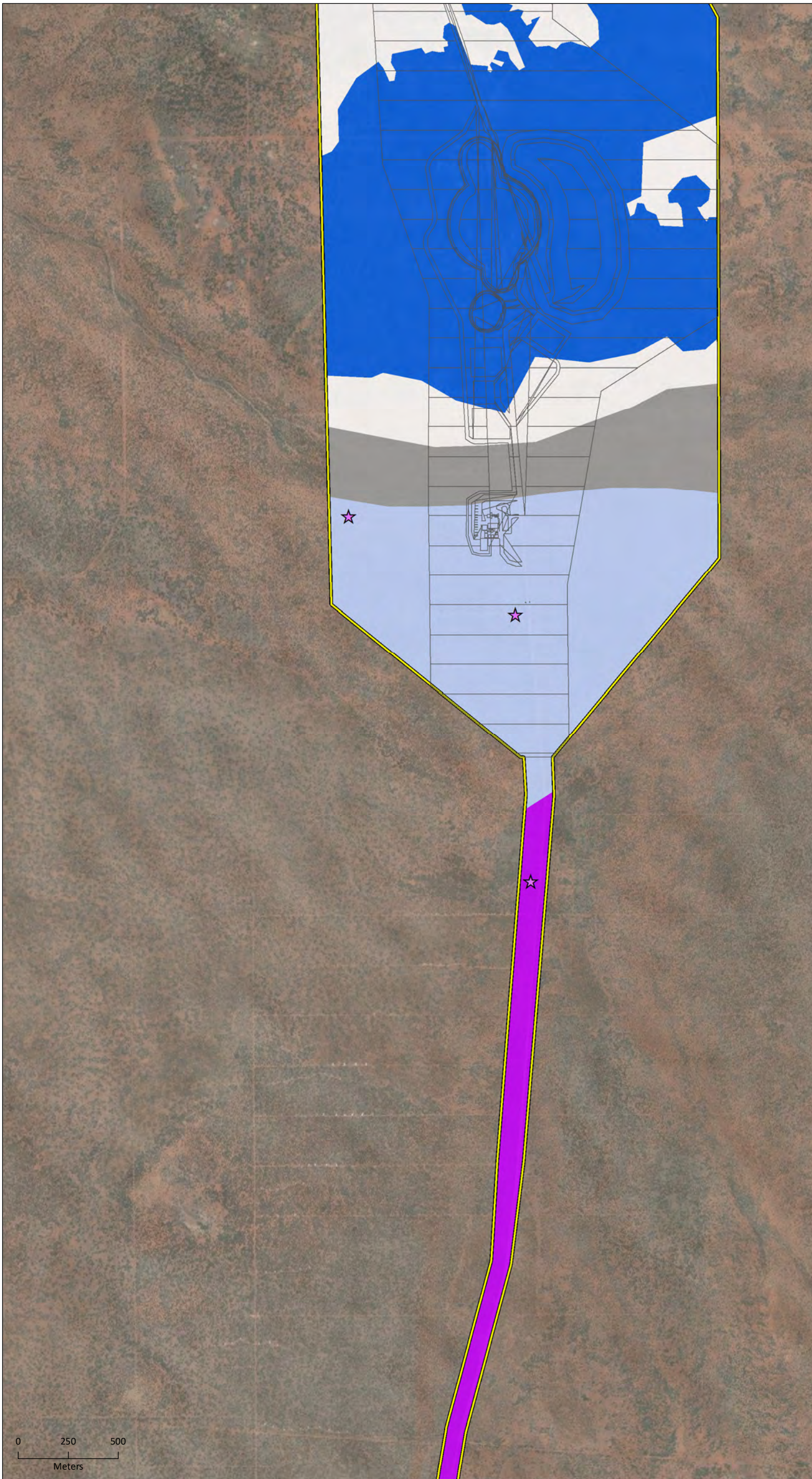
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Project No	1440-RGP-DGL-VER
Date	8/12/2021
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Map author	JS
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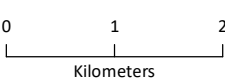
	Study area
	Disturbance footprint
<b>Species</b>	
	<i>Bettongia lesueur graii</i> , EX (EPBC Act, BC Act)
	<i>Dasyurus geoffroii</i> , VU (EPBC Act, BC Act)
	<i>Leporillus apicalis</i> , EX (EPBC Act, BC Act)
	<i>Sminthopsis longicaudata</i> , P4 (DBC list)









**Figure 5-3a**  
**Fauna habitats and significant fauna records from the field survey**







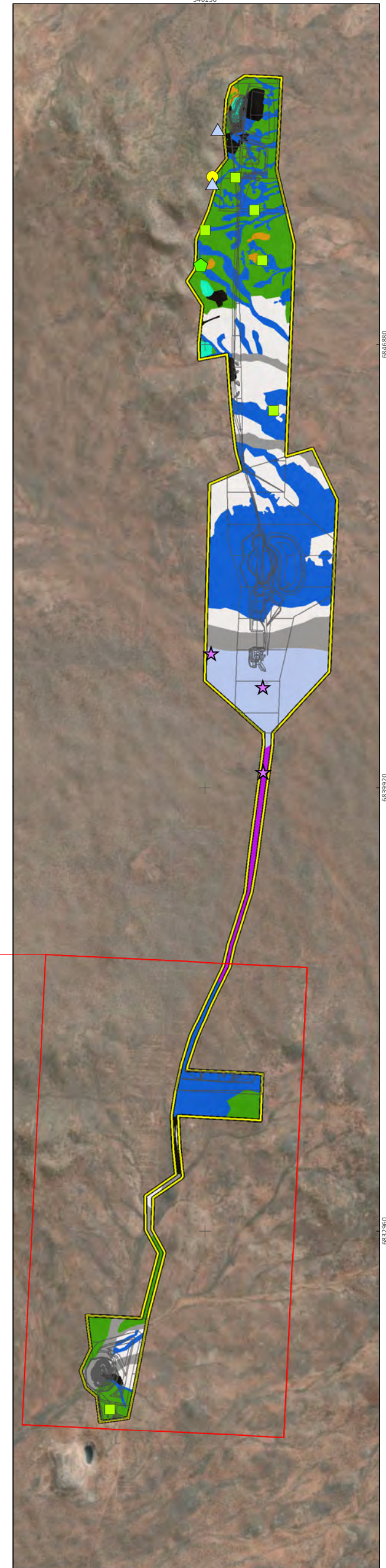
Dacian Gold Limited Redcliffe Gold Project	
Project No	1440-RGP-DGL-VER
Date	8/12/2021
Drawn by	IN
Map author	JS
	
	
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	Study area
	Disturbance footprint
<b>Fauna habitat</b>	
	Groved mulga on lower slopes, minor drainages etc
	Mallee - mulga - triodia on sandplain
	Mulga tall shrubland on sandplain
	Mulga woodland/tall shrubland on drainage
	Open shrubland on lower slopes/plains
<b>Species</b>	
	<i>Leipoa ocellata</i> , VU (EPBC Act, BC Act)

**Figure 5-3b**  
**Fauna habitats and significant fauna records from the field survey**







Dacian Gold Limited Redcliffe Gold Project	
Project No	1440-RGP-DGL-VER
Date	8/12/2021
Drawn by	IN
Map author	JS
1:70,000 (at A3)      GDA 1994 MGA Zone 51	

- Study area
- Disturbance footprint
- Fauna habitat**
- Groved mulga on lower slopes, minor drainages etc
- Mallee - mulga - tridonia on sandplain
- Mulga woodland/tall shrubland on drainage
- Open shrubland on lower slopes/plains
- Open/sparse shrubland on slopes and stony plains
- Other cleared/disturbed
- Species**
- Bettongia lesueur graii*, EX (EPBC Act, BC Act)

**Figure 5-3c**

**Fauna habitats and significant fauna records from the field survey**

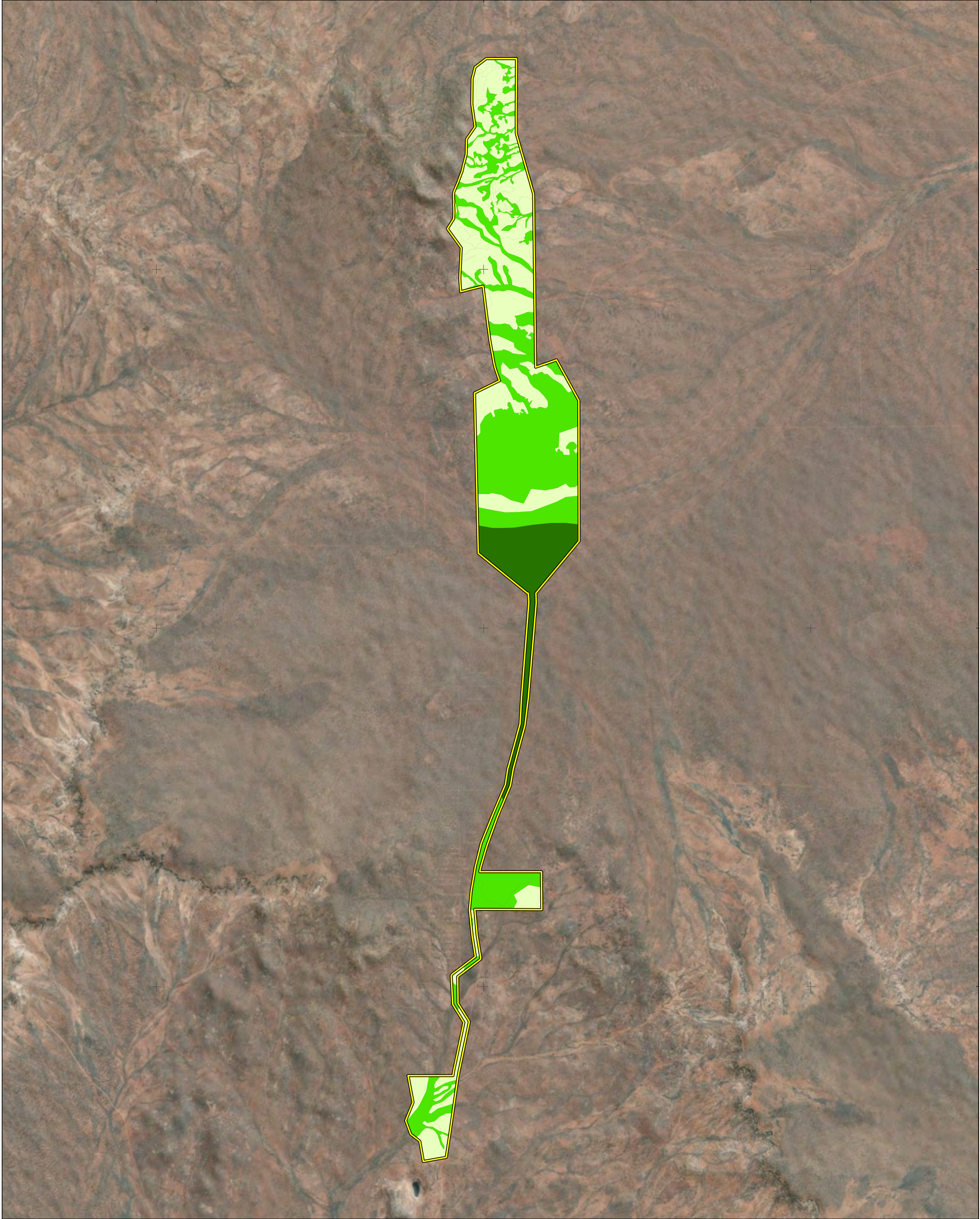
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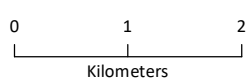


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Project No	1440-RGP-DGL-VER	
Date	8/12/2021	
Drawn by	IN	
Map author	JS	
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 Study area

**Habitat rating**

 High

 Medium

 Low

**Figure 5-4**  
**Malleefowl habitat suitability within the study area**



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### 5.2.1.3 Assemblage

A total of 70 terrestrial vertebrate species representing 46 families and 65 genera were recorded in the study area during the field surveys (Table 5-7; Appendix 3). This assemblage represents 25% of the species identified in the desktop review. Birds were the most diverse class of vertebrates recorded, consistent with the results of the desktop review. Of the 21 mammal species recorded during the field survey, seven were introduced species.

**Table 5-7 Number of vertebrate species recorded in survey in comparison to desktop results, by group**

Group	No. species identified in desktop review	No. species recorded in survey
Amphibians	6	0
Reptiles	74	11
Birds	176	38
Mammals	39 (inc. 11 introduced)	21 (inc. 7 introduced)
<b>Total</b>	<b>283</b>	<b>70</b>

A number of reptiles and mammal taxa, and a few birds, were recorded only from tracks, scats, bones and other 'secondary' evidence. In some instances these could not be identified definitively due to likely presence of two or more similar species, e.g. species of *Sminthopsis* (Dasyuridae), *Osphranter* (Macropodidae), *Pseudechis* (Elapidae) and *Varanus* (*V. gouldii/panoptes*, Varanidae).

Seven microchiropteran bat species (families Emballonuridae, Molossidae and Vespertilionidae) were identified based on ultrasonic recordings of echolocation calls. All are widespread and expected to occur in the region, and none are conservation significant.

Two of the species recorded were not identified as potentially occurring in the desktop review. The gecko *Gehyra crypta*, found at multiple sites in the survey, was only recently distinguished from the common and widespread *G. variegata* (Kealley *et al.* 2018), hence not listed in previous reports and database records. The record of Common Brushtail Possum *Trichosurus vulpecula* represents a significant range extension and is discussed in the next section.

### 5.2.1.4 Significant vertebrate fauna

Two Threatened vertebrate species were recorded in the basic fauna survey by evidence indicating current or recent presence: Malleefowl *Leipoa ocellata* and Chuditch *Dasyurus geoffroyi* (both VU; EPBC Act, BC Act) (Table 5-8; Figure 5-3).

#### 5.2.1.4.1 Malleefowl

During the basic fauna survey, fresh Malleefowl tracks and scrapings of various ages were found during low intensity searches (Figure 5-3).

No nest mounds were detected in the aerial imagery searches. However, the imagery was deemed insufficient to confidently rule out the presence of mounds, particularly in areas of thicker vegetation which is where Malleefowl are most likely to build their nest mound.

During the follow-up high intensity ground searches the search team walked a total of approximately 205km through Medium- and High suitability Malleefowl habitat within the proposed disturbance footprint and did not detect any nest mounds in the area covered (Figure 5-5).

#### 5.2.1.4.2 Chuditch

A maxilla fragment and scat identified as Chuditch were found during the basic fauna survey approximately 120m west of the study area. The maxilla fragment may be many decades old, but the

scat from the same site was found in a more exposed position and appeared relatively fresh; it was submitted for DNA testing but diagnostic sequences were not obtained (Genotyping Australia 2021), so that very recent presence of the species could not be confirmed.

During the follow-up targeted searches, the field team searched approximately 5.5 km of breakaway and surrounding habitat (Figure 5-6). One potential Chuditch scat was found in breakaway at the far northern end of the study area. The scat was collected and morphologically identified as Chuditch before being sent to Genotyping Australia for DNA testing. Genetic sequences could not be obtained, likely due to the age of the scat. As such, this second recent record of the species could also not be confirmed genetically.


**5.2.1.4.3 Other significant taxa**

Other bones found at breakaway cave sites include diagnostic remains of Brushtail Possum *Trichosurus vulpecula*. This widespread species is not listed as conservation significant but has declined or disappeared from most arid parts of its former range (Abbott 2012), and no recent records were identified from the desktop search area. However, distinctive tracks of this species were also observed during Malleefowl transects. As an extension of the accepted current range by several hundred kilometres, this record is regionally significant.

Two extinct taxa were recorded at multiple sites based on historic evidence: Lesser Stick-nest Rat *Leporillus apicalis* and Boodie *Bettongia lesueur graii*. These are listed here as significant fauna records, but are considered to have been regionally extinct for many decades (Stick-nest Rat middens in sheltered sites may be thousands of years old; Pearson *et al.* 1999) and do not represent any limitation to proposed works.


Threatened and Priority fauna records will be reported to DBCA via the licencing return system.



**Table 5-8 Details of significant vertebrate fauna recorded during the field survey**

Species	Survey records	Photograph
<i>Dasyurus geoffroii</i> (Chuditch, VU)	<p>RCG005, cave in breakaway (-28.40388, 121.55259):</p> <p>Maxilla fragment with alveoli of M2-M4, photographed on image of <i>D. geoffroii</i> skull (WAM M1864, Western Australian Museum 2021);</p> <p>Scat found in basic fauna survey (below left; similar example from near Koolyanobbing on right).</p> <p>Close to but not directly associated with Stick-nest Rat nests.</p>	






Species	Survey records	Photograph
		
	<p>RCG001, edge of burrow in breakaway                      (28.3929968, -121.5558332)</p> <p>Scat found in targeted Chuditch survey</p>	

Species	Survey records	Photograph
<p><i>Leipoa ocellata</i> (Malleefowl, VU)</p>	<p>RCG011, RCG025, RCG029, RCG030:  Foraging signs in leaf litter (various ages)</p> <p>RCG011 (-28.47304, 121.57075; -28.48926, 121.56444):  Single fresh trackway traversing study area east-west</p>	

Species	Survey records	Photograph
<p><i>Trichosurus vulpecula</i> (Brush-tailed Possum) (no conservation listing, but extension of recent range; Abbott 2012)</p>	<p>RCG005, cave in breakaway (-28.40388, 121.55259):  Left maxilla and humerus (subfossil, apparently weathered out of stick-nest)</p> <p>RCG011 transect (-28.48942 121.56509):  Fresh tracks</p>	 



Species	Survey records	Photograph
<p><i>Leporillus apicalis</i> (Lesser Stick-nest Rat, EX)</p>	<p>RCG005, cave in breakaway (-28.40388, 121.55259):</p> <p>Remnants of nests (sticks cemented by resinous urine or 'cave bitumen') in caves and overhangs along breakaway. Maxilla with well-preserved tooth-row approx. 7.5 mm long (not shown), consistent with <i>L. apicalis</i> but smaller than <i>L. conditor</i> (tooth-row ~10.5 mm; Copley 1999; Troughton 1923)</p>	
	<p>RCG031, breakaway (-28.39709, 121.55387):</p> <p>Abundant and well-preserved remnants of stick nests in overhangs along breakaway; partial skull and mandible consistent with <i>L. apicalis</i> embedded in nest material.</p>	

Species	Survey records	Photograph
<i>Bettongia lesueur graii</i> (Boodie, EX)	RCG004, RCG006, RCG007, RCG013, RCG017, RCG021:  Old burrows through calcrete hardpan, mostly reoccupied by rabbits and/or varanids	




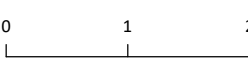








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Project No	1440-RGP-DGL-VER	
Date	8/12/2021	
Drawn by	IN	
Map author	JS	
		
1:62,000 (at A3)		GDA 1994 MGA Zone 51

-  Study area
  -  Disturbance footprint
  -  Malleefowl transect lines
- Habitat rating**
-  High
  -  Medium
  -  Low

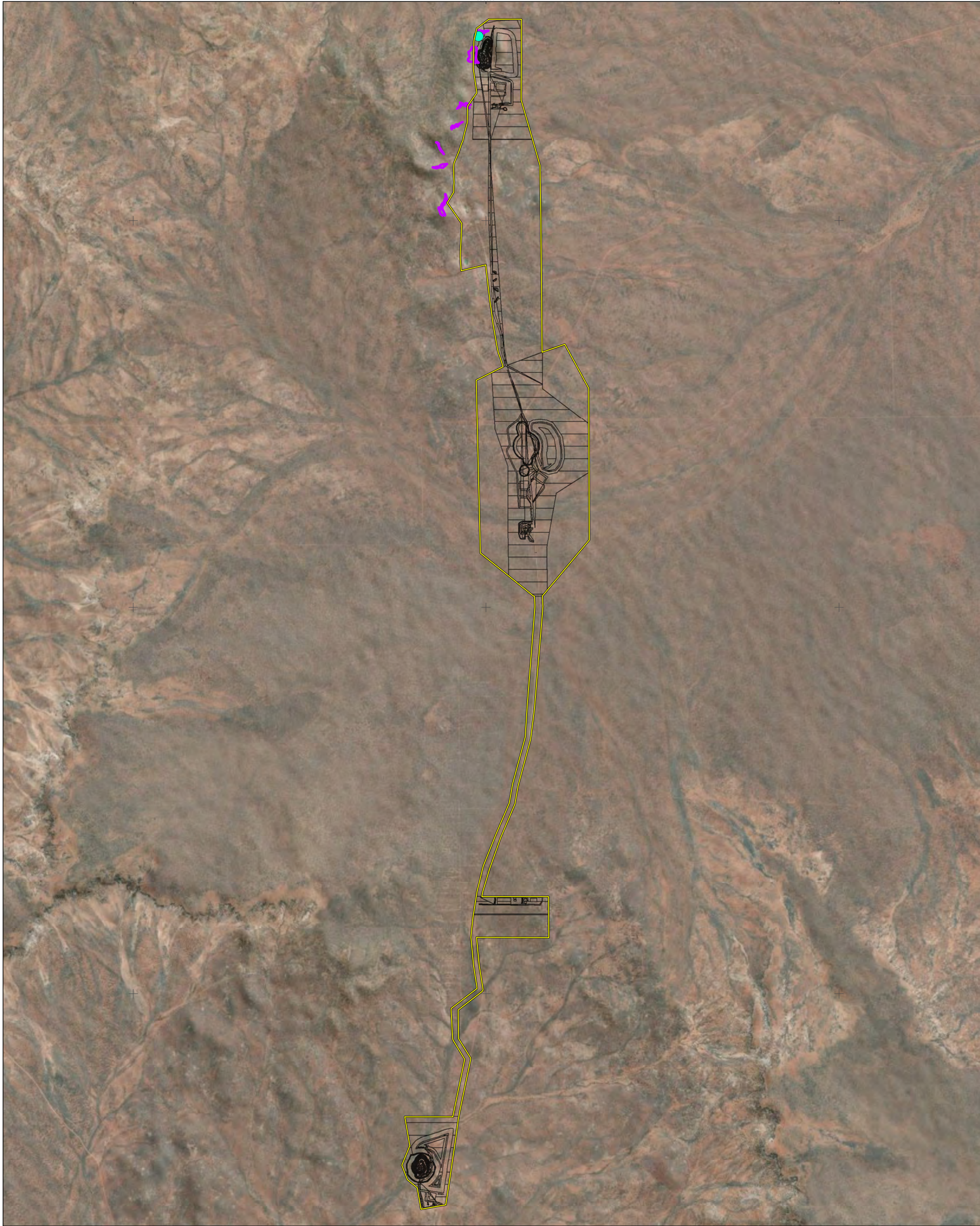
**Figure 5-5**  
**Targeted Malleefowl transects**



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- Study area
- Disturbance footprint
- Targeted Chuditch search areas
- Dasyurus geoffroii*, VU (EPBC Act, BC Act)

**Figure 5-6**  
**Targeted Chuditch search areas and records**



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The likelihood of occurrence assessment (section 4.2.2.10) for the remaining significant species identified in the desktop review (5.1.2) determined two species were **likely** to occur in the study area, four **possibly** occur and the rest are **unlikely** to occur (Table 5-9).

Table 5-9 Likelihood of occurrence for significant vertebrate fauna identified in the desktop review

Species	Status	Likelihood of occurrence	Habitats (as per Table 5-5)								
			Habitat 1	Habitat 2	Habitat 3	Habitat 4	Habitat 5	Habitat 6	Habitat 7	Habitat 8	Habitat 9
<i>Leipoa ocellata</i> Malleefowl	VU (EPBC & BC Acts)	Recorded; foraging and dispersal habitat present, possible breeding (L low suitability, M medium, H high)	L	L	• M	• M	• M	• H	• H	L	L
<i>Apus pacificus</i> Fork-tailed Swift	Mig. (EPBC & BC Acts)	Likely; occasional visitor (foraging, non-breeding)	•	•	•	•	•	•	•	•	•
<i>Plegadis falcinellus</i> Glossy Ibis	Mig. (EPBC & BC Acts)	Possible; occasional visitor in region, may forage at sites with water					•			•	
<i>Falco hypoleucos</i> Grey Falcon	VU (BC Act)	Possible; current distribution mainly north of 26°S but may occasionally occur further south. All habitat types suitable for foraging	•	•	•	•	•	•	•	•	•
<i>Falco peregrinus</i> Peregrine Falcon	OS (BC Act)	Recorded in previous survey; all habitats may be used for foraging as part of wide home range; possible breeding sites may include artificial cliffs of mine pits	• H	•	•	•	•	•	•	• H	•
<i>Charadrius veredus</i> Oriental Plover	Mig. (EPBC & BC Acts)	Possible; occasional visitor, may use sparsely vegetated plains and disturbed areas			•						•
<i>Pluvialis fulva</i> Pacific Golden Plover	Mig. (EPBC & BC Acts)	Unlikely; no suitable habitat in study area									
<i>Thinornis rubricollis</i> Hooded Plover	P4 (DBCA list)	Unlikely; widespread in region but no suitable habitat in study area									
<i>Actitis hypoleucos</i> Common Sandpiper	Mig. (EPBC & BC Acts)	Unlikely; no suitable habitat in study area									
<i>Calidris acuminata</i> Sharp-tailed Sandpiper	Mig. (EPBC & BC Acts)	Unlikely; no suitable habitat in study area									



Species	Status	Likelihood of occurrence	Habitats (as per Table 5-5)										
			Habitat 1	Habitat 2	Habitat 3	Habitat 4	Habitat 5	Habitat 6	Habitat 7	Habitat 8	Habitat 9		
<i>Calidris canutus</i> Red Knot	EN/Mig. (EPBC Act; BC Act)	Unlikely; no suitable habitat in study area											
<i>Calidris melanotos</i> Pectoral Sandpiper	Mig. (EPBC & BC Acts)	Unlikely; no suitable habitat in study area											
<i>Calidris ruficollis</i> Red-necked Stint	Mig. (EPBC & BC Acts)	Unlikely; no suitable habitat in study area											
<i>Limosa lapponica</i> Bar-tailed Godwit	Mig. (EPBC & BC Acts)	Unlikely; no suitable habitat in study area											
<i>Tringa glareola</i> Wood Sandpiper	Mig. (EPBC & BC Acts)	Unlikely; no suitable habitat in study area											
<i>Tringa nebularia</i> Common Greenshank	Mig. (EPBC & BC Acts)	Unlikely; no suitable habitat in study area											
<i>Tringa stagnatilis</i> Marsh Sandpiper	Mig. (EPBC & BC Acts)	Unlikely; no suitable habitat in study area											
<i>Gelochelidon nilotica</i> Gull-billed Tern	Mig. (BC Act)	Unlikely; no suitable habitat in study area											
<i>Pezoporus occidentalis</i> Night Parrot	EN/CR (EPBC Act; BC Act)	Unlikely; hummock grass habitat mostly unsuitable, no records in desktop area									• L		
<i>Polytelis alexandrae</i> Princess Parrot	VU (EPBC Act), P4 (DACA list)	Possible; occasional visitor after irruptions in core habitat to northeast									•		
<i>Motacilla cinerea</i> Grey Wagtail	Mig. (EPBC & BC Acts)	Unlikely; no records in area, no suitable habitat											
<i>Motacilla flava</i> Yellow Wagtail	Mig. (EPBC & BC Acts)	Unlikely; no records in area, no suitable habitat											

Species	Status	Likelihood of occurrence	Habitats (as per Table 5-5)								
			Habitat 1	Habitat 2	Habitat 3	Habitat 4	Habitat 5	Habitat 6	Habitat 7	Habitat 8	Habitat 9
<i>Dasyurus geoffroii</i> Chuditch	VU (EPBC & BC Acts)	Recorded; foraging/dispersal habitat and possible denning along breakaways, may also use other habitats including mallee, and rocky slopes of mine pits	• H	L	L	L	L	L	• M	• M	• M
<i>Sminthopsis longicaudata</i> Long-tailed Dunnart	P4 (DBCA list)	Likely (scats recorded possibly this species); potential resident of breakaway, outcrop, rockpiles including mine pits and rocky spoil; adjacent habitats may be used in foraging/dispersal	• H	L	L	L	L	L	L	• M	• M
<i>Trichosurus vulpecula</i> Common Brushtail Possum	Range extension (no conservation listing)	Recorded from fresh tracks on sandplain, and historic remains in breakaway cave; may use any habitat type	•	•	•	•	•	•	•	•	•
<i>Bettongia lesueur graii</i> Burrowing Bettong, Boodie	EX (EPBC & BC Acts)	Unlikely (extinct); multiple historic warrens recorded on tops and lower slopes of low hills with calcrete soil horizon	(•)	(•)	(•)	(•)					
<i>Leporillus apicalis</i> Lesser Stick-nest Rat	EX (EPBC & BC Acts)	Unlikely (extinct), but remains recorded from historic nests in breakaway caves and overhangs	(•)								
<i>Leporillus conditor</i> Greater Stick-nest Rat	VU (EPBC Act), CD (BC Act)	Unlikely (extinct on mainland), but possibly produced some of the remnant nests present in caves and overhangs	(•)								

## 5.2.2 SRE invertebrate fauna

### 5.2.2.1 Habitats

One habitat was identified within the study area as having High potential for SRE invertebrates (Table 5-10). This habitat primarily occurs in the north of the study area and extends out of the study area to the west. The remaining eight habitats were assessed as having Low potential under the criteria laid out in section 4.2.2.9 (Table 5-10; Figure 5-7).

**Table 5-10 Extent and description of each SRE habitat in the study area**

Habitat type	Site/s	Description	SRE potential
1. Breakaway and upper slope with open shrubland	RCG001 RCG005 RCG017 RCG018 RCG031	Hills capped with weathered volcanic rock forming breakaway with overhangs, caves and/or boulder piles, with open mid shrubland of mulga, other <i>Acacia</i> and mixed shrubs	High
2. Open/sparse shrubland on slopes and stony plains	RCG001 RCG007 RCG014 RCG015 RCG017 RCG020 RCG021	Slopes, low hills and plains with clay loam soils and some low outcrop, mantle of rock fragments usually present (volcanic rocks, quartz, ironstone and/or calcrete), with open to very sparse shrubland including mulga and often <i>Casuarina</i>	Low
3. Open shrubland on lower slopes and plains	RCG013 RCG014 RCG015 RCG016 RCG023	Nearly level ground with open mid to tall mulga shrubland (mostly without grove structure) on clay loam soils with quartz and ironstone pebble mantle	Low
4. Groved mulga on lower slopes, minor drainages and plain	RCG003 RCG004 RCG006 RCG008 RCG013 RCG015 RCG016 RCG018 RCG028	Mulga woodland and tall shrubland forming dense stands interspersed with open areas, on clay loam soils usually with quartz and ironstone mantle; minor drainage lines without distinct channel	Low
5. Mulga woodland/tall shrubland on drainage	RCG002 RCG019 RCG024 RCG026 RCG027	Mulga woodland and tall shrubland (mallees variably present) over patchy dense low to mid shrubs, along drainage lines with distinct channels	Low
6. Mulga tall shrubland on sandplain	RCG025 RCG029 RCG030	Mulga woodland and tall shrubland (scattered mallees variably present) over patchy dense low to mid shrubs, on deep sandy soils with ironstone pebbles	Low
7. Mallee over mulga shrubland with hummock grass on sandplain	RCG009 RCG011	Scattered mallees over mulga mid-tall shrubland over <i>Triodia</i> (stage 3-5, i.e. ring-forming hummocks) on level sandy loam with few or no pebbles	Low



Habitat type	Site/s	Description	SRE potential
8. Mine pit with deep pool	RCG010 RCG022	Disused mine pits with permanent pools, sparse low-mid shrub vegetation on walls	Low
9. Other cleared/disturbed	n/a	Mine pits, spoil heaps, and former infrastructure sites totally cleared of original vegetation; sparse low shrubland or herbland	Low

### 5.2.2.2 SRE records

A total of 24 specimens representing ten taxa from SRE groups were collected within the study area (Figure 5-7; Table 5-12; Table 5-12). Of these ten taxa, four are considered new species. The remaining six are either known species or of unknown species status. Three of six known species collected were identified in the desktop review.

Five of the taxa collected are considered to be potential SREs. The remaining five taxa are either of uncertain SRE status or a widespread. The potential SREs collected are:

- *Aname* 'Phoenix0077' – new species collected from mulga shrubland on drainage. Habitat in which it was found appears to be continuous so this species is unlikely to be restricted to the study area.
- *Kwonkan* 'Phoenix0078' – new species collected from mulga shrubland on drainage. Habitat in which it was found appears to be continuous so this species is unlikely to be restricted to the study area.
- *Idiosoma* 'Phoenix0079' – new species collected from open mallee woodland on rocky outcrop. Habitat deemed to have High potential to support SREs but continues outside the study area so this species is unlikely to be restricted to the study area.
- *Mecistocephalus* 'Phoenix0075' – new species collected from several rocky sites. Habitat deemed to have High potential to support SREs but continues outside the study area so this species is unlikely to be restricted to the study area.
- *Idiosoma* 'WAM T110336' – known species with a current known distribution of less than 100 km<sup>2</sup>. Known from approximately 50km south of the study area. Habitat in which it was found appears to be continuous so this species is unlikely to be restricted to the study area.

**Table 5-11 Summary of SRE taxa collected during the field survey**











Higher taxon	Families	Genera	Taxa	% of taxa
Mygalomorphs (trapdoor spiders)	3	4	6	<b>60</b>
Pseudoscorpions	2	2	2	<b>20</b>
Scorpions	0	0	0	<b>0</b>
Isopods (slaters)	0	0	0	<b>0</b>
Centipedes	2	2	2	<b>20</b>
Millipedes	0	0	0	<b>0</b>
<b>Total</b>	<b>7</b>	<b>8</b>	<b>10</b>	<b>100</b>




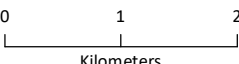
**Fauna habitat**



	Breakaway and upper slope with open shrubland
	Groved mulga on lower slopes, minor drainages etc
	Mallee - mulga - triodia on sandplain
	Mulga tall shrubland on sandplain
	Mulga woodland/tall shrubland on drainage
	Open pit with pool
	Open shrubland on lower slopes/plains
	Open/sparse shrubland on slopes and stony plains
	Other cleared/disturbed

**SRE taxa**

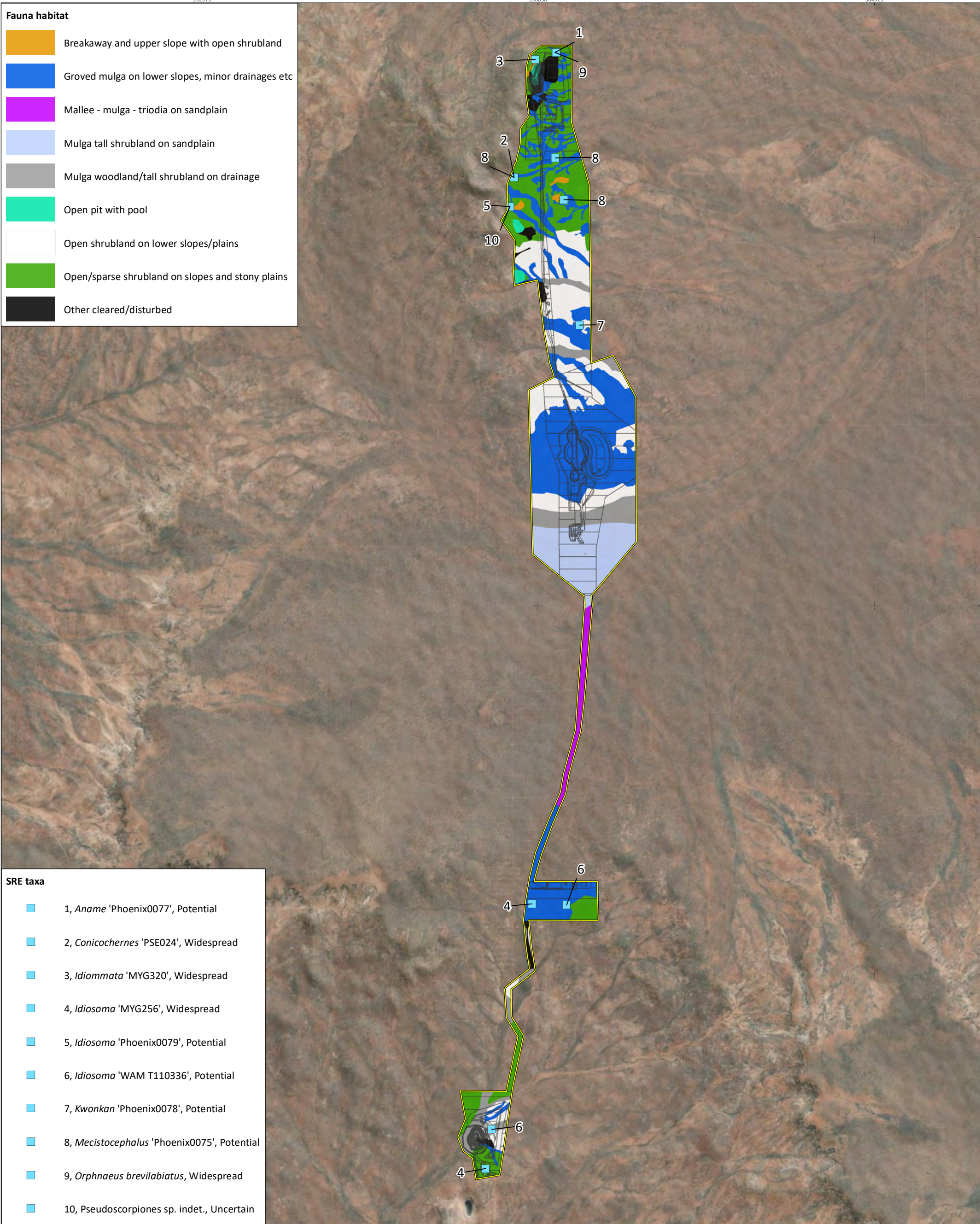
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	2, <i>Conicochernes</i> 'PSE024', Widespread
	3, <i>Idiommata</i> 'MYG320', Widespread
	4, <i>Idiosoma</i> 'MYG256', Widespread
	5, <i>Idiosoma</i> 'Phoenix0079', Potential
	6, <i>Idiosoma</i> 'WAM T110336', Potential
	7, <i>Kwonkan</i> 'Phoenix0078', Potential
	8, <i>Mecistocephalus</i> 'Phoenix0075', Potential
	9, <i>Orphnaeus brevilabiatus</i> , Widespread
	10, <i>Pseudoscorpiones</i> sp. indet., Uncertain



<b>Dacian Gold Limited Redcliffe Gold Project</b>		
Project No	1440-RGP-DGL-VER	
Date	8/12/2021	
Drawn by	IN	
Map author	JS	
1:65,000 (at A3)		GDA 1994 MGA Zone 51

-  Study area
-  Disturbance footprint

All information within this map is current as of 8/12/2021. This product is subject to COPYRIGHT and is property of Phoenix Environmental Sciences (Phoenix). While Phoenix has taken care to ensure the accuracy of this product, Phoenix make no representations or warranties about its accuracy, completeness or suitability for any particular purpose.



**Figure 5-7**  
**SRE habitat and recorded SRE taxa**





Table 5-12 Specimens from SRE groups recorded in the field survey

Higher order/family	Taxa	Site/s	SRE status	No. specimens	Habitats*					Comments
					L	L	L	L	H	
					Mallee over mulga shrubland	Mulga shrubland on drainage	Mulga shrubland on plains, lower slopes, minor drainage	Shrubland on stony plains/slopes	Breakaway and upper slopes	
<b>Class Arachnida, infraorder Mygalomorphae (trapdoor spiders)</b>										
Anamidae	<i>Aname</i> 'Phoenix0077'	RCG003	Potential	1			✓			This specimen is 10.4% divergent from its nearest relative in Genbank and is therefore considered here as a new species.
	<i>Kwonkan</i> 'Phoenix0078'	RCG013	Potential	1			✓			This specimen is 12.9% divergent from its nearest relative in Genbank and is therefore considered here as a new species.
Barychelidae	<i>Idiommata</i> 'MYG320'	RCG001	Widespread	1					✓	This specimen is 6% divergent from KJ745205 ( <i>Idiommata</i> sp. MYG320 voucher T54155) and is therefore considered as a conservative conspecific.
Idiopidae	<i>Idiosoma</i> 'MYG256'	RCG007, RCG028	Widespread	2			✓	✓		This specimen is 7.4% divergent from KJ745099 ( <i>Idiosoma</i> sp. MYG256 voucher T123106) and is therefore considered as a conservative conspecific.



Higher order/family	Taxa	Site/s	SRE status	No. specimens	Habitats*					Comments
					L	L	L	L	H	
					Mallee over mulga shrubland	Mulga shrubland on drainage	Mulga shrubland on plains, lower slopes, minor drainage	Shrubland on stony plains/slopes	Breakaway and upper slopes	
	<i>Idiosoma</i> 'Phoenix0079'	RCG018	Potential	1					✓	This specimen is 16.8% divergent from its nearest relative in Genbank and is therefore considered here as a new species.
	<i>Idiosoma</i> 'WAM T110336'	RCG008, RCG027	Potential	2		✓	✓			This specimen is 1.2% divergent from KY295274 ( <i>Idiosoma</i> sp. WAM T110336) and is therefore considered conspecific.
<b>Class Arachnida, order Pseudoscorpions</b>										
Chernetidae	<i>Conicochernes</i> 'PSE024'	RCG006, RCG018	Widespread	9			✓		✓	Represents a known species.
Pseudoscorpiones	Pseudoscorpions sp. indet.	RCG018	Uncertain	3						Unknown if this specimen represents a known or undescribed species.
<b>Class Chilopoda, order Geophilida (centipedes)</b>										
Mecistocephalidae	<i>Mecistocephalus</i> 'Phoenix0075'	RCG006, RCG017, RCG021	Potential	6			✓	✓	✓	This specimen is 16.5% divergent from MW621080 <i>Mecistocephalus</i> sp. DNA10 voucher WAMT128077) and is therefore considered a new species.

Higher order/family	Taxa	Site/s	SRE status	No. specimens	Habitats*					Comments
					L	L	L	L	H	
					Mallee over mulga shrubland	Mulga shrubland on drainage	Mulga shrubland on plains, lower slopes, minor drainage	Shrubland on stony plains/slopes	Breakaway and upper slopes	
Oryidae	<i>Orphnaeus brevilabiatus</i>	RCG003	Widespread	1			✓			Represents a known species.

\*L = low potential to support SREs, H = high potential to support SREs

### 5.3 SURVEY LIMITATIONS

The limitations of the flora and vegetation survey and terrestrial fauna survey have been considered in accordance with EPA (2016b, e) (Table 5-13).

**Table 5-13 Consideration of potential survey limitations**

Limitations	Comments
Availability of contextual information at a regional and local scale	Vertebrate fauna of the Goldfields region is well known in general, but there is often limited information available at the local scale.  SREs are generally poorly known at the regional and local level, although knowledge is improving and barriers to dispersal are fewer than elsewhere, typically.
Competency/experience of the team carrying out the survey	The field team and report authors have sufficient experience in terrestrial biological surveys within the Goldfields region to satisfy EPA criteria and were competent in sampling the target fauna.
Scope and completeness	All items in the scope were achieved.
Proportion of flora and fauna recorded and/or collected, any identification issues	Fauna survey recorded 25% of vertebrate species identified as potentially occurring in the desktop review and is considered adequate for a basic survey.  SRE invertebrate survey recorded several new and/or undescribed species (submitted to taxonomic specialists on relevant groups for identification), and including numerous taxa identified in the desktop review.
Access within the study area	Access was adequate to conduct surveys in the study area.
Timing, rainfall, season	Conditions during the survey were warm and dry. The survey was conducted outside the optimal survey periods for reptiles, birds and mammals but within the optimal survey period for SREs.
Disturbance that may have affected the results of the survey	No substantial disturbances were present within the study area which could have significantly affected the results of the survey.



## 6 DISCUSSION

### 6.1 VERTEBRATE FAUNA

Fauna habitat types occurring in the study area are mostly widespread in the region, the most restricted being breakaway low cliffs with caves and overhangs (type 1) and permanent pools within old mine pits (type 8, Table 5-5). The sections of breakaway habitat on the western edge of the study area are outliers of the extensive 'Terraces' cliff-line that extends for tens of kilometres northeast of Leonora.

The 70 vertebrate species recorded during the survey were almost all expected to occur based on previous surveys in the area and other sources reviewed in the desktop study. Two Threatened vertebrate species were recorded during the survey, and recent and historic evidence of several other species are regarded as significant.

Malleefowl (*Leipoa ocellata*, VU) was recorded from a fresh track, and signs of foraging activity in leaf litter, but no direct sightings or nest mounds. Habitat suitability for this species was assessed at 32 locations using a scoring system (5.2.1.2, Table 5-6), and extrapolated to mapping of the study area (Table 5-5, Figure 5-4); habitat of High suitability (with potential for nesting as well as foraging) comprises about 12.9% (222.5 ha) of the study area, Medium (foraging/dispersal habitat) 38.7% (669.7 ha), and the remaining 48.5% (838.4 ha) is assessed as Low suitability (may be used for dispersal). Targeted searches along walked transects in High- and Medium suitability habitat (Figure 5-5) found no evidence of current or former nesting activity by this species.

Chuditch (*Dasyurus geoffroii*, VU) was recorded from diagnostic skeletal remains (which may be very old) and also two scats which appear recent but did not retain identifiable DNA sequences. All three records were associated with the breakaway habitat type at the periphery of the study area, which may represent a significant (if intermittent) dispersal corridor for this species and also contains foraging and potential denning habitat (caves, overhangs, fig trees). The evidence does not indicate a current resident population, but is consistent with sporadic presence of dispersing individuals. Apart from the breakaway habitat, other rocky areas and mallee woodlands in the study area may be suitable for foraging and dispersal.

Brush-tailed Possum (*Trichosurus vulpecula*) was recorded from diagnostic skeletal remains (of indeterminate age) in breakaway habitat, and a fresh track of an adult in mallee-mulga-*Triodia* habitat on sandplain. This is considered a locally significant record because the most recent review (Abbott 2012) inferred the species is extinct across most of its former range in WA, and the desktop review identified no recent records within several hundred kilometres. In the past few years, Phoenix has recorded evidence that this species occurs at widely separated woodland sites across inland WA, e.g. Kambalda south of Kalgoorlie, around Koolyanobbing near the edge of the Wheatbelt, and Golden Grove in the Yalgoo (Phoenix 2020a, b, 2021b). It is not known positively that these represent remnant populations rather than reoccupation from the southwest, but the species is not considered well adapted for long-distance dispersal.

Former presence of two extinct mammal species, Lesser Stick-nest Rat (*Leporillus apicalis*) and Boodie (*Bettongia lesueur graii*), was indicated by nest structures recorded in the survey. Stick nests in caves and rock overhangs, and Boodie burrows through calcrete hardpan, can persist for many decades after disappearance of their makers, and continue to provide refugia used by other vertebrate species. The Greater Stick-nest Rat (*Leporillus conditor*, VU/CD; extinct in the wild on the mainland) may also have occurred, but only *L. apicalis* was identified from skeletal remains.

## 6.2 SRE INVERTEBRATE FAUNA

Three previously unknown species of mygalomorph spider and one previously unknown species of centipede were collected from the study area. This is not unusual for the region which is under-surveyed. Of the five potential SRE taxa collected, which includes all four previously unknown taxa, three were recorded in mulga shrubland habitat on plains, slopes or drainage deemed to have Low potential to support SREs (*Aname* 'Phoenix007', *Kwonkan* 'Phoenix0078' and *Idiosoma* 'WAM T110336'). Mulga shrubland in its various forms dominates that vast majority of the study area and is also widespread outside the study area.

The remaining two potential SRE taxa were recorded from rocky breakaways and upper slopes deemed to have High potential to support SREs (*Idiosoma* 'Phoenix0079' and *Mecistocephalus* 'Phoenix0075').

A mygalomorph spider collected in the survey was genetically matched to *Idiommatata* 'MYG320' that had previously been assigned potential SRE status as it had only been recorded from several locations in close proximity to one another. In mid-2021, it was found to have a significantly more extensive range than previous thought and is no longer considered an SRE. Similarly, *Idiosoma* 'MYG256' was previously thought to be a potential SRE but has since been recorded at Mt Ida, Murrin Murrin, Wiluna and Kalgoorlie. These links of species recently considered to be SREs between survey sites hundreds of kilometres apart suggests that many of the potential SREs in the region will be reassessed as widespread as survey coverage increases.

Poor representation or absence of some groups may be due to dry environmental conditions in the years preceding the survey. The region has been receiving substantially lower than average rainfall since 2019. Millipede, snail and isopod activity mostly requires humid conditions, and no members of these groups were collected.

Despite several new and potential SRE species being discovered during this survey, it is unlikely that these species are restricted to the study area. All specimens from SRE groups were obtained from habitats either widespread within the study area or habitats that are limited within the study area but are connected to similar and extensive habitat outside the study area.

## 6.3 CONCLUSION

The two Threatened vertebrate species recorded in the survey, Malleefowl *Leipoa ocellata* and Chuditch *Dasyurus geoffroii* (both VU), are inferred to use parts of the study area intermittently for dispersal and foraging, but not to be breeding residents. Peregrine Falcon *Falco peregrinus* (OS) has previously been recorded and may breed as well as foraging in habitats of the study area; the walls of disused mine pits have significant potential as nesting and foraging sites for this cliff-dwelling species. Habitat is also suitable for Grey Falcon *F. hypoleucos* (VU), but it is less likely to occur due to its rarity and more northerly distribution (and is not associated with cliffs). Some other Migratory or nomadic bird species may occasionally occur in the study area as part of much wider ranges, and it does not represent important or restricted habitat values for such species. Long-tailed Dunnart *Sminthopsis longicaudata* (P4) was not positively identified but considered a likely resident.

While several new and/or potential SRE taxa were recorded during the survey, it is considered unlikely that these species are restricted to the study area.

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**Appendix 1     Survey site locations**

Site	Site type	Latitude	Longitude
RCG001	Fauna site	-28.392606	121.55671
RCG002	Fauna site	-28.567519	121.55007
RCG003	Fauna site	-28.391512	121.56069
RCG004	Fauna site	-28.404875	121.55699
RCG005	Fauna site	-28.404824	121.55343
RCG006	Fauna site	-28.412407	121.55235
RCG007	Fauna site	-28.579368	121.54462
RCG008	Fauna site	-28.535152	121.56072
RCG009	Targeted fauna species site	-28.504104	121.5637
RCG010	Targeted fauna species site	-28.396151	121.55671
RCG011	Fauna site	-28.488496	121.56511
RCG012	Fauna site	-28.521723	121.55743
RCG013	Fauna site	-28.437429	121.56452
RCG014	Fauna site	-28.449581	121.5592
RCG015	Fauna site	-28.454881	121.55568
RCG016	Fauna site	-28.454959	121.57222
RCG017	Fauna site	-28.416269	121.56178
RCG018	Fauna site	-28.417325	121.5515
RCG019	Fauna site	-28.43046	121.56499
RCG020	Fauna site	-28.561663	121.55035
RCG021	Fauna site	-28.409241	121.56026
RCG022	Fauna site	-28.429308	121.55354
RCG023	Fauna site	-28.467343	121.55752
RCG024	Fauna site	-28.467441	121.57172
RCG025	Fauna site	-28.471962	121.55597
RCG026	Fauna site	-28.546686	121.55306
RCG027	Fauna site	-28.572788	121.54591
RCG028	Fauna site	-28.534885	121.55411
RCG029	Fauna site	-28.476539	121.56214
RCG030	Fauna site	-28.476584	121.57223
RCG031	Fauna site	-28.397088	121.55387
RCG-NP01	Fauna site	-28.517571	121.55995

Site details			
Site	RCG001	Position (WGS84)	-28.392606, 121.556705
Topography	breakaway	Soil texture	sandy loam, clay
Slope	moderate	Rock type	ferrous - ironstone, quartz
Soil colour	red-orange	Rock cover (%)	80

Sample and effort summary				
Visit	Sample method	Sample quant. (hrs)	Date start	Date stop
1	Birding	2.30	31 Aug 2021	31 Aug 2021
1	Camera trap	121.38	31 Aug 2021	05 Sep 2021
1	Foraging	2.30	30 Aug 2021	30 Aug 2021
1	Litter sieve	0.00	01 Sep 2021	01 Sep 2021
1	Site description	0.00	30 Aug 2021	30 Aug 2021
1	SRE foraging	1.17	01 Sep 2021	01 Sep 2021
1	Ultrasonic recording	90.55	30 Aug 2021	03 Sep 2021

Site description - visit 1 (30 Aug 2021)			
Breakaway with caves in mulga shrubland with <i>Melaleuca</i> shrubs over mixed low shrubs and herbs.			
Habitat	shrubland		
Disturbance	exploration (drill pads and access tracks)		
Vegetation condition	Very Good	Fire age	moderate (>5 years)
Total veg. cover (%)	40	Litter distribution	under vegetation
Tree cover (%)	30	Litter depth(cm)	1
Shrub cover (%)	10	Litter cover (%)	10
Grass cover (%)	0		
Herb cover (%)	10		





Site details			
Site	RCG002	Position (WGS84)	-28.567519, 121.550071
Topography	drainage line	Soil texture	gravel / alluvial, clay loam, sandy loam
Slope	negligible	Rock type	granite - rocks, quartz
Soil colour	light-brown, orange	Rock cover (%)	2

Sample and effort summary				
Visit	Sample method	Sample quant. (hrs)	Date start	Date stop
1	Birding	1.34	31 Aug 2021	31 Aug 2021
1	Foraging	2.00	31 Aug 2021	31 Aug 2021
1	Site description	0.00	30 Aug 2021	30 Aug 2021
1	Ultrasonic recording	39.47	30 Aug 2021	01 Sep 2021

**Site description - visit 1 (30 Aug 2021)**

Open mallees and mulga trees and shrubs over mixed mid shrubs, tussock grasses and herbs along incised sandy gravel drainage channel.

Habitat	open woodland		
Disturbance	exploration (drill pads and access tracks), livestock tracks, vehicle tracks		
Vegetation condition	Very Good	Fire age	moderate (>5 years)
Total veg. cover (%)	50	Litter distribution	under vegetation
Tree cover (%)	30	Litter depth(cm)	1
Shrub cover (%)	20	Litter cover (%)	15
Grass cover (%)	3		
Herb cover (%)	0.1		



Site details			
Site	RCG003	Position (WGS84)	-28.391512, 121.56069
Topography	drainage line	Soil texture	clay loam
Slope	gentle	Rock type	none
Soil colour	red-brown	Rock cover (%)	0

Sample and effort summary				
Visit	Sample method	Sample quant. (hrs)	Date start	Date stop
1	Birding	1.30	01 Sep 2021	01 Sep 2021
1	Foraging	2.53	31 Aug 2021	31 Aug 2021
1	Litter sieve	0.00	01 Sep 2021	01 Sep 2021
1	Site description	0.00	31 Aug 2021	31 Aug 2021
1	SRE foraging	0.83	01 Sep 2021	01 Sep 2021

#### Site description - visit 1 (31 Aug 2021)

Drainage line with mulga woodland surrounded by mulga shrubland on undulating plains. Mulga trees over lower mixed *Acacia* and *Eremophila* over grasses and herbs.

Habitat	woodland		
Disturbance	grazing-low, vehicle tracks		
Vegetation condition	Very Good	Fire age	moderate (>5 years)
Total veg. cover (%)	70	Litter distribution	under vegetation
Tree cover (%)	60	Litter depth(cm)	1
Shrub cover (%)	20	Litter cover (%)	30
Grass cover (%)	30		
Herb cover (%)	20		





Site details			
Site	RCG004	Position (WGS84)	-28.404875, 121.556989
Topography	undulating plain	Soil texture	clay loam
Slope	negligible	Rock type	ferrous - ironstone, quartz
Soil colour	red-brown	Rock cover (%)	30

Sample and effort summary				
Visit	Sample method	Sample quant. (hrs)	Date start	Date stop
1	Birding	0.67	31 Aug 2021	31 Aug 2021
1	Foraging	1.17	31 Aug 2021	31 Aug 2021
1	Site description	0.00	31 Aug 2021	31 Aug 2021

**Site description - visit 1 (31 Aug 2021)**

Open mulga woodland over mixed *Acacia*, *Eremophila* and other low shrubs over herbs on plains with ironstone and quartz gravel.

Habitat	woodland		
Disturbance	grazing-low, vehicle tracks		
Vegetation condition	Very Good	Fire age	moderate (>5 years)
Total veg. cover (%)	50	Litter distribution	under vegetation
Tree cover (%)	30	Litter depth(cm)	1
Shrub cover (%)	20	Litter cover (%)	20
Grass cover (%)	0		
Herb cover (%)	10		



Site details			
Site	RCG005	Position (WGS84)	-28.404824, 121.553425
Topography	gully	Soil texture	clay loam, loam, rocks
Slope	moderate	Rock type	ferrous - ironstone, quartz
Soil colour	red-brown	Rock cover (%)	10

Sample and effort summary				
Visit	Sample method	Sample quant. (hrs)	Date start	Date stop
1	Birding	0.67	31 Aug 2021	31 Aug 2021
1	Foraging	0.87	31 Aug 2021	31 Aug 2021
1	Site description	0.00	31 Aug 2021	31 Aug 2021

#### Site description - visit 1 (31 Aug 2021)

Gully between two breakaways. Mulga over mixed *Acacia* over mixed low shrubs on ironstone and quartz gravel.

Habitat	shrubland		
Disturbance	grazing-low, vehicle tracks		
Vegetation condition	Very Good	Fire age	moderate (>5 years)
Total veg. cover (%)	50	Litter distribution	under vegetation
Tree cover (%)	40	Litter depth(cm)	2
Shrub cover (%)	20	Litter cover (%)	20
Grass cover (%)	0		
Herb cover (%)	5		





Site details			
Site	RCG006	Position (WGS84)	-28.412407, 121.552354
Topography	drainage line	Soil texture	clay loam, loam, rocks
Slope	gentle	Rock type	ferrous - ironstone, quartz
Soil colour	red-brown	Rock cover (%)	0

Sample and effort summary				
Visit	Sample method	Sample quant. (hrs)	Date start	Date stop
1	Foraging	1.97	31 Aug 2021	31 Aug 2021
1	Litter sieve	0.00	31 Aug 2021	31 Aug 2021
1	Site description	0.00	31 Aug 2021	31 Aug 2021
1	SRE foraging	2.00	31 Aug 2021	31 Aug 2021

#### Site description - visit 1 (31 Aug 2021)

Drainage line with mallee and mulga over mixed low shrubs. Surrounded by open mulga shrubland on undulating plains with ironstone and quartz gravel.

Habitat	woodland		
Disturbance	grazing-low, vehicle tracks		
Vegetation condition	Very Good	Fire age	moderate (>5 years)
Total veg. cover (%)	80	Litter distribution	even/continuous
Tree cover (%)	60	Litter depth(cm)	5
Shrub cover (%)	50	Litter cover (%)	80
Grass cover (%)	0		
Herb cover (%)	5		



Site details			
Site	RCG007	Position (WGS84)	-28.579368, 121.544616
Topography	hill top	Soil texture	clay loam, rocks
Slope	gentle	Rock type	quartz
Soil colour	red-brown	Rock cover (%)	10

Sample and effort summary				
Visit	Sample method	Sample quant. (hrs)	Date start	Date stop
1	Birding	0.67	01 Sep 2021	01 Sep 2021
1	Foraging	2.40	01 Sep 2021	01 Sep 2021
1	Litter sieve	0.00	01 Sep 2021	01 Sep 2021
1	Site description	0.00	01 Sep 2021	01 Sep 2021
1	SRE foraging	2.00	01 Sep 2021	01 Sep 2021

Site description - visit 1 (01 Sep 2021)			
Open mulga shrubland over mixed low <i>Acacia</i> over mixed low shrubs on quartz gravel on small hill top.			
Habitat	shrubland		
Disturbance	grazing-low, vehicle tracks		
Vegetation condition	Very Good	Fire age	moderate (>5 years)
Total veg. cover (%)	50	Litter distribution	under vegetation
Tree cover (%)	20	Litter depth(cm)	2
Shrub cover (%)	30	Litter cover (%)	10
Grass cover (%)	5		
Herb cover (%)	5		





Site details			
Site	RCG008	Position (WGS84)	-28.535152, 121.560716
Topography	undulating plain	Soil texture	clay loam, rocks
Slope	negligible	Rock type	ferrous - ironstone, quartz
Soil colour	red-brown	Rock cover (%)	0

Sample and effort summary				
Visit	Sample method	Sample quant. (hrs)	Date start	Date stop
1	Birding	0.70	01 Sep 2021	01 Sep 2021
1	Foraging	3.63	01 Sep 2021	01 Sep 2021
1	Site description	0.00	01 Sep 2021	01 Sep 2021

### Site description - visit 1 (01 Sep 2021)

Tall open Mulga shrubland over low *Acacia*, *Eremophila* and other mixed low shrubs on ironstone and quartz gravel.

Habitat	shrubland		
Disturbance	exploration (drill pads and access tracks), grazing-low		
Vegetation condition	Good	Fire age	moderate (>5 years)
Total veg. cover (%)	50	Litter distribution	under vegetation
Tree cover (%)	40	Litter depth(cm)	1
Shrub cover (%)	20	Litter cover (%)	10
Grass cover (%)	5		
Herb cover (%)	5		



Site details			
Site	RCG009	Position (WGS84)	-28.504104, 121.5637
Topography	undulating plain	Soil texture	sandy loam
Slope	negligible	Rock type	calcrete, ferrous - ironstone
Soil colour	red-brown	Rock cover (%)	0

Sample and effort summary				
Visit	Sample method	Sample quant. (hrs)	Date start	Date stop
1	Site description	0.02	01 Sep 2021	01 Sep 2021
1	Transect	6.00	01 Sep 2021	01 Sep 2021

Site description - visit 1 (01 Sep 2021)			
Habitat			
Disturbance			
Vegetation condition		Fire age	
Total veg. cover (%)		Litter distribution	
Tree cover (%)		Litter depth(cm)	
Shrub cover (%)		Litter cover (%)	
Grass cover (%)			
Herb cover (%)			



**Site description - visit 1 (01 Sep 2021)**

Low closed mulga shrubland with scattered mallee over triodia and other mixed low shrubs on sandy plain.

<b>Habitat</b>	shrubland		
<b>Disturbance</b>	vehicle tracks		
<b>Vegetation condition</b>	Very Good	<b>Fire age</b>	moderate (>5 years)
<b>Total veg. cover (%)</b>	80	<b>Litter distribution</b>	even/continuous
<b>Tree cover (%)</b>	30	<b>Litter depth(cm)</b>	3
<b>Shrub cover (%)</b>	70	<b>Litter cover (%)</b>	80
<b>Grass cover (%)</b>	10		
<b>Herb cover (%)</b>	5		



Site details			
Site	RCG010	Position (WGS84)	-28.396151, 121.556708
Topography		Soil texture	
Slope		Rock type	
Soil colour		Rock cover (%)	0

Sample and effort summary				
Visit	Sample method	Sample quant. (hrs)	Date start	Date stop
1	Foraging	2.00	01 Sep 2021	01 Sep 2021
1	Site description	0.00	01 Sep 2021	01 Sep 2021
1	Ultrasonic recording	89.82	01 Sep 2021	05 Sep 2021

#### Site description - visit 1 (01 Sep 2021)

Mine pit containing fresh water. Surrounding area is shrubland on rocky hills. No vegetation in pit beside scattered small shrubs. Water contains fish and yabbies.

Habitat	shrubland		
Disturbance	excavation, large-scale clearing		
Vegetation condition	Completely Degraded	Fire age	moderate (>5 years)
Total veg. cover (%)	0.1	Litter distribution	
Tree cover (%)		Litter depth(cm)	0
Shrub cover (%)	0.1	Litter cover (%)	0
Grass cover (%)			
Herb cover (%)			



Site details			
Site	RCG011	Position (WGS84)	-28.488496, 121.565114
Topography	undulating plain	Soil texture	sandy loam
Slope	negligible	Rock type	none
Soil colour	red-brown	Rock cover (%)	0

Sample and effort summary				
Visit	Sample method	Sample quant. (hrs)	Date start	Date stop
1	Birding	0.67	04 Sep 2021	04 Sep 2021
1	Foraging	3.20	01 Sep 2021	01 Sep 2021
1	Litter sieve	0.00	05 Sep 2021	05 Sep 2021
1	Site description	0.00	01 Sep 2021	01 Sep 2021

#### Site description - visit 1 (01 Sep 2021)

Low closed mulga shrubland with scattered mallee over *Triodia* on sandy plain.

Habitat	shrubland		
Disturbance	vehicle tracks		
Vegetation condition	Very Good	Fire age	moderate (>5 years)
Total veg. cover (%)	80	Litter distribution	under vegetation
Tree cover (%)	40	Litter depth(cm)	2
Shrub cover (%)	40	Litter cover (%)	30
Grass cover (%)	50		
Herb cover (%)	0		





Site details			
Site	RCG012	Position (WGS84)	-28.521723, 121.557431
Topography	plain	Soil texture	clay loam, rocks
Slope	negligible	Rock type	ferrous - ironstone, quartz
Soil colour	red-brown	Rock cover (%)	0

Sample and effort summary				
Visit	Sample method	Sample quant. (hrs)	Date start	Date stop
1	Site description	0.00	01 Sep 2021	01 Sep 2021

Site description - visit 1 (01 Sep 2021)				
Tall open mulga shrubland over low <i>Acacia</i> over mixed low shrubs on ironstone and quartz gravel.				
Habitat	shrubland			
Disturbance	grazing-low, vehicle tracks			
Vegetation condition	Good	Fire age	moderate (>5 years)	
Total veg. cover (%)	50	Litter distribution	under vegetation	
Tree cover (%)	40	Litter depth(cm)	2	
Shrub cover (%)	30	Litter cover (%)	30	
Grass cover (%)	0			
Herb cover (%)	0			



Site details			
Site	RCG013	Position (WGS84)	-28.437429, 121.564523
Topography	plain	Soil texture	clay loam
Slope	negligible	Rock type	ferrous - ironstone, quartz
Soil colour	red-brown	Rock cover (%)	0

Sample and effort summary				
Visit	Sample method	Sample quant. (hrs)	Date start	Date stop
1	Birding	0.67	02 Sep 2021	02 Sep 2021
1	Foraging	2.00	02 Sep 2021	02 Sep 2021
1	Site description	0.00	02 Sep 2021	02 Sep 2021

#### Site description - visit 1 (02 Sep 2021)

Tall semi closed mulga shrubland over low *Acacia* over mixed low shrubs over scattered tussock grasses on ironstone and quartz gravel.

Habitat	shrubland		
Disturbance	grazing-low, vehicle tracks		
Vegetation condition	Very Good	Fire age	moderate (>5 years)
Total veg. cover (%)	60	Litter distribution	under vegetation
Tree cover (%)	50	Litter depth(cm)	2
Shrub cover (%)	30	Litter cover (%)	20
Grass cover (%)	5		
Herb cover (%)	2		



Site details			
Site	RCG014	Position (WGS84)	-28.449581, 121.559197
Topography	hill top	Soil texture	clay loam, rocks
Slope	gentle	Rock type	ferrous - ironstone
Soil colour	red-brown	Rock cover (%)	30

Sample and effort summary				
Visit	Sample method	Sample quant. (hrs)	Date start	Date stop
1	Birding	0.67	02 Sep 2021	02 Sep 2021
1	Foraging	2.00	02 Sep 2021	02 Sep 2021
1	Site description	0.00	02 Sep 2021	02 Sep 2021

#### Site description - visit 1 (02 Sep 2021)

Ironstone outcrop at top of very low hill. Open *Allocasuarina* shrubland with mulga over mixed low shrubs on ironstone gravel.

Habitat	shrubland		
Disturbance	exploration (drill pads and access tracks), grazing-low		
Vegetation condition	Very Good	Fire age	moderate (>5 years)
Total veg. cover (%)	30	Litter distribution	under vegetation
Tree cover (%)	20	Litter depth(cm)	2
Shrub cover (%)	10	Litter cover (%)	15
Grass cover (%)	0		
Herb cover (%)	5		





Site details			
Site	RCG015	Position (WGS84)	-28.454881, 121.555678
Topography	plain	Soil texture	clay loam, rocks
Slope	negligible	Rock type	ferrous - ironstone, quartz
Soil colour	red-brown	Rock cover (%)	0

Sample and effort summary				
Visit	Sample method	Sample quant. (hrs)	Date start	Date stop
1	Site description	0.00	02 Sep 2021	02 Sep 2021

Site description - visit 1 (02 Sep 2021)				
Tall semi open mulga shrubland over mixed low shrubs on quartz and ironstone gravel on flat plain.				
Habitat	shrubland			
Disturbance	exploration (drill pads and access tracks), grazing-low			
Vegetation condition	Good	Fire age	moderate (>5 years)	
Total veg. cover (%)	60	Litter distribution	under vegetation	
Tree cover (%)	40	Litter depth(cm)	1	
Shrub cover (%)	30	Litter cover (%)	20	
Grass cover (%)	0			
Herb cover (%)	5			



Site details			
Site	RCG016	Position (WGS84)	-28.454959, 121.572215
Topography	plain	Soil texture	clay loam, rocks
Slope	negligible	Rock type	ferrous - ironstone, quartz
Soil colour	red-brown	Rock cover (%)	0

Sample and effort summary				
Visit	Sample method	Sample quant. (hrs)	Date start	Date stop
1	Site description	0.00	02 Sep 2021	02 Sep 2021

#### Site description - visit 1 (02 Sep 2021)

Tall semi open mulga shrubland (thicker toward north) over mixed low shrubs on quartz and ironstone gravel on flat plain.

Habitat	shrubland			
Disturbance	exploration (drill pads and access tracks), grazing-low			
Vegetation condition	Good	Fire age	moderate (>5 years)	
Total veg. cover (%)	50	Litter distribution	under vegetation	
Tree cover (%)	40	Litter depth(cm)	2	
Shrub cover (%)	20	Litter cover (%)	15	
Grass cover (%)	0			
Herb cover (%)	5			



Site details			
Site	RCG017	Position (WGS84)	-28.416269, 121.561782
Topography	undulating plain	Soil texture	sandy clay, clay loam, rocks
Slope	gentle	Rock type	calcrete, ferrous - ironstone, quartz
Soil colour	brown, orange	Rock cover (%)	0

Sample and effort summary				
Visit	Sample method	Sample quant. (hrs)	Date start	Date stop
1	Birding	1.00	02 Sep 2021	02 Sep 2021
1	Foraging	4.00	02 Sep 2021	02 Sep 2021
1	Litter sieve	0.00	04 Sep 2021	04 Sep 2021
1	Site description	0.00	02 Sep 2021	02 Sep 2021
1	SRE foraging	1.97	04 Sep 2021	04 Sep 2021

#### Site description - visit 1 (02 Sep 2021)

Calcrete gilgai with herbs surrounded by tall mostly closed mulga shrubland over ptilotus shrubs on rocky low hills and plains with ironstone and quartz gravel.

Habitat	shrubland		
Disturbance	exploration (drill pads and access tracks), grazing-high		
Vegetation condition	Good	Fire age	moderate (>5 years)
Total veg. cover (%)	70	Litter distribution	under vegetation
Tree cover (%)	40	Litter depth(cm)	1
Shrub cover (%)	40	Litter cover (%)	30
Grass cover (%)	0		
Herb cover (%)	40		





Site details			
Site	RCG018	Position (WGS84)	-28.417325, 121.551495
Topography	breakaway	Soil texture	gravel / alluvial, clay loam, sandy loam
Slope	moderate	Rock type	ferrous - Banded Iron Formation, quartz
Soil colour	brown, white	Rock cover (%)	50

Sample and effort summary				
Visit	Sample method	Sample quant. (hrs)	Date start	Date stop
1	Birding	0.67	02 Sep 2021	02 Sep 2021
1	Foraging	1.00	02 Sep 2021	02 Sep 2021
1	Litter sieve	0.00	02 Sep 2021	02 Sep 2021
1	Site description	0.00	02 Sep 2021	02 Sep 2021
1	SRE foraging	2.00	02 Sep 2021	02 Sep 2021

#### Site description - visit 1 (02 Sep 2021)

Breakaway of banded sedimentary rock formation. Open mallee and tall mulga woodland over mixed low shrubs.

Habitat	open woodland		
Disturbance	exploration (drill pads and access tracks), vehicle tracks		
Vegetation condition	Good	Fire age	moderate (>5 years)
Total veg. cover (%)	60	Litter distribution	under vegetation
Tree cover (%)	40	Litter depth(cm)	4
Shrub cover (%)	40	Litter cover (%)	50
Grass cover (%)	0		
Herb cover (%)	10		





Site details			
Site	RCG019	Position (WGS84)	-28.43046, 121.564985
Topography	drainage line	Soil texture	clay loam, rocks
Slope	negligible	Rock type	ferrous - ironstone, quartz
Soil colour	red-brown	Rock cover (%)	0

Sample and effort summary				
Visit	Sample method	Sample quant. (hrs)	Date start	Date stop
1	Foraging	1.17	02 Sep 2021	02 Sep 2021
1	Site description	0.00	02 Sep 2021	02 Sep 2021

#### Site description - visit 1 (02 Sep 2021)

Tall closed mulga shrubland over low *Acacia* and mixed shrubs in drainage line in ironstone and quartz gravel.

Habitat	shrubland		
Disturbance	exploration (drill pads and access tracks)		
Vegetation condition	Very Good	Fire age	moderate (>5 years)
Total veg. cover (%)	80	Litter distribution	under vegetation
Tree cover (%)	60	Litter depth(cm)	2
Shrub cover (%)	30	Litter cover (%)	30
Grass cover (%)	5		
Herb cover (%)	5		



Site details			
Site	RCG020	Position (WGS84)	-28.561663, 121.550354
Topography	hill top	Soil texture	clay loam, rocks
Slope	gentle	Rock type	ferrous - ironstone, quartz
Soil colour	red-brown	Rock cover (%)	0

Sample and effort summary				
Visit	Sample method	Sample quant. (hrs)	Date start	Date stop
1	Birding	1.67	03 Sep 2021	03 Sep 2021
1	Foraging	1.60	03 Sep 2021	03 Sep 2021
1	Site description	0.00	03 Sep 2021	03 Sep 2021

### Site description - visit 1 (03 Sep 2021)

Low stony rise with tall open mulga shrubland over chenopod shrubland with mixed medium and low shrubs including chenopods, low *Acacia*, *Eremophila* and *Ptilotus* over herbs on ironstone and quartz gravel.

Habitat	shrubland		
Disturbance	grazing-low, vehicle tracks		
Vegetation condition	Very Good	Fire age	moderate (>5 years)
Total veg. cover (%)	70	Litter distribution	under vegetation
Tree cover (%)	30	Litter depth(cm)	1
Shrub cover (%)	60	Litter cover (%)	10
Grass cover (%)	0		
Herb cover (%)	10		



Site details			
Site	RCG021	Position (WGS84)	-28.409241, 121.560262
Topography	breakaway	Soil texture	sand, clay loam, rocks
Slope	gentle	Rock type	quartz
Soil colour	red-brown	Rock cover (%)	50

Sample and effort summary				
Visit	Sample method	Sample quant. (hrs)	Date start	Date stop
1	Birding	0.67	03 Sep 2021	03 Sep 2021
1	Foraging	2.00	03 Sep 2021	03 Sep 2021
1	Litter sieve	0.00	03 Sep 2021	03 Sep 2021
1	Site description	0.00	03 Sep 2021	03 Sep 2021
1	SRE foraging	2.00	03 Sep 2021	03 Sep 2021

#### Site description - visit 1 (03 Sep 2021)

Quartz outcrop surrounded by tall closed mulga shrubland over mixed low shrubs. Outcrop has scattered tall mulga shrubs over mixed low shrubs over herbs on quartz boulders and gravel.

Habitat	shrubland		
Disturbance	grazing-low		
Vegetation condition	Good	Fire age	moderate (>5 years)
Total veg. cover (%)	50	Litter distribution	under vegetation
Tree cover (%)	20	Litter depth(cm)	1
Shrub cover (%)	30	Litter cover (%)	10
Grass cover (%)	0		
Herb cover (%)	40		





Site details			
Site	RCG022	Position (WGS84)	-28.429308, 121.553538
Topography		Soil texture	
Slope		Rock type	
Soil colour		Rock cover (%)	0

Sample and effort summary				
Visit	Sample method	Sample quant. (hrs)	Date start	Date stop
1	Birding	0.67	03 Sep 2021	03 Sep 2021
1	Site description	0.33	03 Sep 2021	03 Sep 2021

#### Site description - visit 1 (03 Sep 2021)

Mine pit containing water. Walls of pit have some large shrubs.

Habitat	shrubland		
Disturbance	excavation		
Vegetation condition	Completely Degrade	Fire age	moderate (>5 years)
Total veg. cover (%)	20	Litter distribution	under vegetation
Tree cover (%)	20	Litter depth(cm)	2
Shrub cover (%)	10	Litter cover (%)	10
Grass cover (%)	0		
Herb cover (%)	5		



Site details			
Site	RCG023	Position (WGS84)	-28.467343, 121.557522
Topography	plain	Soil texture	clay loam, rocks
Slope	negligible	Rock type	ferrous - ironstone, quartz
Soil colour	red-brown	Rock cover (%)	0

Sample and effort summary				
Visit	Sample method	Sample quant. (hrs)	Date start	Date stop
1	Birding	0.67	03 Sep 2021	03 Sep 2021
1	Foraging	1.00	03 Sep 2021	03 Sep 2021
1	Site description	0.00	03 Sep 2021	03 Sep 2021

#### Site description - visit 1 (03 Sep 2021)

Open tall mulga shrubland over low mixed shrubs including *Acacia* and *Eremophila* over scattered tussock grass on quartz and ironstone gravel.

Habitat	shrubland		
Disturbance	exploration (drill pads and access tracks), grazing-low		
Vegetation condition	Very Good	Fire age	moderate (>5 years)
Total veg. cover (%)	60	Litter distribution	under vegetation
Tree cover (%)	40	Litter depth(cm)	2
Shrub cover (%)	30	Litter cover (%)	20
Grass cover (%)	5		
Herb cover (%)	2		





Site details			
Site	RCG024	Position (WGS84)	-28.467441, 121.57172
Topography	drainage line	Soil texture	clay loam
Slope	negligible	Rock type	none
Soil colour	red-brown	Rock cover (%)	0

Sample and effort summary				
Visit	Sample method	Sample quant. (hrs)	Date start	Date stop
1	Birding	0.67	03 Sep 2021	03 Sep 2021
1	Foraging	2.00	03 Sep 2021	03 Sep 2021
1	Site description	0.00	03 Sep 2021	03 Sep 2021

### Site description - visit 1 (03 Sep 2021)

Tall open mulga shrubland over scattered low shrubs on bare clay in drainage line.

Habitat	shrubland		
Disturbance	exploration (drill pads and access tracks)		
Vegetation condition	Good	Fire age	moderate (>5 years)
Total veg. cover (%)	70	Litter distribution	under vegetation
Tree cover (%)	60	Litter depth(cm)	2
Shrub cover (%)	20	Litter cover (%)	40
Grass cover (%)	5		
Herb cover (%)	5		



Site details			
Site	RCG025	Position (WGS84)	-28.471962, 121.555969
Topography	plain	Soil texture	sandy loam
Slope	negligible	Rock type	ferrous - ironstone, quartz
Soil colour	red-brown	Rock cover (%)	0

Sample and effort summary				
Visit	Sample method	Sample quant. (hrs)	Date start	Date stop
1	Foraging	1.10	03 Sep 2021	03 Sep 2021
1	Site description	0.00	03 Sep 2021	03 Sep 2021
1	Transect	2.03	03 Sep 2021	03 Sep 2021

#### Site description - visit 1 (03 Sep 2021)

Semi closed mid to tall mulga shrubland with scattered mallee over low to mid *Acacia* and low mixed shrubs over tussock grass and *Triodia* on sandy plain.

Habitat	shrubland		
Disturbance	exploration (drill pads and access tracks), grazing-low		
Vegetation condition	Good	Fire age	moderate (>5 years)
Total veg. cover (%)	70	Litter distribution	under vegetation
Tree cover (%)	30	Litter depth(cm)	2
Shrub cover (%)	50	Litter cover (%)	30
Grass cover (%)	10		
Herb cover (%)	0		



Site details			
Site	RCG026	Position (WGS84)	-28.546686, 121.55306
Topography	drainage line	Soil texture	sandy loam, clay
Slope	negligible	Rock type	ferrous - ironstone, quartz
Soil colour	red-brown	Rock cover (%)	0

Sample and effort summary				
Visit	Sample method	Sample quant. (hrs)	Date start	Date stop
1	Birding	1.43	05 Sep 2021	05 Sep 2021
1	Foraging	3.40	03 Sep 2021	03 Sep 2021
1	Site description	0.00	03 Sep 2021	03 Sep 2021
1	Ultrasonic recording	40.40	03 Sep 2021	05 Sep 2021

### Site description - visit 1 (03 Sep 2021)

Drainage line with tree form *Acacia* over thick mid story of *Eremophila* and *Acacia* over mixed low shrubs over tussock grasses.

Habitat	woodland		
Disturbance	grazing-low		
Vegetation condition	Very Good	Fire age	moderate (>5 years)
Total veg. cover (%)	100	Litter distribution	even/continuous
Tree cover (%)	70	Litter depth(cm)	3
Shrub cover (%)	40	Litter cover (%)	80
Grass cover (%)	5		
Herb cover (%)	5		





Site details			
Site	RCG027	Position (WGS84)	-28.572788, 121.545908
Topography	drainage line	Soil texture	clay loam
Slope	negligible	Rock type	none
Soil colour	red-brown	Rock cover (%)	0

Sample and effort summary				
Visit	Sample method	Sample quant. (hrs)	Date start	Date stop
1	Birding	0.73	04 Sep 2021	04 Sep 2021
1	Foraging	2.00	04 Sep 2021	04 Sep 2021
1	Litter sieve	0.00	04 Sep 2021	04 Sep 2021
1	Site description	0.00	04 Sep 2021	04 Sep 2021
1	SRE foraging	2.00	04 Sep 2021	04 Sep 2021

Site description - visit 1 (04 Sep 2021)			
Tall closed mulga shrubland over mixed mid to low shrubs including <i>Acacia</i> , <i>Senna</i> and <i>Eremophila</i> over herbs and grasses in drainage line.			
Habitat	shrubland		
Disturbance	exploration (drill pads and access tracks), grazing-medium		
Vegetation condition	Good	Fire age	moderate (>5 years)
Total veg. cover (%)	90	Litter distribution	under vegetation
Tree cover (%)	70	Litter depth(cm)	2
Shrub cover (%)	40	Litter cover (%)	50
Grass cover (%)	10		
Herb cover (%)	40		





Site details			
Site	RCG028	Position (WGS84)	-28.534885, 121.554105
Topography	plain	Soil texture	sand, clay loam
Slope	negligible	Rock type	ferrous - ironstone
Soil colour	red-brown	Rock cover (%)	0

Sample and effort summary				
Visit	Sample method	Sample quant. (hrs)	Date start	Date stop
1	Birding	0.67	04 Sep 2021	04 Sep 2021
1	Foraging	2.00	04 Sep 2021	04 Sep 2021
1	Litter sieve	0.00	04 Sep 2021	04 Sep 2021
1	Site description	0.00	04 Sep 2021	04 Sep 2021
1	SRE foraging	1.10	04 Sep 2021	04 Sep 2021

#### Site description - visit 1 (04 Sep 2021)

Tall semi open mulga shrubland over medium *Acacia* over low mixed shrubs including *Acacia* and *Eremophila* over tussock grasses on ironstone gravel.

Habitat	shrubland		
Disturbance	exploration (drill pads and access tracks), grazing-low		
Vegetation condition	Very Good	Fire age	moderate (>5 years)
Total veg. cover (%)	60	Litter distribution	under vegetation
Tree cover (%)	40	Litter depth(cm)	2
Shrub cover (%)	30	Litter cover (%)	20
Grass cover (%)	10		
Herb cover (%)	0		



Site details			
Site	RCG029	Position (WGS84)	-28.476539, 121.562137
Topography	plain	Soil texture	sandy loam, clay
Slope	negligible	Rock type	ferrous - ironstone
Soil colour	red-brown	Rock cover (%)	0

Sample and effort summary				
Visit	Sample method	Sample quant. (hrs)	Date start	Date stop
1	Birding	0.67	04 Sep 2021	04 Sep 2021
1	Foraging	4.00	04 Sep 2021	04 Sep 2021
1	Site description	0.00	04 Sep 2021	04 Sep 2021
1	Transect	2.00	04 Sep 2021	04 Sep 2021

#### Site description - visit 1 (04 Sep 2021)

Tall closed mulga shrubland over mid level *Acacia* over low shrubs over tussock grasses and *Triodia* on sandy plain with ironstone gravel.

Habitat	shrubland		
Disturbance	exploration (drill pads and access tracks), grazing-low		
Vegetation condition	Very Good	Fire age	moderate (>5 years)
Total veg. cover (%)	80	Litter distribution	under vegetation
Tree cover (%)	60	Litter depth(cm)	3
Shrub cover (%)	30	Litter cover (%)	40
Grass cover (%)	30		
Herb cover (%)	5		





Site details			
Site	RCG030	Position (WGS84)	-28.476584, 121.572229
Topography	plain	Soil texture	sandy loam, clay
Slope	negligible	Rock type	ferrous - ironstone
Soil colour	red-brown	Rock cover (%)	0

Sample and effort summary				
Visit	Sample method	Sample quant. (hrs)	Date start	Date stop
1	Site description	0.00	04 Sep 2021	04 Sep 2021
1	Transect	2.00	04 Sep 2021	04 Sep 2021

#### Site description - visit 1 (04 Sep 2021)

Tall closed mulga shrubland over mid level *Acacia* over *Triodia* and low shrubs on sandy plain with ironstone gravel.

Habitat	shrubland		
Disturbance	exploration (drill pads and access tracks), grazing-low		
Vegetation condition	Good	Fire age	moderate (>5 years)
Total veg. cover (%)	70	Litter distribution	under vegetation
Tree cover (%)	60	Litter depth(cm)	2
Shrub cover (%)	20	Litter cover (%)	20
Grass cover (%)	40		
Herb cover (%)	0		



Site details			
Site	RCG031	Position (WGS84)	-28.397088, 121.553866
Topography	breakaway	Soil texture	sandy clay, rocks
Slope	moderate	Rock type	not recorded
Soil colour	light-brown, orange	Rock cover (%)	80

Sample and effort summary				
Visit	Sample method	Sample quant. (hrs)	Date start	Date stop
1	Foraging	2.00	05 Sep 2021	05 Sep 2021
1	Site description	0.00	05 Sep 2021	05 Sep 2021

### Site description - visit 1 (05 Sep 2021)

Mid open shrubland of mulga and mixed *Acacia* over *Senna*, *Melaleuca*, *Ficus* and misc. shrubs over scattered *Ptilotus*, tussocks etc.

Habitat	shrubland		
Disturbance			
Vegetation condition	Very Good	Fire age	moderate (>5 years)
Total veg. cover (%)	40	Litter distribution	
Tree cover (%)	30	Litter depth(cm)	1
Shrub cover (%)	20	Litter cover (%)	10
Grass cover (%)	2		
Herb cover (%)	1		





Site details			
Site	RCG-NP01	Position (WGS84)	-28.517137, 121.559731
Topography	plain	Soil texture	sandy loam
Slope	negligible	Rock type	ferrous - ironstone, quartz
Soil colour	orange	Rock cover (%)	1

Sample and effort summary				
Visit	Sample method	Sample quant. (hrs)	Date start	Date stop
1	Audio recording	140.28	30 Aug 2021	05 Sep 2021
1	Site description	0.00	30 Aug 2021	30 Aug 2021
1	Transect	0.90	05 Sep 2021	05 Sep 2021

### Site description - visit 1 (30 Aug 2021)

Scattered mallees over open mulga shrubland over scattered low-mid shrubs e.g *Senna* sp. over low dead stage 4-5 hard spinifex.

Habitat	shrubland		
Disturbance	exploration (drill pads and access tracks), grazing-low, livestock tracks, vehicle tracks		
Vegetation condition	Very Good	Fire age	moderate (>5 years)
Total veg. cover (%)	60	Litter distribution	under vegetation
Tree cover (%)	30	Litter depth(cm)	1
Shrub cover (%)	5	Litter cover (%)	15
Grass cover (%)	25		
Herb cover (%)			



Appendix 3 Vertebrate fauna desktop and field survey results

Family	Species	Common name	Conservation status	Protected Matters (DAWE 2021a)	Threatened fauna (DBCA 2021b)	NatureMap (DBCA 2021a)	ALA (2021)	Mckenzie <i>et al.</i> (1994)	Murrin Murrin (Phoenix 2019a, 2021a)	Leonora Gold (Phoenix 2019b)	Redcliffe (Phoenix 2010a)	This survey
<b>Amphibians (6)</b>												
Hylidae	<i>Cyclorana maini</i>	Sheep Frog					3	•				
	<i>Cyclorana occidentalis (ex platycephala)</i>	Western Water-holding Frog				•	32	•	•	•		
	<i>Litoria rubella</i>	Little Red Tree Frog				•	17		•	•	•	
Limnodynastidae	<i>Neobatrachus kunapalari</i>	Kunapalari Frog					3	•				
	<i>Notaden nichollsi</i>	Desert Spadefoot									•	
Myobatrachidae	<i>Pseudophryne occidentalis</i>	Western Toadlet				•	6					
<b>Reptiles (74)</b>												
Cheluidae	<i>Chelodina steindachneri</i>	Dinner-plate Turtle					1					
Agamidae	<i>Ctenophorus infans (caudicinctus s.l.)</i>	Laverton Ring-tailed Dragon					2		•			
	<i>Ctenophorus fordi</i>	Mallee Military Dragon						•				
	<i>Ctenophorus isolepis</i>	Military Dragon					7	•	•			
	<i>Ctenophorus nuchalis</i>	Central Netted Dragon				•	5	•		•		
	<i>Ctenophorus reticulatus</i>	Western Netted Dragon				•	9	•				
	<i>Ctenophorus salinarum</i>	Claypan Dragon					5	•				
	<i>Ctenophorus scutulatus</i>	Lozenge-marked Dragon					2	•	•			•
	<i>Diporiphora amphiboluroides</i>	Mulga Dragon				•			•		•	
	<i>Moloch horridus</i>	Thorny Devil					1	•	•			
	<i>Pogona minor</i>	Western Bearded Dragon				•	2	•	•		•	
	<i>Tympanocryptis pseudopsephos</i>	Goldfields Pebble Dragon					6		•			

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Family	Species	Common name	Conservation status	Protected Matters (DAWE 2021a)	Threatened fauna (DBCA 2021b)	NatureMap (DBCA 2021a)	ALA (2021)	McKenzie et al. (1994)	Murrin Murrin (Phoenix 2019a, 2021a)	Leonora Gold (Phoenix 2019b)	Redcliffe (Phoenix 2010a)	This survey
Gekkonidae	<i>Gehyra crypta</i>	Western Cryptic Gehyra										•
	<i>Gehyra montium</i>	Centralian Dtella							•			
	<i>Gehyra purpurascens</i>	Purplish Dtella					2	•				
	<i>Gehyra variegata</i> (s.l.)	Common Dtella				•	25	•	•	•	•	
	<i>Heteronotia binoei</i>	Bynoe's Prickly Gecko				•	34	•	•	•	•	•
Carphodactylidae	<i>Nephrurus vertebralis</i>	Midline Knob-tailed Gecko				•	1					
	<i>Nephrurus w. wheeleri</i>	Banded Knob-tailed Gecko					4					
	<i>Underwoodisaurus milii</i>	Barking Gecko				•	2	•	•		•	•
Diplodactylidae	<i>Diplodactylus conspicillatus</i> (s.l.)	Fat-tailed Gecko				•	2	•			•	
	<i>Diplodactylus granariensis rex</i>	Western Stone Gecko				•	6		•		•	
	<i>Diplodactylus laevis</i>	Desert Fat-tailed Gecko					2					
	<i>Diplodactylus pulcher</i>	Fine-faced Gecko				•	6		•		•	
	<i>Lucasium squarrosum</i>	Spotted Ground Gecko				•	6	•	•			
	<i>Rhynchoedura ornata</i>	Western Beaked Gecko				•	4	•	•		•	
	<i>Strophurus assimilis</i>	Goldfields Spiny-tail Gecko				•					•	
	<i>Strophurus elderi</i>	Jewelled Gecko					1	•				
	<i>Strophurus strophurus</i>	Western Spiny-tailed Gecko					2	•				
	<i>Strophurus wellingtonae</i>	Western Shield Spiny-tail Gecko				•	4	•	•		•	•
Pygopodidae	<i>Aprasia picturata</i>	Black-headed Worm lizard					2					
	<i>Delma butleri</i>	Unbanded Delma						•				
	<i>Delma nasuta</i>	Sharp-snouted Delma					1	•				
	<i>Lialis burtonis</i>	Burton's Legless Lizard						•				



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	<i>Pygopus nigriceps</i>	Western Hooded Scaly-foot				•	5				•	
Scincidae	<i>Cryptoblepharus australis</i>	Inland Snake-eyed Skink					2	•				
	<i>Cryptoblepharus buchananii</i>	Buchanan's Snake-eyed Skink				•		•	•		•	
	<i>Ctenotus greeri</i>							•				
	<i>Ctenotus helenae</i>	Clay-soil Ctenotus					1	•				
	<i>Ctenotus inornatus</i>	Plain Ctenotus					7					
	<i>Ctenotus leonhardii</i>	Leonhard's Ctenotus					4					
	<i>Ctenotus pantherinus ocellifer</i>	Leopard Ctenotus					4	•				
	<i>Ctenotus schomburgkii</i>							•				
	<i>Ctenotus severus</i>	Stern Ctenotus							•			
	<i>Ctenotus uber uber</i>	Spotted Ctenotus				•	2		•	•	•	
	<i>Egernia depressa</i>	Southern Pygmy Spiny-tailed Skink				•			•	•	•	•
	<i>Egernia formosa</i>	Goldfields Crevice-skink							•			
	<i>Eremiascincus richardsonii</i>	Broad-banded Sandswimmer								•	•	
	<i>Lerista desertorum</i>	Central Deserts Robust Slider				•	20	•	•	•	•	
	<i>Lerista kingi</i>	King's Three-toed Slider					1					
	<i>Lerista timida</i>	Timid Slider				•	19	•	•		•	
	<i>Liopholis inornata</i>	Desert Skink					1					
	<i>Menetia greyii</i>	Common Dwarf Skink				•	5	•	•			•
	<i>Morethia butleri</i>	Woodland Morethia Skink				•	11	•	•		•	•
	<i>Tiliqua multifasciata</i>	Centralian Bluetongue						•				

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Family	Species	Common name	Conservation status	Protected Matters (DAWE 2021a)	Threatened fauna (DBCA 2021b)	NatureMap (DBCA 2021a)	ALA (2021)	McKenzie et al. (1994)	Murrin Murrin (Phoenix 2019a, 2021a)	Leonora Gold (Phoenix 2019b)	Redcliffe (Phoenix 2010a)	This survey
	<i>Tiliqua occipitalis</i>	Western Bluetongue Skink					2	•				
	<i>Tiliqua rugosa</i>	Bobtail							•			
Varanidae	<i>Varanus brevicauda</i>	Short-tailed Monitor						•				
	<i>Varanus caudolineatus</i>	Stripe-tailed Monitor				•	3	•	•		•	•
	<i>Varanus giganteus</i>	Perentie							•			
	<i>Varanus gouldii</i>	Gould's Sand Monitor				•		•	•		•	?
	<i>Varanus panoptes</i>	Yellow-spotted Monitor				•	4		•	•	•	?
	<i>Varanus tristis</i>	Black-headed Monitor					1					
Typhlopidae	<i>Anilius hamatus</i>	Pale-headed Blindsnake					10	•	•			
	<i>Anilius waitii</i>	Beaked Blindsnake					2					
Pythonidae	<i>Antaresia childreni (ex stimsoni)</i>	Children's Python					1			•		
Elapidae	<i>Furina ornata</i>	Moon Snake						•				
	<i>Pseudechis australis</i>	Mulga Snake, King Brown					1	•				
	<i>Pseudechis butleri</i>	Spotted Mulga Snake					2			•		•
	<i>Pseudonaja mengdeni</i>	Western Brown Snake					3			•		
	<i>Pseudonaja modesta</i>	Ringed Brown Snake					3		•			
	<i>Simoselaps bertholdi</i>	Jan's Banded Snake					1	•				
	<i>Suta fasciata</i>	Rosen's Snake				•	5		•			
	<i>Suta monachus</i>	Monk Snake				•	2		•		•	
<b>Birds (176)</b>												
Casuariidae	<i>Dromaius novaehollandiae</i>	Emu				•	61	•	•	•	•	•
Megapodiidae	<i>Leipoa ocellata</i>	Malleefowl	VU (EPBC & BC Acts)	known	68		1					•

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Phasianidae	<i>Coturnix pectoralis</i>	Stubble Quail					1					
Anatidae	<i>Anas gracilis</i>	Grey Teal				•	79		•			
	<i>Anas rhynchotis</i>	Australian Shoveler					2					
	<i>Anas superciliosus</i>	Pacific Black Duck				•	45					
	<i>Aythya australis</i>	Hardhead					18					
	<i>Biziura lobata</i>	Musk Duck				•	9					
	<i>Chenonetta jubata</i>	Australian Wood Duck				•	42					
	<i>Cygnus atratus</i>	Black Swan					53					
	<i>Malacorhynchus membranaceus</i>	Pink-eared Duck					28					
	<i>Tadorna tadornoides</i>	Australian Shelduck					58		•			
Podicipedidae	<i>Podiceps cristatus</i>	Great Crested Grebe					1					
	<i>Poliiocephalus poliocephalus</i>	Hoary-headed Grebe					41					
	<i>Tachybaptus novaehollandiae</i>	Australasian Grebe					16					
Columbidae	* <i>Columba livia</i>	Rock Dove, Feral Pigeon		likely			4					
	<i>Geopelia cuneata</i>	Diamond Dove					16	•				
	<i>Ocyphaps lophotes</i>	Crested Pigeon				•	164	•	•	•	•	•
	<i>Phaps chalcoptera</i>	Common Bronzewing				•	48	•	•	•	•	
	* <i>Streptopelia senegalensis</i>	Laughing Dove		likely			2					
Caprimulgidae	<i>Eurostopodus argus</i>	Spotted Nightjar					17		•			
Podargidae	<i>Podargus strigoides</i>	Tawny Frogmouth					5			•		•
Aegothelidae	<i>Aegotheles cristatus</i>	Australian Owlet Nightjar				•	5				•	
Apodidae	<i>Apus pacificus</i>	Fork-tailed Swift	Mig (EPBC & BC Acts)	likely								



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Anhingidae	<i>Anhinga novaehollandiae</i>	Australasian Darter					8					
Phalacrocoracidae	<i>Microcarbo melanoleucos</i>	Little Pied Cormorant					22					
	<i>Phalacrocorax carbo</i>	Great Cormorant					11					
	<i>Phalacrocorax sulcirostris</i>	Little Black Cormorant				•	44					
Pelecanidae	<i>Pelecanus conspicillatus</i>	Australian Pelican				•	25					
Ardeidae	<i>Ardea modesta</i>	Eastern Great Egret					7					
	<i>Ardea pacifica</i>	White-necked Heron				•	52		•			
	<i>Egretta novaehollandiae</i>	White-faced Heron					52			•		
	<i>Nycticorax caledonicus</i>	Nankeen Night-heron					2					
Threskiornithidae	<i>Plegadis falcinellus</i>	Glossy Ibis	Mig (EPBC & BC Acts)		1							
	<i>Platalea flavipes</i>	Yellow-billed Spoonbill					19					
	<i>Platalea regia</i>	Royal Spoonbill					1					
	<i>Threskiornis moluccus</i>	Australian White Ibis					2					
	<i>Threskiornis spinicollis</i>	Straw-necked Ibis					8		•			
Accipitridae	<i>Accipiter cirrocephalus</i>	Collared Sparrowhawk					9					
	<i>Accipiter fasciatus</i>	Brown Goshawk					7					
	<i>Aquila audax</i>	Wedge-tailed Eagle				•	81	•	•	•	•	•
	<i>Circus assimilis</i>	Spotted Harrier					9					
	<i>Circus approximans</i>	Swamp Harrier					3					
	<i>Elanus caeruleus axillaris</i>	Black-shouldered Kite					6					
	<i>Hamirostra melanosternon</i>	Black-breasted Buzzard					1					
	<i>Haliastur sphenurus</i>	Whistling Kite				•	56			•		

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	<i>Hieraeetus morphnoides</i>	Little Eagle					6					
	<i>Lophoictinia isura</i>	Square-tailed Kite					2					
	<i>Milvus migrans</i>	Black Kite				•	9					
Falconidae	<i>Falco berigora</i>	Brown Falcon				•	49	•	•			
	<i>Falco cenchroides</i>	Nankeen Kestrel				•	92	•	•	•	•	•
	<i>Falco hypoleucos</i>	Grey Falcon	VU (BC Act)	likely	1							
	<i>Falco longipennis</i>	Australian Hobby					38		•			
	<i>Falco peregrinus</i>	Peregrine Falcon	OS (BC Act)		13	•	4		•		•	
	<i>Falco subniger</i>	Black Falcon					2					
Rallidae	<i>Fulica atra</i>	Eurasian Coot					46					
	<i>Gallinula tenebrosa</i>	Dusky Moorhen					3					
	<i>Tribonyx ventralis</i>	Black-tailed Native-hen					35		•			
Otididae	<i>Ardeotis australis</i>	Australian Bustard				•	8		•	•		•
Burhinidae	<i>Burhinus grallarius</i>	Bush Stone-curlew					2		•			•
Recurvirostridae	<i>Cladorhynchus leucocephalus</i>	Banded Stilt					5					
	<i>Himantopus himantopus</i>	Black-winged Stilt					29					
	<i>Recurvirostra novaehollandiae</i>	Red-necked Avocet					20					
Charadriidae	<i>Charadrius ruficapillus</i>	Red-capped Plover					45					
	<i>Charadrius veredus</i>	Oriental Plover	Mig (EPBC & BC Acts)	may			2					
	<i>Euseyonis melanops</i>	Black-fronted Dotterel					62					
	<i>Erythronyx cinctus</i>	Red-kneed Dotterel					18					
	<i>Peltohyas australis</i>	Inland Dotterel					7					

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	<i>Pluvialis fulva</i>	Pacific Golden Plover	Mig (EPBC & BC Acts)		1		1					
	<i>Thinornis rubricollis</i>	Hooded Plover	P4 (DBCA list)	known	1							
	<i>Vanellus tricolor</i>	Banded Lapwing					32		•			
Scolopacidae	<i>Actitis hypoleucos</i>	Common Sandpiper	Mig (EPBC & BC Acts)	known	11		16					
	<i>Calidris acuminata</i>	Sharp-tailed Sandpiper	Mig (EPBC & BC Acts)	may	1		11					
	<i>Calidris canutus</i>	Red Knot	EN/Mig (EPBC & BC Acts)		1		1					
	<i>Calidris melanotos</i>	Pectoral Sandpiper	Mig (EPBC & BC Acts)	may								
	<i>Calidris ruficollis</i>	Red-necked Stint	Mig (EPBC & BC Acts)		4							
	<i>Limosa lapponica</i>	Bar-tailed Godwit	VU/Mig (EPBC & BC Acts)				2					
	<i>Tringa glareola</i>	Wood Sandpiper	Mig (EPBC & BC Acts)		4		14					
	<i>Tringa nebularia</i>	Common Greenshank	Mig (EPBC & BC Acts)	likely	14		13					
	<i>Tringa stagnatilis</i>	Marsh Sandpiper	Mig (EPBC & BC Acts)				1					
Turnicidae	<i>Turnix velox</i>	Little Button-quail					6					
Laridae	<i>Chlidonias hybrida</i>	Whiskered Tern					14					
	<i>Chroicocephalus novaehollandiae</i>	Silver Gull					8					
	<i>Gelochelidon nilotica</i>	Gull-billed Tern	Mig (EPBC & BC Acts)		1							
Cacatuidae	<i>Eolophus roseicapillus</i>	Galah				•	97	•	•	•	•	•
	<i>Lophochroa leadbeateri</i>	Major Mitchell's Cockatoo					2					
	<i>Nymphicus hollandicus</i>	Cockatiel				•	34	•			•	
Pstittaculidae	<i>Barnardius zonarius</i>	Australian Ringneck				•	77	•	•	•	•	•
	<i>Melopsittacus undulatus</i>	Budgerigar				•	44	•	•		•	



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	<i>Neophema splendida</i>	Scarlet-chested Parrot					3					
	<i>Neopsephotus bourkii</i>	Bourke's Parrot				•	28	•			•	
	<i>Pezoporus occidentalis</i>	Night Parrot	EN (EPBC Act), CR (BC Act)	may								
	<i>Polytelis alexandrae</i>	Princess Parrot	VU (EPBC Act), P4 (DBCA)	known	2		1					
	<i>Psephotus varius</i>	Mulga Parrot				•	44	•	•		•	•
Cuculidae	<i>Chrysococcyx basalis</i>	Horsfield's Bronze-Cuckoo				•	9	•			•	•
	<i>Chrysococcyx osculans</i>	Black-eared Cuckoo		known			5		•			
	<i>Cacomantis flabelliformis</i>	Fan-tailed Cuckoo							•			
	<i>Cacomantis pallidus</i>	Pallid Cuckoo				•	30					
Strigidae	<i>Ninox boobook</i>	Boobook Owl					6					
Tytonidae	<i>Tyto javanica</i>	Eastern Barn Owl					9					
Halcyonidae	<i>Todiramphus pyrrhopygius</i>	Red-backed Kingfisher				•	34					
	<i>Todiramphus sanctus</i>	Sacred Kingfisher					2					
Meropidae	<i>Merops ornatus</i>	Rainbow Bee-eater		may		•	11		•	•	•	
Climacteridae	<i>Climacteris affinis</i>	White-browed Treecreeper				•	8					
	<i>Climacteris rufa</i>	Rufous Treecreeper					3					
Ptilonorhynchidae	<i>Ptilonorhynchus maculatus guttatus</i>	Western Bowerbird				•	34		•	•	•	•
Maluridae	<i>Amytornis textilis</i>	Western Grasswren					1					
	<i>Malurus assimilis (ex lamberti)</i>	Purple-backed Fairy-wren					8	•	•	•		
	<i>Malurus leucopterus leuconotus</i>	White-winged Fairy-wren					27	•	•	•		

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	<i>Malurus splendens</i>	Splendid Fairy-wren				•	24		•		•	•
Acanthizidae	<i>Acanthiza apicalis</i>	Broad-tailed (Inland) Thornbill				•	31	•	•		•	
	<i>Acanthiza chrysorrhoa</i>	Yellow-rumped Thornbill				•	62	•		•	•	•
	<i>Acanthiza iredalei</i>	Slender-billed Thornbill							•	•		
	<i>Acanthiza robustirostris</i>	Slaty-backed Thornbill				•	14		•		•	
	<i>Acanthiza uropygialis</i>	Chestnut-rumped Thornbill				•	41	•	•	•	•	•
	<i>Aphelocephala leucopsis</i>	Southern Whiteface				•	43	•	•		•	
	<i>Calamanthus campestris</i>	Rufous Fieldwren					1					?
	<i>Gerygone fusca</i>	Western Gerygone					10			•		•
	<i>Pyrrholaemus brunneus</i>	Redthroat					6		•			•
	<i>Smicronis brevirostris</i>	Weebill				•	19	•		•	•	•
Pardalotidae	<i>Pardalotus striatus</i>	Striated Pardalote				•	33	•	•			•
Meliphagidae	<i>Acanthagenys rufogularis</i>	Spiny-cheeked Honeyeater				•	116	•	•	•	•	•
	<i>Anthochaera carunculata</i>	Red Wattlebird							•			
	<i>Certhionyx variegatus</i>	Pied Honeyeater					14	•	•			
	<i>Epthianura tricolor</i>	Crimson Chat				•	52	•				
	<i>Epthianura aurifrons</i>	Orange Chat					20					
	<i>Epthianura albifrons</i>	White-fronted Chat					16					
	<i>Gavicalis virescens</i>	Singing Honeyeater				•	193	•	•	•	•	•
	<i>Lacustroica whitei</i>	Grey Honeyeater					1					
	<i>Lichmera indistincta</i>	Brown Honeyeater				•	22	•	•			•
	<i>Manorina flavigula</i>	Yellow-throated Miner				•	142	•	•	•	•	•

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	<i>Ptilotula keartlandi</i>	Grey-headed Honeyeater					1					
	<i>Ptilotula penicillata</i>	White-plumed Honeyeater				•	5					
	<i>Ptilotula plumula</i>	Grey-fronted Honeyeater					4	•				
	<i>Purnella albifrons</i>	White-fronted Honeyeater				•	32	•			•	
Pomatostomidae	<i>Pomatostomus superciliosus</i>	White-browed Babbler				•	30	•	•	•	•	•
Cinclosomatidae	<i>Cinclosoma clarum</i>	Copperback Quail-thrush					4					
	<i>Cinclosoma marginatum</i>	Western Quail-thrush				•	25				•	
Psophodidae	<i>Psophodes occidentalis</i>	Chiming Wedgebill					26					
Neositidae	<i>Daphoenositta chrysoptera</i>	Varied Sitella					1					
Campephagidae	<i>Coracina maxima</i>	Ground Cuckoo-shrike				•	22	•				
	<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike				•	74	•	•	•	•	•
	<i>Lalage tricolor</i>	White-winged Triller				•	38	•	•	•	•	
Pachycephalidae	<i>Colluricincla harmonica</i>	Grey Shrike-thrush				•	40	•	•		•	•
	<i>Oreoica gutturalis</i>	Crested Bellbird				•	115	•	•	•	•	•
	<i>Pachycephala occidentalis</i>	Western Golden Whistler					1					
	<i>Pachycephala rufiventris</i>	Rufous Whistler				•	54	•	•	•	•	•
Artamidae	<i>Artamus cinereus</i>	Black-faced Woodswallow				•	111	•	•	•	•	
	<i>Artamus minor</i>	Little Woodswallow					2					•
	<i>Artamus personatus</i>	Masked Woodswallow				•	32	•	•		•	
Cracticidae	<i>Cracticus nigrogularis</i>	Pied Butcherbird				•	119	•	•	•	•	•
	<i>Cracticus tibicen</i>	Australian Magpie				•	94		•	•		•
	<i>Cracticus torquatus</i>	Grey Butcherbird				•	58	•	•	•	•	•



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	<i>Strepera versicolor</i>	Grey Currawong					20					•
Rhipiduridae	<i>Rhipidura albiscapa</i>	Grey Fantail					5					
	<i>Rhipidura leucophrys</i>	Willie Wagtail				•	134	•	•	•	•	•
Corvidae	<i>Corvus bennetti</i>	Little Crow				•	111	•	•	•		•
	<i>Corvus coronoides</i>	Australian Raven				•	7		•		•	
	<i>Corvus orru</i>	Torresian Crow				•	33					
Monarchidae	<i>Grallina cyanoleuca</i>	Magpie-Lark				•	151		•	•	•	
Petroicidae	<i>Melanodryas cucullata</i>	Hooded Robin					37	•				•
	<i>Microeca fascinans</i>	Jacky Winter				•	4	•			•	
	<i>Petroica goodenovii</i>	Red-capped Robin				•	90	•	•	•	•	•
Megaluridae	<i>Cincloramphus cruralis</i>	Brown Songlark				•	29					
	<i>Cincloramphus mathewsi</i>	Rufous Songlark					22					
Hirundinidae	<i>Cheramoeca leucosterna</i>	White-backed Swallow				•	41					
	<i>Hirundo neoxena</i>	Welcome Swallow				•	111		•			
	<i>Petrochelidon ariel</i>	Fairy Martin					26					
	<i>Petrochelidon nigricans</i>	Tree Martin				•	51				•	
Nectariniidae	<i>Dicaeum hirundinaceum</i>	Mistletoebird				•	9	•				
Estrildidae	<i>Emblema pictum</i>	Painted Finch					3					
	<i>Taeniopygia guttata</i>	Zebra Finch				•	133	•	•	•	•	
Motacillidae	<i>Anthus australis</i>	Australasian Pipit				•	118	•	•	•	•	
	<i>Motacilla cinerea</i>	Grey Wagtail	Mig. (EPBC & BC Acts)	may								

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	<i>Motacilla flava</i>	Yellow Wagtail	Mig. (EPBC & BC Acts)	may								
<b>Mammals (39)</b>												
Tachyglossidae	<i>Tachyglossus aculeatus</i>	Short-beaked Echidna						•	•	•		•
Dasyuridae	<i>Dasyurus geoffroii</i>	Chuditch	VU (EPBC & BC Acts)	may								•
	<i>Ningau ridei</i>	Wongai Ningau				•	1	•			•	
	<i>Sminthopsis crassicaudata</i>	Fat-tailed Dunnart					10	•				
	<i>Sminthopsis dolichura</i>	Little Long-tailed Dunnart				•			•		•	
	<i>Sminthopsis hirtipes</i>	Hairy-footed Dunnart						•				
	<i>Sminthopsis longicaudata</i>	Long-tailed Dunnart	P4 (DBCA list)		12					•		
	<i>Sminthopsis macroura</i>	Stripe-faced Dunnart				•	1	•			•	
	<i>Sminthopsis ooldea</i>	Ooldea Dunnart					1	•				
Potoroidae	<i>Bettongia lesueur graii</i>	Burrowing Bettong, Boodie	EX (EPBC & BC Acts)						•	•		•
Macropodidae	<i>Osphranter robustus</i>	Euro, Biggada				•	1	•	•	•	•	•
	<i>Osphranter rufus</i>	Red Kangaroo, Marlu				•	1	•	•	•	•	•
Phalangeridae	<i>Trichosurus vulpecula</i>	Common Brushtail Possum	(range extension)									•
Emballonuridae	<i>Taphozous hilli</i>	Hill's Sheathtail-bat				•			•		•	•
Molossidae	<i>Ozimops petersi</i>	Inland Free-tailed Bat				•		•			•	•
	<i>Austronomus australis</i>	White-striped Freetail-bat				•	1	•	•		•	•
Vespertilionidae	<i>Chalinolobus gouldii</i>	Gould's Wattled Bat				•	2	•	•	•	•	•
	<i>Chalinolobus morio</i>	Chocolate Wattled Bat							•			
	<i>Nyctophilus geoffroyi</i>	Lesser Long-eared Bat				•	3	•	•		•	•

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	<i>Scotorepens balstoni</i>	Inland Broad-nosed Bat				•	5	•	•		•	•
	<i>Vespadelus baverstocki</i>	Inland Forest Bat				•			•		•	
	<i>Vespadelus finlaysoni</i>	Finlayson's Cave Bat				•			•		•	•
	<i>Vespadelus regulus</i>	Southern Forest Bat							•			
Muridae	<i>Leporillus apicalis</i>	Lesser Stick-nest Rat	EX (EPBC & BC Acts)						?	?		•
	<i>Leporillus conditor</i>	Greater Stick-nest Rat	VU (EPBC Act), CD (BC Acts)						?	?		
	* <i>Mus musculus</i>	House Mouse		likely			16	•	•	•		
	<i>Notomys alexis</i>	Spinifex Hopping-mouse						•				
	<i>Pseudomys hermannsburgensis</i>	Sandy Inland Mouse				•	15	•	•		•	
Leporidae	* <i>Oryctolagus cuniculus</i>	Rabbit		likely		•		•	•	•	•	•
Camelidae	* <i>Camelus dromedarius</i>	Camel, Dromedary		likely			1	•				•
Bovidae	* <i>Bos taurus</i>	Domestic Cattle							•	•		•
	* <i>Capra hircus</i>	Goat		likely					•	•		•
Suidae	* <i>Sus scrofa</i>	Pig					1					
Equidae	* <i>Equus asinus</i>	Donkey		likely						•		•
	* <i>Equus caballus</i>	Horse							•			
Canidae	* <i>Canis familiaris</i>	Dog/Dingo		likely			8		•	•		•
	* <i>Vulpes vulpes</i>	Red Fox		likely				•				
Felidae	* <i>Felis catus</i>	Domestic Cat		likely				•	•	•		•



**Appendix 1 Short-range endemic invertebrate desktop results**

Higher taxon, family	Species	Latitude	Longitude	SRE category	Proximity to study area	Habitat records
<b>Class Arachnida, infraorder Mygalomorphae (trapdoor spiders)</b>						
<b>Actinopodidae (mouse spiders)</b>	Missulena `sp. indet.`	-27.917	120.700	Uncertain	99.17	
	Missulena `sp. indet.`	-28.883	121.333	Uncertain	39.25	
	Missulena `sp. indet.`	-28.813	122.145	Uncertain	63.80	
	Missulena `sp. indet.`	-29.333	121.483	Uncertain	83.57	
	Missulena `sp. indet.`	-28.617	122.383	Uncertain	80.37	under bin
<b>Anamidae</b>	`Teyl?` `sp. indet.`	-28.811	122.146	Uncertain	63.81	
	`Teyl?` `sp. indet.`	-27.801	121.668	Uncertain	66.07	mallee, mulga/Triodia
	`Teyl?` `sp. indet.`	-28.811	122.146	Uncertain	63.81	
	`Teyl?` `sp. indet.`	-27.801	121.668	Uncertain	66.08	mallee, mulga/Triodia
	Aname `glenorn sp. 2`	-29.051	121.809	Potential	58.03	
	Aname `glenorn sp. 2`	-29.051	121.809	Potential	58.04	
	Aname `Goldfields sp. 1`	-27.783	121.650	Potential	67.81	
	Aname `Goldfields sp. 1`	-27.783	121.650	Potential	67.81	
	Aname `Goldfields sp. 1`	-27.783	121.650	Potential	67.81	
	Aname `Goldfields sp. 1`	-27.783	121.650	Potential	67.81	dune Triodia
	Aname `Goldfields sp. 1`	-27.801	121.668	Potential	66.08	mulga/Triodia

Higher taxon, family	Species	Latitude	Longitude	SRE category	Proximity to study area	Habitat records
	Aname `Goldfields sp. 2`	-27.801	121.668	Potential	66.08	mallee, mulga/Triodia
	Aname `mellosa group?`	-28.617	122.433	Potential	85.23	
	Aname `mellosa group?`	-29.200	121.467	Potential	68.99	
	Aname `mellosa group?`	-28.617	122.433	Potential	85.23	
	Aname `mellosa group?`	-28.617	122.433	Potential	85.23	
	Aname `mellosa group?`	-28.833	121.917	Potential	45.69	
	Aname `mellosa group?`	-28.833	121.917	Potential	45.69	
	Aname `mellosa group?`	-28.833	121.917	Potential	45.69	
	Aname `mellosa group?`	-28.617	122.433	Potential	85.23	
	Aname `MYG216`	-27.905	122.383	Potential	96.76	
	Aname `MYG216`	-27.902	122.379	Potential	96.65	
	Aname `MYG216`	-27.905	122.383	Potential	96.76	
	Aname `MYG216`	-27.905	122.383	Potential	96.76	
	Aname `MYG216`	-28.430	121.140	Potential	40.16	
	Aname `MYG216`	-27.901	122.371	Potential	96.02	
	Aname `MYG216`	-27.869	122.341	Potential	95.74	

Higher taxon, family	Species	Latitude	Longitude	SRE category	Proximity to study area	Habitat records
	Aname `Phoenix0055`	-28.935	121.803	Potential	46.54	acacia shrubland on calcrete undulating plain
	Aname `Phoenix0055`	-28.935	121.803	Potential	46.54	acacia shrubland on calcrete undulating plain
	Aname `Phoenix0055`	-28.935	121.803	Potential	46.54	acacia shrubland on calcrete undulating plain
	Aname `Phoenix0055`	-28.935	121.803	Potential	46.54	acacia shrubland on calcrete undulating plain
	Aname `Phoenix0056`	-28.971	121.745	Potential	47.42	acacia shrubland
	Aname `Phoenix0058`	-28.965	121.782	Potential	48.41	calcrete hill slope with mulga
	Aname `Phoenix0058`	-28.965	121.782	Potential	48.41	calcrete hill slope with mulga
	Aname `river wishbone group`	-27.783	121.650	Potential	67.81	dune Triodia
	Aname `river wishbone group`	-27.783	121.650	Potential	67.81	dune Triodia



Higher taxon, family	Species	Latitude	Longitude	SRE category	Proximity to study area	Habitat records
	Aname `sp. indet. (?MYG216)`	-27.901	122.371	Uncertain	96.02	
	Aname `sp. indet.`	-29.258	122.404	Uncertain	112.36	mulga/lignum
	Aname `sp. indet.`	-28.578	121.543	Uncertain	0.00	
	Aname `sp. indet.`	-29.265	122.410	Uncertain	113.28	
	Aname `sp. indet.`	-27.783	121.650	Uncertain	67.81	dune Triodia
	Aname `sp. indet.`	-27.797	121.651	Uncertain	66.30	samphire
	Aname `sp. indet.`	-28.578	121.543	Uncertain	0.00	
	Aname `sp. indet.`	-28.859	122.511	Uncertain	98.94	mulga woodland
	Aname `sp. indet.`	-28.811	122.146	Uncertain	63.81	
	Aname `sp. indet.`	-28.813	122.145	Uncertain	63.80	
	Aname `sp. indet.`	-28.814	122.147	Uncertain	64.03	
	Aname `sp. indet.`	-28.811	122.146	Uncertain	63.81	
	Aname `sp. indet.`	-28.813	122.145	Uncertain	63.80	
	Aname `sp. indet.`	-28.813	122.145	Uncertain	63.80	
	Aname `sp. with chevrons`	-27.800	122.317	Uncertain	98.78	
	Anamidae `sp. indet.`	-29.382	122.468	Uncertain	126.26	mulga/shrubs
	Anamidae `sp. indet.`	-29.382	122.468	Uncertain	126.26	mulga/shrubs
	Anamidae `sp. indet.`	-29.258	122.404	Uncertain	112.36	mulga/lignum
	Anamidae `sp. indet.`	-28.792	121.834	Uncertain	36.52	mulga woodland

Higher taxon, family	Species	Latitude	Longitude	SRE category	Proximity to study area	Habitat records
	Anamidae `sp. indet.`	-28.792	121.834	Uncertain	36.52	mulga woodland
	Kwonkan `MYG719`	-28.806	121.900	Potential	42.54	open mulga woodland
	Kwonkan `MYG719`	-28.806	121.900	Potential	42.54	open mulga woodland
	Kwonkan `sp. indet.`	-29.382	122.468	Uncertain	126.26	mulga/shrubs
	Kwonkan `sp. indet.`	-27.797	121.651	Uncertain	66.30	
	Kwonkan goongarriensis	-29.183	121.467	Potential	67.15	
	Proshermacha `MYG504`	-28.813	122.145	Potential	63.81	
	Proshermacha `sp. indet.`	-27.800	122.317	Uncertain	98.78	
	Proshermacha `sp. indet.`	-28.811	122.146	Uncertain	63.81	
	Teyl `MYG444`	-28.811	122.146	Potential	63.81	
	Teyl `MYG444`	-28.811	122.146	Potential	63.81	
<b>Barychelidae</b>	Barychelidae `sp. indet.`	-29.079	121.808	Uncertain	60.80	
	Idiommata `sp. indet.`	-28.811	122.146	Uncertain	63.81	
	Idiommata `sp. indet.`	-28.743	121.565	Uncertain	18.04	
	Trittame `sp. indet.`	-28.450	121.160	Uncertain	38.33	
<b>Euagridae</b>	Cethegus `sp. indet.`	-27.921	120.691	Uncertain	99.69	on ground in silk with dirt
	Cethegus `sp. indet.`	-27.800	121.650	Uncertain	65.97	samphire

Higher taxon, family	Species	Latitude	Longitude	SRE category	Proximity to study area	Habitat records
<b>Halonoproctidae</b>	Conothele `Phoenix0057`	-28.735	121.870	Potential	35.91	mulga woodland in low drainage area
	Conothele `sp. indet.`	-28.617	122.367	Uncertain	78.76	
<b>Idiopidae</b>	Eucyrtops `sp. indet.`	-29.400	122.467	Uncertain	127.58	mallee, mulga/Triodia
	Eucyrtops `sp. indet.`	-27.905	122.374	Uncertain	96.10	
	Euoplos `sp. indet.`	-28.811	122.146	Uncertain	63.81	
	Euoplos `sp. indet.`	-28.812	122.144	Uncertain	63.72	
	Euoplos `sp. indet.`	-28.811	122.146	Uncertain	63.81	
	Euoplos `sp. indet.`	-28.811	122.146	Uncertain	63.81	
	Euoplos `sp. indet.`	-28.812	122.144	Uncertain	63.72	
	Euoplos `sp. indet.`	-28.814	122.145	Uncertain	63.90	
	Euoplos `sp. indet.`	-28.812	122.145	Uncertain	63.82	
	Euoplos `sp. indet.`	-28.817	122.144	Uncertain	63.96	
	Euoplos `WAM T110336`	-28.806	121.900	Potential	42.54	open mulga woodland
	Euoplos `WAM T110336`	-28.806	121.900	Potential	42.54	open mulga woodland
	Euoplos `WAM T110336`	-28.735	121.870	Potential	35.91	mulga woodland in low drainage area



Higher taxon, family	Species	Latitude	Longitude	SRE category	Proximity to study area	Habitat records
	Euoplos `WAM T110336`	-28.726	121.887	Potential	36.89	mulga woodland
	Euoplos `WAM T110336`	-28.735	121.870	Potential	35.91	mulga woodland in low drainage area
	Idiosoma `MYG014`	-28.947	121.791	Potential	47.10	mulga woodland at base of hill slope
	Idiosoma `MYG017`	-28.802	122.433	Potential	89.62	
	Idiosoma `occidentalis sp. group`	-29.083	121.667	Uncertain	56.93	
	Idiosoma `occidentalis sp. group`	-29.083	121.667	Uncertain	56.93	
	Idiosoma `occidentalis sp. group`	-29.083	121.667	Uncertain	56.93	
	Idiosoma `sp. indet.`	-29.383	122.467	Uncertain	126.27	mulga/shrubs
	Idiosoma `sp. indet.`	-29.088	122.439	Uncertain	103.61	
	Idiosoma `sp. indet.`	-28.383	122.183	Uncertain	60.05	
	Idiosoma `sp. indet.`	-29.383	122.467	Uncertain	126.27	mulga/shrubs
	Idiosoma `sp. indet.`	-28.812	122.144	Uncertain	63.72	
	Idiosoma `sp. indet.`	-28.883	122.510	Uncertain	99.79	mulga woodland
	Idiosoma `sp. indet.`	-28.813	122.146	Uncertain	63.89	
	Idiosoma `sp. indet.`	-28.813	122.146	Uncertain	63.89	

Higher taxon, family	Species	Latitude	Longitude	SRE category	Proximity to study area	Habitat records
	Idiosoma `sp. indet.`	-28.864	122.512	Uncertain	99.16	mulga woodland
	Idiosoma `sp. indet.`	-28.578	121.543	Uncertain	0.00	
	Idiosoma `sp. indet.`	-28.578	121.543	Uncertain	0.00	
	Idiosoma `sp. indet.`	-29.088	122.439	Uncertain	103.61	
	Idiosoma `sp. indet.`	-28.882	122.511	Uncertain	99.82	mulga woodland
	Idiosoma `sp. indet.`	-28.814	122.147	Uncertain	64.06	
	Idiosoma `sp. indet.`	-28.813	122.147	Uncertain	63.98	
	Idiosoma `sp. indet.`	-28.875	122.512	Uncertain	99.64	mulga woodland
	Idiosoma `sp. indet.`	-28.818	122.145	Uncertain	64.04	
<b>Theraphosidae</b>	Selenocosmia `sp. indet.`	-29.382	122.468	Uncertain	126.26	mulga/shrubs
	Selenocosmia `sp. indet.`	-28.633	122.400	Uncertain	82.21	
	Selenocosmia `wacarina`	-28.633	122.400	Potential	82.21	
	Selenocosmia `wacarina`	-27.783	121.650	Potential	67.81	
<b>Class Arachnida, order Pseudoscorpions</b>						
<b>Atemnidae</b>	Atemnidae `sp. indet.`	-28.946	121.733	Uncertain	44.34	dense mulga woodland in drainage
<b>Chernetidae</b>	`PSEAAF` `sp. indet.`	-27.889	122.397	Uncertain	98.88	under bark
	Chernetidae `sp. indet.`	-28.882	121.806	Uncertain	41.87	mulga woodland at top of mesa
	Chernetidae `sp. indet.`	-28.801	121.598	Uncertain	24.91	

Higher taxon, family	Species	Latitude	Longitude	SRE category	Proximity to study area	Habitat records
	Nesidiochernes `sp. indet.`	-28.936	121.784	Uncertain	45.74	mixed acacia woodland
<b>Garypidae</b>	Synsphyronus `PSE115`	-27.900	122.377	Potential	96.60	under bark
	Synsphyronus `PSE115`	-27.889	122.397	Potential	98.88	under bark
	Synsphyronus `PSE115`	-27.889	122.397	Potential	98.88	under bark
	Synsphyronus `PSE115`	-27.889	122.397	Potential	98.88	under bark
<b>Olpiidae</b>	Austrohorus `sp. indet.`	-28.914	121.429	Uncertain	38.56	
	Austrohorus `sp. indet.`	-28.699	120.901	Uncertain	63.99	
	Beierolpium `sp. 8/2`	-27.900	122.377	Potential	96.60	under bark
	Beierolpium `sp. 8/2`	-27.877	122.351	Potential	96.03	under bark
	Beierolpium `sp. 8/3`	-28.914	121.429	Potential	38.56	
	Euryolpium `sp. indet.`	-28.947	121.791	Uncertain	47.10	mulga woodland at base of hill slope
	Euryolpium `sp. indet.`	-28.936	121.784	Uncertain	45.74	mixed acacia woodland
	Indolpium `sp. indet.`	-28.836	121.848	Uncertain	40.85	mulga woodland
	Indolpium `sp. indet.`	-28.792	121.834	Uncertain	36.52	mulga woodland
	Indolpium `sp. indet.`	-28.861	121.791	Uncertain	39.11	
	Olpiidae `sp. indet.`	-28.914	121.429	Uncertain	38.56	
Olpiidae `sp. indet.`	-28.914	121.429	Uncertain	38.56		



Higher taxon, family	Species	Latitude	Longitude	SRE category	Proximity to study area	Habitat records
	Olpiidae `sp. indet.`	-29.300	122.417	Uncertain	116.38	
	Olpiidae `sp. indet.`	-28.743	121.565	Uncertain	18.04	
<b>Class Arachnida, order Scorpiones</b>						
<b>Bothriuridae</b>	Cercophonius `sp. indet.`	-28.712	120.891	Uncertain	65.19	
<b>Buthidae</b>	Isometroides `MM1`	-28.946	121.733	Potential	44.34	dense mulga woodland in drainage
	Isometroides `MM1`	-28.726	121.887	Potential	36.89	mulga woodland
	Isometroides `sp. indet.`	-28.817	122.433	Uncertain	90.17	
	Isometroides `sp. indet.`	-28.430	121.140	Uncertain	40.16	
	Isometroides `sp. indet.`	-27.877	122.349	Uncertain	95.91	
	Isometroides `sp. indet.`	-27.918	122.360	Uncertain	94.11	
	Isometroides `sp. indet.`	-28.860	121.804	Uncertain	39.84	
	Isometroides `sp. indet.`	-28.677	121.536	Uncertain	10.67	
	Lychas `cf. jonesae`	-28.806	121.900	Potential	42.54	open mulga woodland
	Lychas `cf. jonesae`	-28.806	121.900	Potential	42.54	open mulga woodland
	Lychas `cf. jonesae`	-28.935	121.803	Potential	46.54	acacia shrubland on calcrete undulating plain

Higher taxon, family	Species	Latitude	Longitude	SRE category	Proximity to study area	Habitat records
	Lychas `cf. jonesae`	-28.946	121.733	Potential	44.34	dense mulga woodland in drainage
	Lychas `cf. jonesae`	-28.883	121.811	Potential	42.28	side of breakaway with scattered mulga
	Lychas `cf. jonesae`	-28.836	121.848	Potential	40.85	mulga woodland
	Lychas `cf. jonesae`	-28.883	121.811	Potential	42.28	side of breakaway with scattered mulga
	Lychas `cf. jonesae`	-28.883	121.811	Potential	42.28	side of breakaway with scattered mulga
	Lychas `cf. jonesae`	-28.971	121.745	Potential	47.42	acacia shrubland
	Lychas `cf. jonesae`	-28.726	121.887	Potential	36.89	mulga woodland
	Lychas `cf. jonesae`	-28.726	121.887	Potential	36.89	mulga woodland
	Lychas `cf. jonesae`	-28.836	121.848	Potential	40.85	mulga woodland
	Lychas `cf. jonesae`	-28.836	121.848	Potential	40.85	mulga woodland
	Lychas `cf. jonesae`	-28.735	121.870	Potential	35.91	mulga woodland in low drainage area

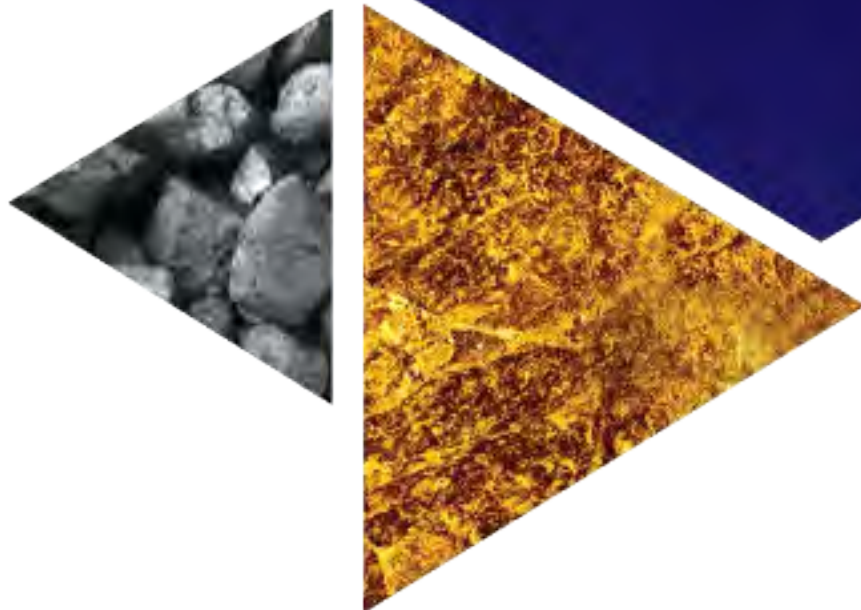
Higher taxon, family	Species	Latitude	Longitude	SRE category	Proximity to study area	Habitat records
	Lychas `cf. jonesae`	-28.735	121.870	Potential	35.91	mulga woodland in low drainage area
	Lychas `cf. jonesae`	-28.726	121.887	Potential	36.89	mulga woodland
	Lychas `cf. jonesae`	-28.735	121.870	Potential	35.91	mulga woodland in low drainage area
	Lychas `pilbara 1`	-28.819	122.434	Potential	90.30	
	Lychas `sp. indet.`	-27.869	122.377	Uncertain	98.59	
	Lychas `sp. indet.`	-27.905	122.383	Uncertain	96.76	
	Lychas `sp. indet.`	-29.056	121.809	Uncertain	58.60	
	Lychas `sp. indet.`	-27.869	122.393	Uncertain	99.85	
	Lychas `sp. indet.`	-27.905	122.374	Uncertain	96.10	
	Lychas `sp. indet.`	-27.877	122.349	Uncertain	95.91	
	Lychas `sp. indet.`	-27.902	122.379	Uncertain	96.65	
	Lychas `sp. indet.`	-27.905	122.374	Uncertain	96.10	
	Lychas `sp. indet.`	-29.088	121.808	Uncertain	61.72	
	Lychas `sp. indet.`	-27.920	122.336	Uncertain	91.99	
	Lychas `sp. indet.`	-28.817	122.433	Uncertain	90.17	
	Lychas `sp. indet.`	-27.890	122.353	Uncertain	95.29	
	Lychas `sp. indet.`	-27.920	122.338	Uncertain	92.16	
	Lychas `sp. indet.`	-28.430	121.140	Uncertain	40.16	



Higher taxon, family	Species	Latitude	Longitude	SRE category	Proximity to study area	Habitat records
	Lychas `sp. indet.`	-28.450	121.160	Uncertain	38.33	
<b>Urodacidae</b>	Urodacus `GD`	-28.799	122.434	Potential	89.54	
	Urodacus `GD`	-28.799	122.434	Potential	89.54	
	Urodacus `gibson 1?`	-29.088	121.808	Potential	61.72	
	Urodacus `sp. indet.`	-28.833	121.833	Uncertain	39.57	mulga
	Urodacus `sp. indet.`	-28.872	122.521	Uncertain	100.30	mulga woodland
	Urodacus `sp. indet.`	-28.633	122.400	Uncertain	82.21	
	Urodacus `sp. indet.`	-28.633	122.400	Uncertain	82.21	
	Urodacus `sp. indet.`	-28.861	121.800	Uncertain	39.69	
	Urodacus `sp. indet.`	-28.799	122.434	Uncertain	89.54	
	Urodacus `sp. indet.`	-29.079	121.811	Uncertain	60.90	
	Urodacus `sp. indet.`	-28.667	120.967	Uncertain	56.94	under table on patio nr garden bed
	Urodacus `yeelirrie?`	-29.078	121.816	Uncertain	61.02	
	Urodacus `yeelirrie?`	-29.069	121.806	Uncertain	59.77	
<b>Class Chilopoda, order Geophilda</b>						
<b>Chilenophilidae</b>	Chilenophilidae `sp. indet.`	-28.647	121.542	Uncertain	7.26	
<b>Mecistocephalidae</b>	Mecistocephalidae `sp. indet.`	-28.965	121.782	Uncertain	48.41	calcrete hill slope with mulga
<b>Class Chilopoda, order Scutigera</b>						
<b>Scutigeridae</b>	Pilbarascutigera `sp. indet.`	-28.785	121.610	Uncertain	23.52	
<b>Class Diplopoda, order Polydemida</b>						

Higher taxon, family	Species	Latitude	Longitude	SRE category	Proximity to study area	Habitat records
<b>Paradoxosomatidae</b>	Antichiropus `sp. indet.`	-29.383	121.367	Uncertain	90.55	
	Antichiropus `sp. indet.`	-28.578	121.543	Uncertain	0.00	
<b>Class Gastropoda, order Littorinimorpha</b>						
<b>Bithyniidae</b>	Gabbia cf. kendricki	-28.016	121.008	Potential	67.98	
<b>Class Gastropoda, order Stylommatophora</b>						
<b>Succineidae</b>	Succinea sp.	-28.840	122.418	Uncertain	89.68	
	Succinea sp.	-28.938	121.416	Uncertain	41.41	
	Succinea sp.	-28.824	122.434	Uncertain	90.49	

# Appendix E. Mining Proposal and Mine Closure Plan Approval Letter







Your ref Redcliffe Gold  
Our ref EARS-MP-102646  
Enquiries [REDACTED]  
[REDACTED]  
[REDACTED] [@dmirs.wa.gov.au](mailto:[REDACTED]@dmirs.wa.gov.au)

[REDACTED]  
Manager Redcliffe  
Redcliffe Project Pty Ltd

Sent by email: [REDACTED] [@daciangold.com.au](mailto:[REDACTED]@daciangold.com.au)

Dear [REDACTED],

**APPROVAL FOR MINING PROPOSAL - REDCLIFFE GOLD PROJECT MINING PROPOSAL: HUB AND GOLDEN TERRACE SOUTH OPEN PITS VERSION 2  
REGISTRATION ID: 102646**

I refer to your Mining Proposal received on 27 January 2022, and revised on 26 May 2022. The Mining Proposal has been assessed by the Department of Mines, Industry Regulation and Safety (DMIRS) and determined to be acceptable for approval under the *Mining Act 1978* (the Mining Act).

I hereby approve the Mining Proposal (Doc ID: 9211815) under the provisions of the Mining Act.

By signing this document I declare that I have no conflict of interest that prevents me from making a decision on this proposal, as outlined in the DMIRS Conflict of Interest Policy.

**I am aware the proposed activities intersect Commonwealth land as defined by the Mining Act, Mertondale pastoral lease (N049506), and as such requirements under Section 25A of the Mining Act apply. Please note this approval in no way grants consent to mine under Section 25A of the Mining Act, nor infers that consent will be granted. No mining activities can occur unless any necessary consent under Section 25A is granted.**

Please note the comments in Schedule 1 which must be addressed in the next review of the Mine Closure Plan. The approved Mine Closure Plan (Doc ID: 9265331) must be revised and re-submitted to DMIRS by the end of November 2023, in accordance with the revised tenement conditions (see Schedule 2).

I advise that I intend to recommend the Minister for Mines and Petroleum's delegate impose further conditions on M 37/1276, M 37/1286, M 37/1295, M 37/1348 and M 37/233, as outlined in Schedule 2. Further correspondence will be sent from DMIRS once the conditions are imposed.

**Important** – please note that you must submit a revised Mining Proposal for assessment and approval in the following circumstances:

- When any disturbance is proposed outside the approved disturbance envelope;
- The characteristics of any ‘Key Mine Activities’ detailed in the Mining Proposal need to be altered;
- A new activity, or change to an activity type, beyond that listed in the ‘Activity Details’ section of the Mining Proposal is proposed; or
- An increase in area is required for any key mine activity or total activity area on any tenement.

This approval does not supersede any other applicable provisions of the Mining Act, or remove the need for any necessary approvals from other authorities.

You are reminded that you are required to report disturbance data on an annual basis and pay any corresponding levy in accordance with the *Mining Rehabilitation Fund Act 2012* and associated Regulations.

Please be reminded of your obligation to carry out the mining operation in accordance with the provisions of the *Mines Safety and Inspection Act 1994* and Regulations 1995. You must have an approved Project Management Plan (PMP) in place prior to commencing construction or mining operations.

Further to this, if your proposal is clearing native vegetation a clearing permit under Part V Division 2 of the *Environmental Protection Act 1986* for clearing of native vegetation will be required unless a relevant exemption applies.

Please be reminded that the *Aboriginal Heritage Act 1972* protects all Aboriginal heritage sites in Western Australia, whether or not they have previously been identified or registered under that Act. Consent is required from the Minister for Aboriginal Affairs for any activity which will impact Aboriginal heritage sites. This approval in no way grants authority to impact any Aboriginal heritage site protected under the *Aboriginal Heritage Act 1972*.

Should you have any queries regarding this letter, please contact Environmental Officer, Harry Jockel on (08) 9222 3206.

Yours sincerely



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Executive Director Resource and Environmental Compliance  
Resource and Environmental Compliance Division  
13 June 2022

Attach: Schedule 1: Areas of the Mine Closure Plan that require further development in the next revision  
Schedule 1/2: Recommended further conditions

**SCHEDULE 1: AREAS OF THE MINE CLOSURE PLAN THAT REQUIRE FURTHER DEVELOPMENT IN THE NEXT REVISION**

Section of the Mine Closure Plan	Comments
Environmental Outcomes, Performance Criteria and Reporting	<p>It is noted that there was improvement in the completion criteria in Revision 2 of the MCP, however further refinement needs to be undertaken in the next revision. For example, completion criteria will need to specifically state vegetation rehabilitation targets such as density, number of species, weed cover etc.</p> <p>In addition, more specific details on the monitoring needs to be included</p>
Baseline data	<p>As the Project progresses, more specific data in relation to rehabilitation must be collected and included in the next revision. In particular, the results of any Normalised Difference Vegetation Index (NDVI) monitoring and groundwater monitoring must be included and used to refine the closure implementation as well as the completion criteria.</p>
Closure Risk Assessment	<p>The risk assessment must be reviewed and updated in the next MCP.</p> <p>It is recommended that the Mine Closure Planning Risk Assessment include details of a position/ person within the company who is responsible for implementing the proposed controls.</p>



## SCHEDULE 2: RECOMMENDED FURTHER CONDITIONS

### RECOMMENDED FURTHER CONDITIONS FOR MINING LEASE 37/233

Please impose the following new condition(s):

- All mining operations approved by a Mining Proposal submitted on or after 3 March 2020 to meet the environmental outcomes and performance criteria stated in the latest, relevant approved Mining Proposal/s. **[MTSD: Standard Condition 661]**
- All ground disturbance approved by a Mining Proposal submitted on or after 3 March 2020 to be undertaken within the disturbance envelope as presented within the latest, relevant approved Mining Proposal/s. **[MTSD: Standard Condition 669]**
- No alteration or expansion of mining operations beyond the activities described within the Activity, and Key Mine Activity tables of the latest, relevant approved Mining Proposal/s unless a subsequent Mining Proposal is submitted, in the form defined in section 70O of the *Mining Act 1978*, to cover the alteration or expansion, and until such Mining Proposal is approved by the Executive Director, Resource and Environmental Compliance Division, Department of Mines, Industry Regulation and Safety. **[MTSD: Standard Condition 670]**
- The lessee to ensure adequate environmental monitoring and analysis is undertaken of activities approved by a Mining Proposal submitted on or after 3 March 2020 to demonstrate the level of achievement of the performance criteria stated in the latest, relevant approved Mining Proposal/s. **[MTSD: Standard Condition 664]**
- Report any breach of environmental outcome or performance criteria contained within an approved Mining Proposal submitted on or after 3 March 2020, to the Executive Director, Resource and Environmental Compliance Division, Department of Mines, Industry Regulation and Safety within 24 hours of becoming aware of the occurrence of the breach. **[MTSD: Standard Condition 672]**
- Report any incident arising from mining activities that has caused, or has the potential to cause environmental harm or injury to land, to the Executive Director, Resource and Environmental Compliance Division, Department of Mines, Industry Regulation and Safety, within 24 hours of becoming aware of the occurrence of the incident. **[MTSD: Standard Condition 671]**
- The development and operation of the project being carried out in such a manner so as to create the minimum practicable disturbance to the existing vegetation and natural landform. **[MTSD: Standard Condition 384]**
- Topsoil and vegetation to be removed ahead of mining operations and appropriately stockpiled for later respreading or immediately respread as rehabilitation progresses. **[MTSD: Standard Condition 385]**
- All rubbish and waste will be appropriately managed and disposed. **[MTSD: Standard Condition 387]**
- The lessee taking all reasonable and practicable measures to prevent or minimise the generation of dust from mining operations. **[MTSD: Standard Condition 659]**
- Where saline water is used for dust suppression, all reasonable measures being taken to avoid any detrimental effects to surrounding vegetation and topsoil stockpiles. **[MTSD: Standard Condition 401]**

- Placement of waste material must be such that the final footprint after rehabilitation will not be impacted upon by pit wall subsidence or be within the zone of pit instability to the satisfaction of the Executive Director, Resource and Environmental Compliance Division, Department of Mines, Industry Regulation and Safety. **[MTSD: Standard Condition 573]**
  - All mining related landforms and disturbances must be rehabilitated, in a progressive manner where practicable, to ensure they are safe, stable, non-polluting, integrated with the surrounding landscape and support self-sustaining, functional ecosystems or alternative agreed outcome to the satisfaction of the Executive Director, Resource and Environmental Compliance, Department of Mines, Industry Regulation and Safety. **[MTSD: Standard Condition 388]**
- 

### RECOMMENDED FURTHER CONDITIONS FOR MINING LEASE 37/1276

Please impose the following new condition(s):

- All mining operations approved by a Mining Proposal submitted on or after 3 March 2020 to meet the environmental outcomes and performance criteria stated in the latest, relevant approved Mining Proposal/s. **[MTSD: Standard Condition 661]**
- All ground disturbance approved by a Mining Proposal submitted on or after 3 March 2020 to be undertaken within the disturbance envelope as presented within the latest, relevant approved Mining Proposal/s. **[MTSD: Standard Condition 669]**
- No alteration or expansion of mining operations beyond the activities described within the Activity, and Key Mine Activity tables of the latest, relevant approved Mining Proposal/s unless a subsequent Mining Proposal is submitted, in the form defined in section 70O of the *Mining Act 1978*, to cover the alteration or expansion, and until such Mining Proposal is approved by the Executive Director, Resource and Environmental Compliance Division, Department of Mines, Industry Regulation and Safety. **[MTSD: Standard Condition 670]**
- The lessee to ensure adequate environmental monitoring and analysis is undertaken of activities approved by a Mining Proposal submitted on or after 3 March 2020 to demonstrate the level of achievement of the performance criteria stated in the latest, relevant approved Mining Proposal/s. **[MTSD: Standard Condition 664]**
- Report any breach of environmental outcome or performance criteria contained within an approved Mining Proposal submitted on or after 3 March 2020, to the Executive Director, Resource and Environmental Compliance Division, Department of Mines, Industry Regulation and Safety within 24 hours of becoming aware of the occurrence of the breach. **[MTSD: Standard Condition 672]**
- Management of mine closure to be undertaken in accordance with the latest, relevant approved Mine Closure Plan. **[MTSD: Standard Condition 662]**
- Report any incident arising from mining activities that has caused, or has the potential to cause environmental harm or injury to land, to the Executive Director, Resource and Environmental Compliance Division, Department of Mines, Industry Regulation and Safety, within 24 hours of becoming aware of the occurrence of the incident. **[MTSD: Standard Condition 671]**
- The development and operation of the project being carried out in such a manner so as to create the minimum practicable disturbance to the existing vegetation and natural landform. **[MTSD: Standard Condition 384]**
- Topsoil and vegetation to be removed ahead of mining operations and appropriately stockpiled for later respreading or immediately respread as rehabilitation progresses. **[MTSD: Standard Condition 385]**

- All rubbish and waste will be appropriately managed and disposed. **[MTSD: Standard Condition 387]**
- The lessee taking all reasonable and practicable measures to prevent or minimise the generation of dust from mining operations. **[MTSD: Standard Condition 659]**
- Where saline water is used for dust suppression, all reasonable measures being taken to avoid any detrimental effects to surrounding vegetation and topsoil stockpiles. **[MTSD: Standard Condition 401]**
- Placement of waste material must be such that the final footprint after rehabilitation will not be impacted upon by pit wall subsidence or be within the zone of pit instability to the satisfaction of the Executive Director, Resource and Environmental Compliance Division, Department of Mines, Industry Regulation and Safety. **[MTSD: Standard Condition 573]**
- All mining related landforms and disturbances must be rehabilitated, in a progressive manner where practicable, to ensure they are safe, stable, non-polluting, integrated with the surrounding landscape and support self-sustaining, functional ecosystems or alternative agreed outcome to the satisfaction of the Executive Director, Resource and Environmental Compliance, Department of Mines, Industry Regulation and Safety. **[MTSD: Standard Condition 388]**
- All activities being carried out in such a manner so as to not have a detrimental effect on the natural water flow through the lease and surrounding areas to the satisfaction of the Environmental Officer, Department of Mines, Industry Regulation and Safety. **[MTSD: Standard Condition 657]**
- An annual environmental report is to be submitted to the Executive Director, Resource and Environmental Compliance, Department of Mines, Industry Regulation and Safety, outlining the project operations, minesite environmental management and rehabilitation work undertaken in the previous 12 months and the proposed operations, environmental management plans and rehabilitation programs for the next 12 months. This report is to be submitted each year in: **[MTSD: Standard Condition 392]**
  - November
- A Mine Closure Plan is to be submitted in the Annual Environmental Reporting month specified in tenement conditions in the year specified below, unless otherwise directed by the Executive Director Resource and Environmental Compliance Division, Department of Mines, Industry Regulation and Safety. The Mine Closure Plan is to be prepared in accordance with the Department's "Guidelines for Preparing Mine Closure Plans": **[MTSD: Standard Condition 578]**
  - 2023

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**RECOMMENDED FURTHER CONDITIONS  
FOR MINING LEASE 37/1286**

Please impose the following new condition(s):

- All mining operations approved by a Mining Proposal submitted on or after 3 March 2020 to meet the environmental outcomes and performance criteria stated in the latest, relevant approved Mining Proposal/s. **[MTSD: Standard Condition 661]**
- All ground disturbance approved by a Mining Proposal submitted on or after 3 March 2020 to be undertaken within the disturbance envelope as presented within the latest, relevant approved Mining Proposal/s. **[MTSD: Standard Condition 669]**



- No alteration or expansion of mining operations beyond the activities described within the Activity, and Key Mine Activity tables of the latest, relevant approved Mining Proposal/s unless a subsequent Mining Proposal is submitted, in the form defined in section 70O of the *Mining Act 1978*, to cover the alteration or expansion, and until such Mining Proposal is approved by the Executive Director, Resource and Environmental Compliance Division, Department of Mines, Industry Regulation and Safety. **[MTSD: Standard Condition 670]**
- The lessee to ensure adequate environmental monitoring and analysis is undertaken of activities approved by a Mining Proposal submitted on or after 3 March 2020 to demonstrate the level of achievement of the performance criteria stated in the latest, relevant approved Mining Proposal/s. **[MTSD: Standard Condition 664]**
- Report any breach of environmental outcome or performance criteria contained within an approved Mining Proposal submitted on or after 3 March 2020, to the Executive Director, Resource and Environmental Compliance Division, Department of Mines, Industry Regulation and Safety within 24 hours of becoming aware of the occurrence of the breach. **[MTSD: Standard Condition 672]**
- Management of mine closure to be undertaken in accordance with the latest, relevant approved Mine Closure Plan. **[MTSD: Standard Condition 662]**
- Report any incident arising from mining activities that has caused, or has the potential to cause environmental harm or injury to land, to the Executive Director, Resource and Environmental Compliance Division, Department of Mines, Industry Regulation and Safety, within 24 hours of becoming aware of the occurrence of the incident. **[MTSD: Standard Condition 671]**
- The development and operation of the project being carried out in such a manner so as to create the minimum practicable disturbance to the existing vegetation and natural landform. **[MTSD: Standard Condition 384]**
- Topsoil and vegetation to be removed ahead of mining operations and appropriately stockpiled for later respreading or immediately respread as rehabilitation progresses. **[MTSD: Standard Condition 385]**
- All rubbish and waste will be appropriately managed and disposed. **[MTSD: Standard Condition 387]**
- The lessee taking all reasonable and practicable measures to prevent or minimise the generation of dust from mining operations. **[MTSD: Standard Condition 659]**
- Where saline water is used for dust suppression, all reasonable measures being taken to avoid any detrimental effects to surrounding vegetation and topsoil stockpiles. **[MTSD: Standard Condition 401]**
- Placement of waste material must be such that the final footprint after rehabilitation will not be impacted upon by pit wall subsidence or be within the zone of pit instability to the satisfaction of the Executive Director, Resource and Environmental Compliance Division, Department of Mines, Industry Regulation and Safety. **[MTSD: Standard Condition 573]**
- All mining related landforms and disturbances must be rehabilitated, in a progressive manner where practicable, to ensure they are safe, stable, non-polluting, integrated with the surrounding landscape and support self-sustaining, functional ecosystems or alternative agreed outcome to the satisfaction of the Executive Director, Resource and Environmental Compliance, Department of Mines, Industry Regulation and Safety. **[MTSD: Standard Condition 388]**
- All activities being carried out in such a manner so as to not have a detrimental effect on the natural water flow through the lease and surrounding areas to the satisfaction of the Environmental Officer, Department of Mines, Industry Regulation and Safety. **[MTSD: Standard Condition 657]**

- An annual environmental report is to be submitted to the Executive Director, Resource and Environmental Compliance, Department of Mines, Industry Regulation and Safety, outlining the project operations, minesite environmental management and rehabilitation work undertaken in the previous 12 months and the proposed operations, environmental management plans and rehabilitation programs for the next 12 months. This report is to be submitted each year in: **[MTSD: Standard Condition 392]**
  - November
- A Mine Closure Plan is to be submitted in the Annual Environmental Reporting month specified in tenement conditions in the year specified below, unless otherwise directed by the Executive Director Resource and Environmental Compliance Division, Department of Mines, Industry Regulation and Safety. The Mine Closure Plan is to be prepared in accordance with the Department's "Guidelines for Preparing Mine Closure Plans": **[MTSD: Standard Condition 578]**
  - 2023

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### RECOMMENDED FURTHER CONDITIONS FOR MINING LEASE 37/1295

Please impose the following new condition(s):

- All mining operations approved by a Mining Proposal submitted on or after 3 March 2020 to meet the environmental outcomes and performance criteria stated in the latest, relevant approved Mining Proposal/s. **[MTSD: Standard Condition 661]**
- All ground disturbance approved by a Mining Proposal submitted on or after 3 March 2020 to be undertaken within the disturbance envelope as presented within the latest, relevant approved Mining Proposal/s. **[MTSD: Standard Condition 669]**
- No alteration or expansion of mining operations beyond the activities described within the Activity, and Key Mine Activity tables of the latest, relevant approved Mining Proposal/s unless a subsequent Mining Proposal is submitted, in the form defined in section 700 of the *Mining Act 1978*, to cover the alteration or expansion, and until such Mining Proposal is approved by the Executive Director, Resource and Environmental Compliance Division, Department of Mines, Industry Regulation and Safety. **[MTSD: Standard Condition 670]**
- The lessee to ensure adequate environmental monitoring and analysis is undertaken of activities approved by a Mining Proposal submitted on or after 3 March 2020 to demonstrate the level of achievement of the performance criteria stated in the latest, relevant approved Mining Proposal/s. **[MTSD: Standard Condition 664]**
- Report any breach of environmental outcome or performance criteria contained within an approved Mining Proposal submitted on or after 3 March 2020, to the Executive Director, Resource and Environmental Compliance Division, Department of Mines, Industry Regulation and Safety within 24 hours of becoming aware of the occurrence of the breach. **[MTSD: Standard Condition 672]**
- Management of mine closure to be undertaken in accordance with the latest, relevant approved Mine Closure Plan. **[MTSD: Standard Condition 662]**
- Report any incident arising from mining activities that has caused, or has the potential to cause environmental harm or injury to land, to the Executive Director, Resource and Environmental Compliance Division, Department of Mines, Industry Regulation and Safety, within 24 hours of becoming aware of the occurrence of the incident. **[MTSD: Standard Condition 671]**
- The development and operation of the project being carried out in such a manner so as to create the minimum practicable disturbance to the existing vegetation and natural landform. **[MTSD: Standard Condition 384]**

- Topsoil and vegetation to be removed ahead of mining operations and appropriately stockpiled for later respreading or immediately respread as rehabilitation progresses. **[MTSD: Standard Condition 385]**
- All rubbish and waste will be appropriately managed and disposed. **[MTSD: Standard Condition 387]**
- The lessee taking all reasonable and practicable measures to prevent or minimise the generation of dust from mining operations. **[MTSD: Standard Condition 659]**
- Where saline water is used for dust suppression, all reasonable measures being taken to avoid any detrimental effects to surrounding vegetation and topsoil stockpiles. **[MTSD: Standard Condition 401]**
- Placement of waste material must be such that the final footprint after rehabilitation will not be impacted upon by pit wall subsidence or be within the zone of pit instability to the satisfaction of the Executive Director, Resource and Environmental Compliance Division, Department of Mines, Industry Regulation and Safety. **[MTSD: Standard Condition 573]**
- All mining related landforms and disturbances must be rehabilitated, in a progressive manner where practicable, to ensure they are safe, stable, non-polluting, integrated with the surrounding landscape and support self-sustaining, functional ecosystems or alternative agreed outcome to the satisfaction of the Executive Director, Resource and Environmental Compliance, Department of Mines, Industry Regulation and Safety. **[MTSD: Standard Condition 388]**
- All activities being carried out in such a manner so as to not have a detrimental effect on the natural water flow through the lease and surrounding areas to the satisfaction of the Environmental Officer, Department of Mines, Industry Regulation and Safety. **[MTSD: Standard Condition 657]**
- An annual environmental report is to be submitted to the Executive Director, Resource and Environmental Compliance, Department of Mines, Industry Regulation and Safety, outlining the project operations, minesite environmental management and rehabilitation work undertaken in the previous 12 months and the proposed operations, environmental management plans and rehabilitation programs for the next 12 months. This report is to be submitted each year in: **[MTSD: Standard Condition 392]**
  - November
- A Mine Closure Plan is to be submitted in the Annual Environmental Reporting month specified in tenement conditions in the year specified below, unless otherwise directed by the Executive Director Resource and Environmental Compliance Division, Department of Mines, Industry Regulation and Safety. The Mine Closure Plan is to be prepared in accordance with the Department's "Guidelines for Preparing Mine Closure Plans": **[MTSD: Standard Condition 578]**
  - 2023

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**RECOMMENDED FURTHER CONDITIONS  
FOR MINING LEASE 37/1348**

Please impose the following new condition(s):

- All mining operations approved by a Mining Proposal submitted on or after 3 March 2020 to meet the environmental outcomes and performance criteria stated in the latest, relevant approved Mining Proposal/s. **[MTSD: Standard Condition 661]**
- All ground disturbance approved by a Mining Proposal submitted on or after 3 March 2020 to be undertaken within the disturbance envelope as presented within the latest, relevant approved Mining Proposal/s. **[MTSD: Standard Condition 669]**



- No alteration or expansion of mining operations beyond the activities described within the Activity, and Key Mine Activity tables of the latest, relevant approved Mining Proposal/s unless a subsequent Mining Proposal is submitted, in the form defined in section 70O of the *Mining Act 1978*, to cover the alteration or expansion, and until such Mining Proposal is approved by the Executive Director, Resource and Environmental Compliance Division, Department of Mines, Industry Regulation and Safety. **[MTSD: Standard Condition 670]**
- The lessee to ensure adequate environmental monitoring and analysis is undertaken of activities approved by a Mining Proposal submitted on or after 3 March 2020 to demonstrate the level of achievement of the performance criteria stated in the latest, relevant approved Mining Proposal/s. **[MTSD: Standard Condition 664]**
- Report any breach of environmental outcome or performance criteria contained within an approved Mining Proposal submitted on or after 3 March 2020, to the Executive Director, Resource and Environmental Compliance Division, Department of Mines, Industry Regulation and Safety within 24 hours of becoming aware of the occurrence of the breach. **[MTSD: Standard Condition 672]**
- Management of mine closure to be undertaken in accordance with the latest, relevant approved Mine Closure Plan. **[MTSD: Standard Condition 662]**
- Report any incident arising from mining activities that has caused, or has the potential to cause environmental harm or injury to land, to the Executive Director, Resource and Environmental Compliance Division, Department of Mines, Industry Regulation and Safety, within 24 hours of becoming aware of the occurrence of the incident. **[MTSD: Standard Condition 671]**
- The development and operation of the project being carried out in such a manner so as to create the minimum practicable disturbance to the existing vegetation and natural landform. **[MTSD: Standard Condition 384]**
- Topsoil and vegetation to be removed ahead of mining operations and appropriately stockpiled for later respreading or immediately respread as rehabilitation progresses. **[MTSD: Standard Condition 385]**
- All rubbish and waste will be appropriately managed and disposed. **[MTSD: Standard Condition 387]**
- The lessee taking all reasonable and practicable measures to prevent or minimise the generation of dust from mining operations. **[MTSD: Standard Condition 659]**
- Where saline water is used for dust suppression, all reasonable measures being taken to avoid any detrimental effects to surrounding vegetation and topsoil stockpiles. **[MTSD: Standard Condition 401]**
- Placement of waste material must be such that the final footprint after rehabilitation will not be impacted upon by pit wall subsidence or be within the zone of pit instability to the satisfaction of the Executive Director, Resource and Environmental Compliance Division, Department of Mines, Industry Regulation and Safety. **[MTSD: Standard Condition 573]**
- All mining related landforms and disturbances must be rehabilitated, in a progressive manner where practicable, to ensure they are safe, stable, non-polluting, integrated with the surrounding landscape and support self-sustaining, functional ecosystems or alternative agreed outcome to the satisfaction of the Executive Director, Resource and Environmental Compliance, Department of Mines, Industry Regulation and Safety. **[MTSD: Standard Condition 388]**
- All activities being carried out in such a manner so as to not have a detrimental effect on the natural water flow through the lease and surrounding areas to the satisfaction of the Environmental Officer, Department of Mines, Industry Regulation and Safety. **[MTSD: Standard Condition 657]**

- An annual environmental report is to be submitted to the Executive Director, Resource and Environmental Compliance, Department of Mines, Industry Regulation and Safety, outlining the project operations, minesite environmental management and rehabilitation work undertaken in the previous 12 months and the proposed operations, environmental management plans and rehabilitation programs for the next 12 months. This report is to be submitted each year in: **[MTSD: Standard Condition 392]**
    - November
  - A Mine Closure Plan is to be submitted in the Annual Environmental Reporting month specified in tenement conditions in the year specified below, unless otherwise directed by the Executive Director Resource and Environmental Compliance Division, Department of Mines, Industry Regulation and Safety. The Mine Closure Plan is to be prepared in accordance with the Department's "Guidelines for Preparing Mine Closure Plans": **[MTSD: Standard Condition 578]**
    - 2023
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– END OF REPORT –

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