

**VEGETATION CLEARING PERMIT APPLICATION  
SUPPORT INFORMATION  
MINJAR GOLD PTY LTD**



**December 2018**

**APPLICATION FOR A CLEARING PERMIT (PURPOSE PERMIT) FOR THE  
MINJAR GOLD PROJECT**

**SOUTH MURCHISON REGION, WESTERN AUSTRALIA**

**Bugeye M59/420, M59/497, L59/61**

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## 1 BACKGROUND INFORMATION

### 1.1 OWNERSHIP

The Minjar Gold Pty Ltd (Minjar) tenements are located approximately 70 km south east of Yalgoo, within the boundaries of the de-stocked Badja and Warriedar Stations, in the central Tallering district of the Yalgoo Bioregion of Western Australia. Minjar holds tenements covering approximately 1,700 km<sup>2</sup>. Several prospects have previously been operated to mine gold. The Bugeye prospects is the subject of an expansion proposal and will require a Vegetation Clearing Permit (VCP) (Table 1-1).

Tenement Holder: Minjar Gold Pty Ltd  
 ACN 119 514 528

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 West Perth, WA 6005

**Table 1-1: Relevant Minjar Gold Project Tenements**

Prospect name	Tenement Numbers	Holder
Bugeye	L59/61	Minjar Gold Pty Ltd
	M59/420	Minjar Gold Pty Ltd
	M59/497	Minjar Gold Pty Ltd



1.2 PROJECT OBJECTIVES

The existing resource in Bugeye pit has been reviewed and a cutback proven economical to mine. The design involves cutting back the existing pit approximately 30m on the west side and slightly less on the east side (Figure 1). The pit is planned to be deepened by ~ 14m (from 330mRL to 316mRL) in the south end of the cutback section and ~ 32m (from 318mRL to 286mRL) in the northern section. The final cut-back pit dimensions are ~ 465m in strike length (north-south), ~ 185m width (east-west) and ~ 78m (286mRL) depth.

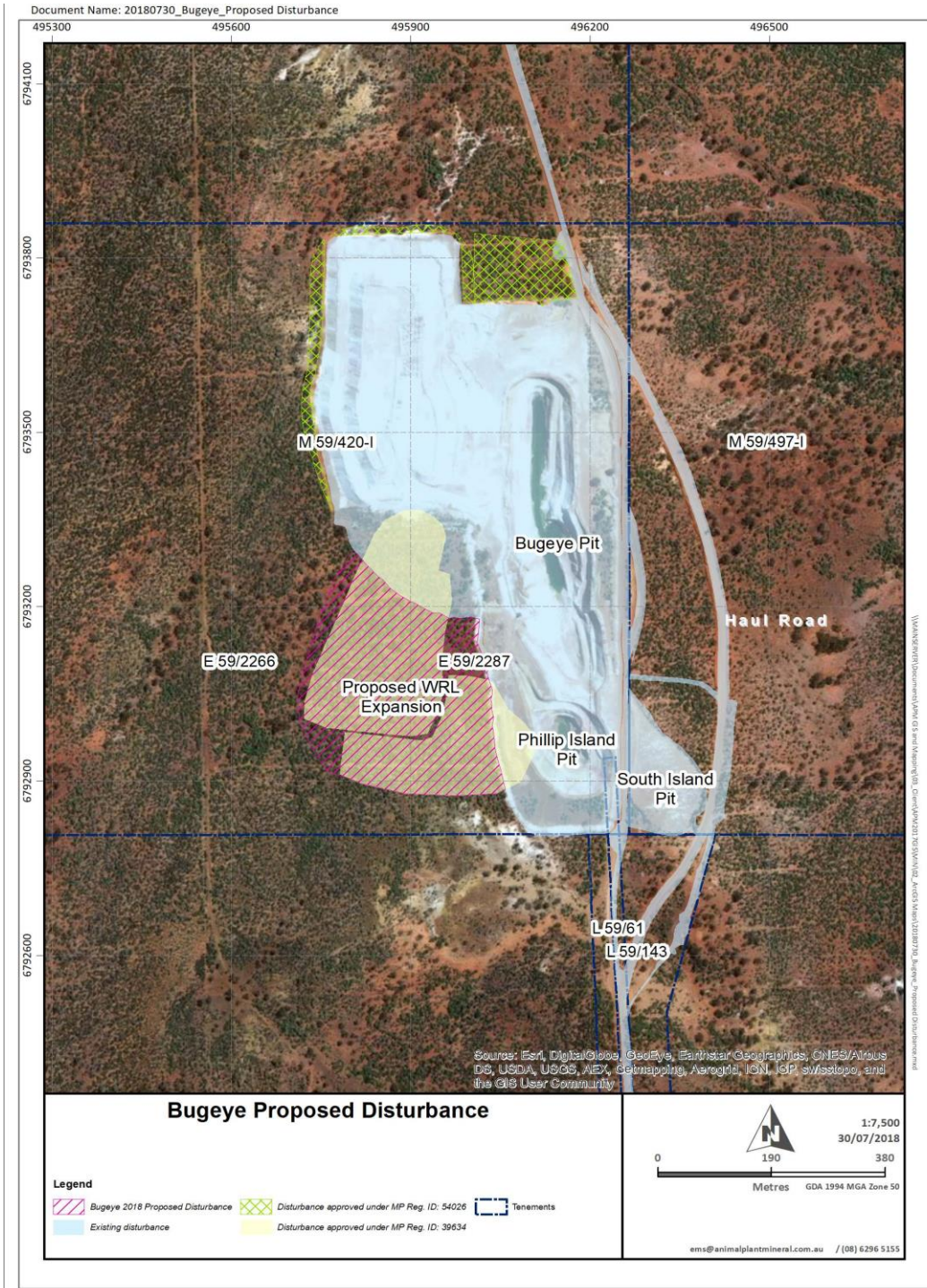


Figure 1-0: Bugeye Proposed Disturbance 2018

A total of 830,000m<sup>3</sup> is planned to be mined from the cutback. This comprises 193,819 tonnes of ore at a grade of 1.46 g/t and Specific Gravity of 2.2, leaving approximately 742,000m<sup>3</sup> of waste rock mined from the pit to be managed. A new waste dump will be developed immediately to the south of the existing dump, in the area designated by Reg. ID: 39634 and refined in Reg.ID: 75413 (Figure 1). It is planned that approximately 313,600m<sup>3</sup> of the waste will be backfilled. The northern section of Bugeye pit and the South Island pit have been sterilised of economic gold resources and are planned to be backfilled with this waste.

Existing cleared areas surrounding Bugeye pit plus the bypassed section of haul road will be utilised for ore handling (ROM) and laydown areas. Vegetation clearing will be limited to the expansion of the Bugeye WRL footprint.

### 1.3 LOCATION AND SITE LAYOUT PLANS

The Minjar Gold Project is located in the South Murchison region of Western Australia, 500 kilometres (km) northeast of Perth and approximately 70 km south east of Yalgoo. The Minjar tenement package runs in a strike line over 40 km in an approximately north south direction. The Badja and Warriedar pastoral leases underlie the tenements. Badja Station is owned by Greg and Cindy Payne and is being run as an active pastoral station. Warriedar Station is under the management of the Department of Biodiversity, Conservation and Attractions (DBCA) and has been destocked. Figure 1-1 further outlines the location of the Minjar Gold Project.

Figure 1-2 shows the project layout of the Minjar Gold Project. The prospect of relevance to this VCP application is Bugeye, at UTM 50J, 496000E, 6793500N.

M1 is an existing pit that is not planned for expansion, however adjacent to M1 is the Minjar Gold Project site office, processing plant, tailings storage facility, fuel farm, process water pond, groundwater production bore and workshop, core shed, landfill and camp facilities.

***This document supports the VCP application for the Bugeye deposit only.***



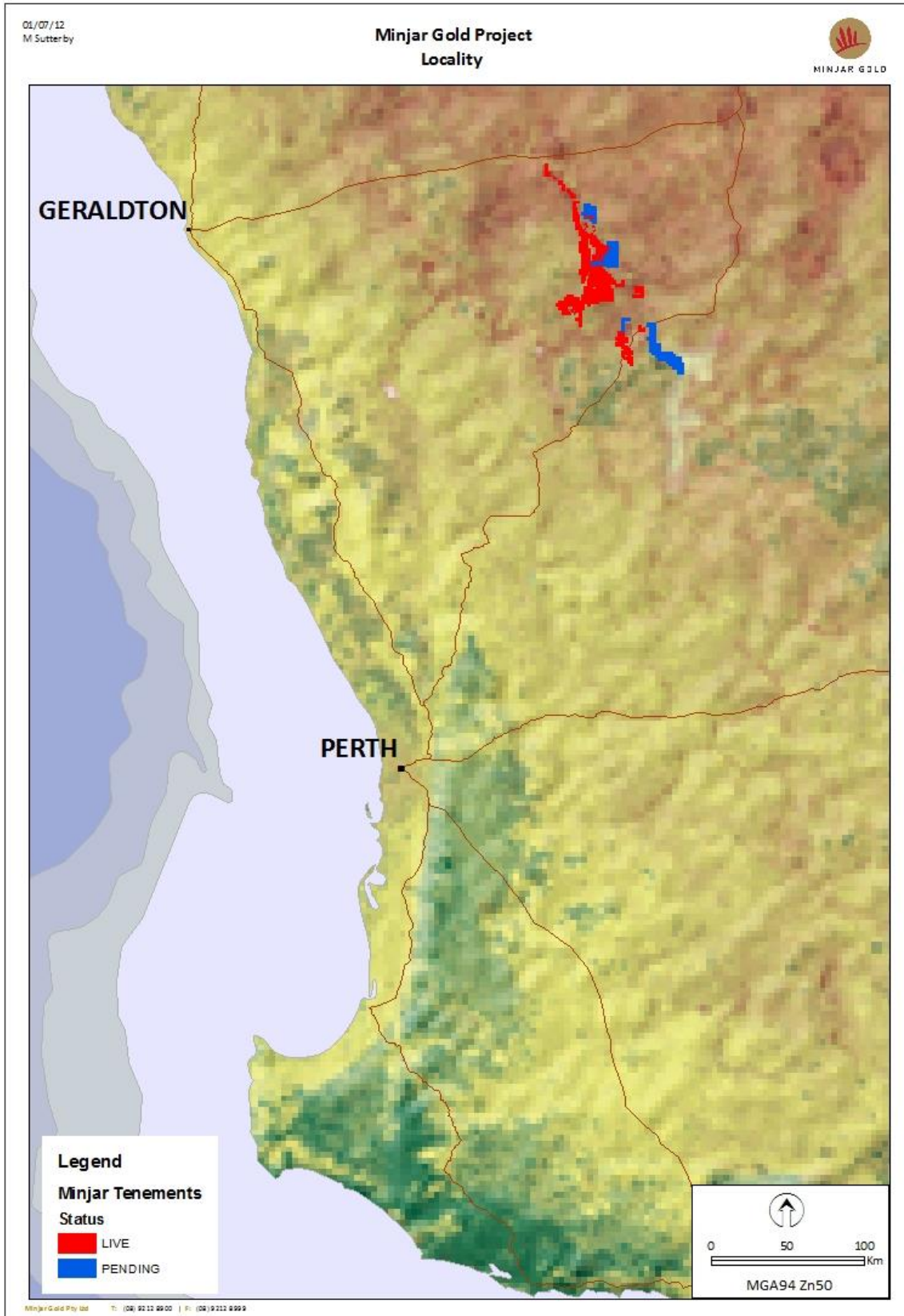


Figure 1-1: Locality of Minjar Gold Project



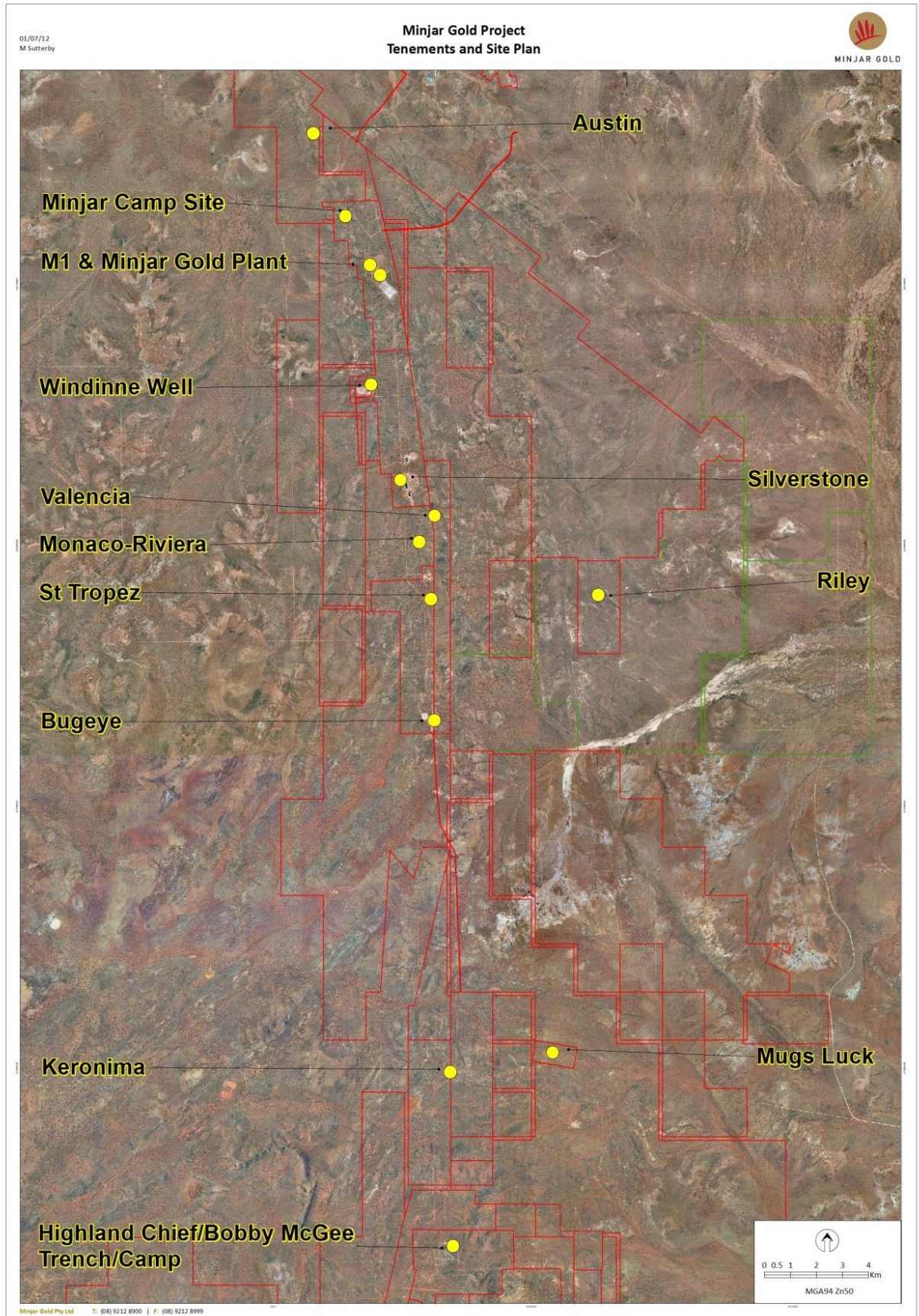


Figure 1-2: Minjar Gold Project Site layout

#### 1.4 HISTORY

The Minjar Gold Project tenements were first systematically explored by Normandy Exploration in the late 1980's and 1990's, with Gindalbie Gold N.L purchasing the project in December 1999. Gindalbie Gold N.L formed the operating company Minjar Gold Pty Ltd and constructed a 500,000 t/annum carbon in leach (CIL) treatment facility in 2000 (later expanded to 650,000 t/annum) and supplied ore from a series of mid-sized open-pits along a strike length of 15 km between December 2001 and June 2004.

The plant reverted to care and maintenance between July 2004 and July 2006 at which time Monarch Gold Mining Pty Ltd acquired Minjar Gold Pty Ltd. The project remained under care and maintenance and Minjar Gold Pty Ltd was purchased by Golden Stallion Resources in March 2009. The Minjar project operated for a number of months during 2010 after which it again went under care and maintenance and was sold to Shandong Tianye Group.

Since this change in ownership, exploration activities across the Minjar tenements have been ongoing to meet the minimum expenditure required by the Department of Mines, Industry Resources and Safety (DMIRS). Significant resource definition drilling was undertaken during 2011 and 2012, pit and waste dump designs were developed and environmental approvals sought. In 2013 the project recommenced operations and have operated continually since that time.

#### 1.5 MINING OPERATIONS

Minjar aims to carry out mining operations with minimal environmental impact. Expansion of the existing Bugeye pit will require both mining from surface and deepening of existing excavations.

The pit cutback will be developed with a standard truck and excavator process in an open pit environment. There is no underground mining proposed. The mining will take place via a mining contractor and the fleet will consist of an excavator (110 T class), and a fleet of dump trucks (85 T class). These will be supported by 35 tonne dozers and 12 tonne graders, over the life of the project.

The mineralisation consists of laterite overlying oxide ore with a varying weathering profile. The proposed method for detail definition and mining of the ore body is as follows.

- (a) After clearing and grabbing the pit area, grade control on the laterite cap will be carried out to a depth of approximately 10 metres.
- (b) Production drilling will follow in a pattern suitable for fracture blasting to a depth of 5 metres.
- (c) Mining of laterite ore will be selective and shall be in 2.5 metre flitches. Waste laterite material may be bulk mined where applicable.
- (d) Grade control of the underlying oxide will be carried out using angle RC drill holes on a 5 metre x 8 metre (along strike) pattern. Grade control drilling will delineate ten mining benches each of 2.5 metre thickness.
- (e) Production drilling and blasting will be carried out on both ore and selected waste in order to loosen the material. Ore may need to be blasted separately from waste.



- (f) Ore and waste will be mined in 2.5 metre flitches. Ore will be selectively mined working from a hanging wall to footwall so that the face angle approximates the boundary dip direction.
- (g) The minimum mining width of ore will be 4 metres.

Mining will be conducted on a 24 hour basis all year round. The ore will be stockpiled on a temporary ROM pad at Bugeye and then transported to the M1 plant ROM pad via road train along the existing haul road.

Ore will be fed into the existing Carbon in Leach (CIL) plant at M1. The finished product, gold bars, are smelted at site and held in a secure room until transported to Perth.

## 1.6 EXISTING FACILITIES

The Project contains existing facilities on Mining Lease M59/406 to support mining operations and enable processing of ore:

- Process Facility including ROM pad; crushing, grinding, gravity concentration, CIL, elution and gold recovery;
- Tailings Storage Facility and monitoring bores;
- Raw water supply pipelines and process water pond;
- Laboratory, warehouse, sample store, reagent storage;
- First Aid room and Ambulance;
- Administration and contractor offices;
- Workshop, maintenance area, carpark, heavy vehicle parking / unloading;
- Core yard, laydown area;
- Bunded fuel storage;
- Accommodation (camp), kitchen, dry and wet mess, games room, gym;
- Reverse Osmosis water treatment facility; and
- Sewage treatment and effluent water evaporation pond;

This infrastructure has all been approved under previous MPs and NOIs.

## 2 EXISTING ENVIRONMENT

### 2.1 REGIONAL SETTING

The proposed Bugeye expansion area is on land previously used for pastoral activity on Warriedar Station. Grazing ceased some time ago and the Warriedar pastoral lease is now managed by the Department of Biodiversity, Conservation and Attractions (DBCA).

The greater Yalgoo region has a long history of exploration and mining. The sites are essentially loamy low slopes and flats with adjacent low stony or gravelly hills that have occasional exposures of rocks on their summits. The division between the flats and the low stony slopes is gradual in many cases. There are almost no developed drainage lines and drainage is by sheet flows. Some low-lying areas hold water after rain. These areas have the most clayey soils.

### 2.2 GEOLOGY AND SOILS

#### 2.2.1 Regional and Local Geological Settings

The Minjar Project is located within the Yalgoo-Singleton Greenstone Belt in the Southern Murchison Province of the Yilgarn Block of Western Australia. The Greenstone Belt strikes approximately north-south and comprises a sequence of variably foliated Archaean sedimentary and volcanic rocks.

The fold belt is a tectonic unit of supracrustal rocks bounded by intrusive granitoid batholiths. It is characterised by heterogeneous deformation, with narrow zones of high strain separating more weakly deformed zones. Metamorphic grade is greenschist facies. The Windaning and Mouggooderra Formations are the main supracrustal sequences identified within the tenements. The greenstone belt contains a number of regional scale shear zones, some of which are associated with mineralisation.

The Western Australian Department of Agriculture and Food (DAF) described the land system of the area as the Tallering Land System which is comprised of prominent ridges and hills of banded ironstone, dolerite and sedimentary rocks supporting bowgada and other acacia shrublands (Van Vreeswyk et al., 2004).

#### 2.2.2 Minjar Deposit Geology

The tenement group covers an approximately north-south striking sequence of Achaean supracrustal, sedimentary rocks, felsic volcanoclastic and volcanogenic rocks, intrusive mafic rocks, and basal granitoid, which lie on the limbs of a shallowly southward-plunging regional syncline.

The Mouggooderra and Windaning Formations are the only two supracrustal sequences of the Murchison Supergroup identified within the tenements. The conglomerates, lithic arenites and shales of the Mouggooderra Formation unconformably overlie the jaspilitic Banded Ironstone Formation (BIF), chert and felsic volcanic, volcanoclastic and volcanogenic rocks of the Windaning Formation. The eastern and western unconformable contacts of the Mouggooderra Formation are currently interpreted to be shear and/or thrust zones. The relative sense of movement along these structures is currently thought to be dominantly dip slip.

The supracrustal sequence is intruded by thick packages of subconcordant to concordant, differentiated, mafic/ultramafic sills. The intrusive suite attains its maximum surface width of

approximately 4 km to the south of M59/420. The suite intrudes the supracrustal sequence at two stratigraphic levels; at the unconformable contact of the Mougooderra and Windaning Formations, and along the basal contact of the Windaning Formation with the Western granitic basement.

### 2.2.3 Soils

The profile of topsoil and subsoil layers throughout the Minjar Gold Project, based on depth below the surface, can be characterised by:

- Topsoil Surface and growth medium to 0.9 m depth
- Surface Caprock 0.9 m to 1.7 m depth
- Upper transported cover 1.7 m to 3.8 m depth
- Lower Transported cover 3.8 m to 14 m depth

This profile is well exposed in existing pits as well as in RC drill chips from the 2009 resource definition drill program. The following sequence of photographs (

Figure 2-1) illustrates the sub-surface profile:





**Figure 2-1: Soil Profiles – Minjar Gold Project**

The topsoil and growth medium is light brown in colour and fine to medium in coarseness. The soil is equigranular and particles are well rounded due to extensive windblown erosion. It is derived from weathering of the transported cover sub-layers below, as seen in the above photographic sequence. This soil type covers the entire proposed mining area and based on drilling results is continuous in thickness throughout. No other soil types are present in the area under consideration.

Based on the Unified Soil Classification System (USDS) it is classified as a medium sandy soil. Based on geochemical analyses the soil is mineral and carbon enriched and as such is classified as a Class 7 soil, suitable for vegetation regrowth when reseeded. Particle size distribution and Emmerson aggregate tests show no evidence for fines dispersion with the classification of the topsoil ranked as Category 2 (non- dispersive) with minimal sand grains of silica or gypsum developed less than 1 mm. The soil contains no hazardous chemical components

A representative sample of each of the topsoil and subsoil layers was taken and was analysed to identify possible adverse parameters. The following parameters were tested:

- pH
- Salinity
- Nutrient/trace element deficiencies
- Sodidity
- Dispersivity via particle size distribution and Emmerson Aggregate Testing (slake).
- Hazardous compound analysis
- P, N, PO<sub>4</sub>, NO<sub>3</sub> analyses to determine quality of soil.
- C:N ratio
- Multi-element analysis inclusive of Cu, Zn, Pb and Fe.

No adverse parameters were found. Below is a summary of the key findings:

- The sodicity or exchangeable sodium percentage of the soils is indicative of a mineral enriched soil that with correct replacement during rehabilitation will ensure re-growth of the native vegetation after reseeded.
- Carbon analyses for the C:N ratio indicated the topsoil was rich in carbon and classified as a Class 7 soil, suitable for the support of native vegetation regrowth after reseeded.
- The soils and sub-layers have no extreme alkaline or acid readings and have total dissolved salts within guidelines.
- The particle size distribution and Emmerson aggregate tests show no evidence for fines dispersion with classification of the topsoil and sub-layers ranked as Category 2 (non-dispersive) with minimal sand grains of silica or gypsum developed less than 1 mm. The resultant dispersive flake, using the Emmerson aggregate test, was classified as a Class 7 soil (non-dispersive).
- The multi-element geochemical analyses for each rock suite highlighted no potentially hazardous compound quantities (Mercury, Arsenic, Uranium, Fluorine or Selenium).
- Phosphorous, Nitrate and Phosphate levels were typical for soils in the region and indicated the soil had no unique characteristics or element traces that would need special consideration in rehabilitation processes.

**Table 2-1: Topsoil analyses**

	C	Cu	EC	Fe	N-Kjel	N-NO3	P	P-PO4	Pb	pH	TDSCon	Zn
UNITS	%	mg/Kg	mS/cm	mg/Kg	mg/Kg	mg/Kg	ppm	mg/Kg	mg/Kg	NONE	mg/l	mg/Kg
METHOD	Ind/IR	K/OES	W/METER	K/OES	/VOL	W/COL	A/OES	W/COL	K/OES	W/METER	/CALC	K/OES
RESULT	0.43	15	0.03	47402	210	X	266	0.09	20	5.5	84	12

**Table 2-2: Sub layers – Sodicity results**

WASTE ROCK TYPE	ESP %
CAPROCK	28.51
COVER TOP	31
COVER BOTTOM	30.74

**Table 2-3: Sub layers – Salinity and pH results**

WASTE ROCK TYPE	EC	pH	TDSCon
CAPROCK	0.09	6.6	267
COVER TOP	0.06	7.7	174
COVER BOTTOM	0.12	7.3	372

**Table 2-4: Analyses for hazardous compounds**

WASTE ROCK TYPE	As	F	Hg	Se	U
UNITS	ppm	ppm	ppm	ppm	ppm
CAPROCK	26	165	0.05	0.55	1.67
COVER TOP	22	243	0.09	0.38	1.63
COVER BOTTOM	76	165	0.08	1.34	2.31

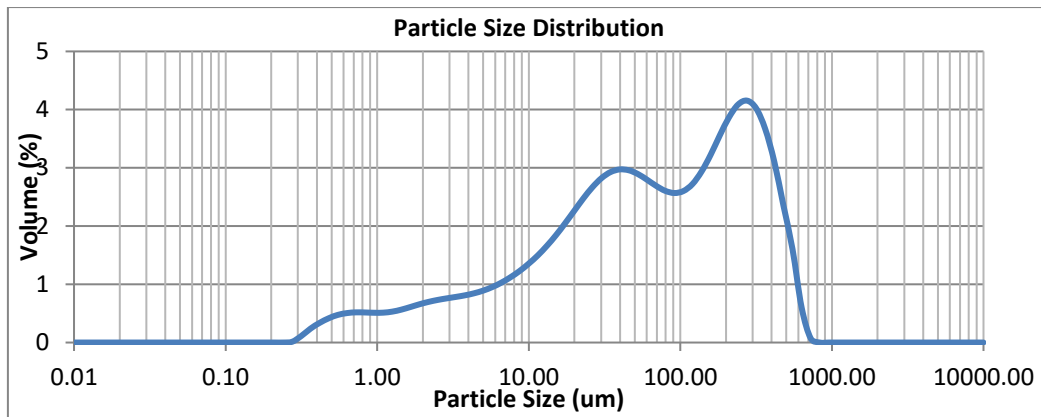


Figure 2-2: Particle Size Distribution for the Topsoil

## 2.3 FLORA AND FAUNA

### 2.3.1 Regional Vegetation

Mapping for the Interim Biogeographic Regionalisation for Australia (IBRA version 6.1) programme placed the Minjar Gold Project area in the Yalgoo Bioregion. Yalgoo extends westwards to the boundary of the South-West Botanical Province and includes the Toolonga Plateau of the Southern Carnarvon Basin. This region is an interzone between the South-western and the Murchison Bioregions and is characterised by *Callitris* and *Eucalyptus salubris*, Mulga and Bowgada open woodlands and scrubs on earth to sandy earth plains rich in ephemerals.

The climate is a crossover of Mediterranean influences from the south and semi-arid to arid and warm influences from the north. Acacia shrublands and Acacia forest and woodland dominate cover, estimated at 61 and 21 percent respectively. Hummock grasslands, Chenopod/samphire shrublands, and Eucalypt woodlands are also represented in lesser quantities. The Australian Native Vegetation Assessment (2001) estimates that 97.9% of pre European native vegetation cover persisted to 1997 in the Yalgoo Bioregion.

Known special features of the Yalgoo Bioregion include:

- Talling Peak Ironstone and jaspilite range (Priority Ecological Community – Priority 1) – unique landform and vegetation complexes. For example *Eriostemon sericeus* and *Thryptomene decussata* low shrublands.
- Banded Ironstone Mt Gibson ranges (Priority Ecological Community – Priority 1). Contains a significant number of endangered flora.
- Warradagga Rock. Granite outcrop with endangered flora and invertebrates in ephemeral ponds.
- Mt Singleton Ranges. Number of endangered flora with some unusual vegetation types.

None of these special features appears within the proposed Bugeye disturbance area.

The Biodiversity Audit of Western Australia (CALM, 2003) describes the conservation reserve of Yalgoo as mainly to the northern end of the group of tenements (Toolonga Nature Reserve), however since the production of that report the Badja, Warriedar and Lochada

Stations, surrounding Minjar Gold Project, have been de-stocked with the intention of future addition to the Western Australian Conservation estate. The White Wells Station has also become the Charles Darwin Conservation Reserve.

The Rangeland Land System Mapping for Western Australia dataset (DAF 2009) was consulted to further facilitate a broad assessment of the regional representation of vegetation that occurs in the study area. A land system is defined as 'an area or group of areas, throughout which there is a recurring pattern of topography, soils and vegetation' (Christian and Stewart 1953). Payne *et al.* (1998) mapped seven land systems within the Minjar Gold Project area:

**Watson:** Hills, rises and gravelly plains on sedimentary rocks supporting *Acacia ramulosa* shrublands with non-halophytic undershrubs

**Singleton:** Rugged greenstone ranges with dense *Casuarina* and *Acacia* shrublands

**Graves:** Basalt and greenstone rises and low hills, supporting *Eucalyptus* woodlands with prominent saltbush and bluebush understoreys

**Waguin:** Low breakaways with short stony and sandy plains, supporting *Acacia* shrublands and minor halophytic shrublands

**Moriarty:** Low greenstone rises and stony plains supporting halophytic and *Acacia* shrublands with patchy *Eucalyptus* overstoreys

**Illaara:** Gravelly plains supporting *Acacia aneura* – *Casuarina* shrublands

**Tealtoo:** Level to gently undulating loamy plains with fine ironstone lag gravel supporting dense *Acacia* shrublands

### 2.3.2 Site Specific Botanical Surveys

Multiple field and desktop assessments have been conducted since the commencement of the Minjar tenement package. Relevant reports are listed below in Table 2-5.

**Table 2-5: Relevant vegetation and flora survey reports**

Author	Surveyed areas	Scope	Month of Field Work	Year
Animal Plant Mineral	Austin, M1, Windinne Well, Silverstone, Bugeye, Highland Chief	Level 2 'detailed' survey according to Environmental Protection Authority Guidance Statement No. 51 on terrestrial flora and vegetation surveys for environmental impact assessment	November	2011
Hart, Simpson and Associates	M1, Silverstone, Windinne Well, Processing Facilities, Transport Corridors	Landforms, flora, vegetation and fauna of the sites to look at the conservation values of the site and to provide information for environmental management of possible mining.	August	2000
Woodman	Monaco, Bugeye, Highland Chief, Haul Road	Survey of flora and vegetation as well as searching for Declared Rare (DRF) and Priority flora and Threatened Ecological Communities	September	2003
Woodman	Monaco, Bugeye, Highland Chief, Haul Road	Searching for and quantifying Priority flora populations within and outside of proposed disturbance footprints	September & November	2003
Gindalbie Gold	Minjar North, Monaco, Bugeye, Highland Chief, Keronima, Black Dog, Austin, Mug's Luck, Bobby McGee, Apollo, Promises, Western Corridor and Gossan Hill	Priority Flora Management Plan		2004
Woodman	Keronima, Western Corridor, Austin, Mug's Luck, Bobby McGee, Apollo, Promises	Flora and Vegetation Survey Declared Rare and Priority Flora searches TEC/PEC searches	January	2004
Ecotec	Minjar North, Monaco, Bugeye, Highland Chief, Keronima, Black Dog, Austin, Mug's Luck, Bobby McGee, Apollo, Promises, Western Corridor and Gossan Hill	Desktop Survey Priority Flora Handbook		2006
Ecotec	Simca, Ruby Lou, Desiree, Rotator, Trench	Desktop Survey Field quantification of Priority Flora	November	2006

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Author	Surveyed areas	Scope	Month of Field Work	Year
Woodman	Beryl West, Camp, Elroy, Elroy North, Trench, Bobby McGee, Lexie	Flora and Vegetation Survey Declared Rare and Priority Flora searches	May	2007
Mattiske	Bugeye Eastern Creek	Flora and Vegetation Survey Declared Rare and Priority Flora searches TEC/PEC searches	July	2009
Mattiske	Gindalbie Mine Lease Golden Grove*	Desktop assessment of field investigations of priority flora populations	-	2004
Bamford	Bugeye Sprite	Level 1 Fauna assessment (Desktop and Site) and additional targeted searches for conservation significant species within a number of proposed exploration, mining and infrastructure areas	September	2013
Terratree	Bugeye Sprite Exploration areas	Level 1 and 2 Flora and Vegetation Survey and Mapping Potential Habitat for the Threatened (Declared Rare) species <i>Stylidium scintillans</i>	September	2013
Animal Plant Mineral	Keronima and surrounding deposits	Vegetation assessment and targeted search for <i>Stylidium scintillans</i>	July	2012
Bamford	Windinne Well, South Island, Bugeye and a number of other areas within the overall project footprint	Level 1 fauna assessment and targeted searches for conservation significant species	September – October	2014
Terratree	Mug's Luck	Targeted search for <i>Stylidium scintillans</i>	July	2014
Terratree	Keronima and surrounding deposits	Targeted Search for the Threatened (Declared Rare) species <i>Stylidium scintillans</i> within Keronima project areas	July	2014



MINJAR GOLD PTY LTD APPLICATION FOR CLEARING PERMIT (PURPOSE PERMIT) SUPPORT INFORMATION

Author	Surveyed areas	Scope	Month of Field Work	Year
Terratree	Various locations within the project area	Level 1 Flora and Vegetation and Targeted Priority Flora and Malleefowl Survey	July – August	2014
Terratree	Keronima and surrounding deposits	Targeted Survey of Keronima for Malleefowl ( <i>Leipoa ocellata</i> ), Western Spiny-Tailed Skink ( <i>Egernia stokesii</i> subsp. <i>badia</i> ), and Declared Rare and Priority Flora	August	2014
Jennifer Borger Botanical Consultant	Chulaar Well area within Badja Station	Vegetation and Flora Survey of Proposed Exploration Targets at Chulaar For Minjar Gold Pty Ltd	May	2015
Terratree	TSF Cell C	Level 1 Flora and Fauna assessment and Targeted Searches for Malleefowl ( <i>Leipoa ocellata</i> ), the Western Spiny-tailed Skink ( <i>Egernia stokesii</i> subsp. <i>badia</i> ) and Threatened (Declared Rare) and Priority Flora within the proposed Tailings Storage Facility (TSF) expansion area	September	2015
Jennifer Borger Botanical Consultant	Mining tenements M 59/63 and E 59/1268-1 thirty two kilometres north-west of Paynes Find	Vegetation and Flora Survey of Proposed Exploration Targets in M 59/63 and E 59/1268-1	December	2015
Animal Plant Mineral	Gnows Nest, Target 79, Target 71, Target 73	A targeted survey was undertaken by Animal Plant Mineral (APM) to identify declared rare flora (DRF), priority flora and conservation significant fauna	August	2016

MINJAR GOLD PTY LTD APPLICATION FOR CLEARING PERMIT (PURPOSE PERMIT) SUPPORT INFORMATION

Author	Surveyed areas	Scope	Month of Field Work	Year
Animal Plant Mineral	Ground survey of three proposed drill lines, comprising 10 targets	The objective of the survey was to determine the presence/absence of: <ul style="list-style-type: none"> <li>- habitat suitable for <i>Stylidium scintillans</i>;</li> <li>- refuge habitat suitable for the Western Spiny-tailed Skink <i>Egernia stokesii</i> ssp. <i>badia</i>;</li> <li>- Malleefowl <i>Leipoa ocellata</i> mounds; and</li> <li>- Shield-backed Trapdoor Spider <i>Idiosoma nigrum</i> burrows or habitat suitable for this species.</li> </ul>	April	2017
Animal Plant Mineral	1) Sprite South, (2) Chulaar East – ‘North’, (3) Chulaar East – ‘South’, (4) Golden Eagle, (5) Shrike East, (6) Shrike west, (7) Browns Reward East and (8) Browns Reward West	The objective of the survey was to determine the presence/absence of: <ul style="list-style-type: none"> <li>• Priority and Conservation significant flora including: <i>Grevillea scabrida</i>, <i>Micromyrtus trudgenii</i>, <i>M. acuta</i>, <i>Persoonia pentasticha</i>, <i>Drummondita fulva</i> and <i>Stylidium scintillans</i>;</li> <li>• habitat suitable for <i>Stylidium scintillans</i>; and</li> <li>• opportunistic observation of Malleefowl <i>Leipoa ocellata</i> mounds</li> </ul>	May-June	2017
Animal Plant Mineral	Metters, Beryl West and E59/1332 –	Desktop survey focusing on a risk assessment to measure the potential for impact upon fauna, flora and vegetation communities of conservation significance, which may result from clearing for exploration	January	2017
Animal Plant Mineral	MUGS LUCK DEPOSIT M59/431	Threatened Flora (TF) and Priority (P) flora and conservation significant fauna habitat within M59/431. Focus species included those previously recorded within the Mugs Luck area.	September	2017
Animal Plant Mineral	Allegro North, Allenstown, Fold Nose Rothsay, Keranne E, Keronima North, Keronima North E, Keronima North W, Mugs Luck - not formally part of this report, Mugs Luck S, Mugs luck SE, Mugs Luck SW, Mugs Luck W, Riley Haul Rd	Targeted survey for Threatened (T) and Priority (P) flora in concert with recording conservation significant fauna habitat	Spring	2017

During November 2011, Animal Plant Mineral Lead Botanist Eleanor Hoy conducted a biological assessment survey designed to fulfil the criteria for a Level 1 survey according to *Guidance for the Assessment of Environmental factors (in accordance with the Environmental Protection Act 1986) Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia. (No. 51)* (Environmental Protection Authority, 2004). Searches for Declared Rare Flora (DRF) and Priority Flora along with full reconnaissance was undertaken during the survey. The report associated with this survey appears as Appendix 1 (Animal Plant Mineral, 2011).

Field surveys have not found the Minjar Gold Project proposed mining areas to host any *major* BIF, any threatened or priority ecosystems or any flora of critically endangered, endangered, or threatened status.

Additional flora and vegetation survey work has been completed by Terratree Environmental Consultants (2013), Animal Plant Mineral, and fauna survey work completed by Bamford Consulting Ecologists (2013).

### 2.3.3 Conservation Significant Flora and Vegetation

Of the areas surveyed by Animal Plant Mineral (2011), and the clearing envelope area surveyed by Terratree (2013), no DRF species pursuant to subsection 2 of section 23F of the *Wildlife Conservation Act (1950)* or plant taxa pursuant to section 179 of the *EPBC Act 1999* were found. Nor were there any Threatened Ecological Communities (TECs) observed within the survey area. A Priority Ecological Community (PEC) 'Minjar/Gnows Nest vegetation complex (Banded Ironstone Formation)' was identified within the Minjar area, near the Windinne Well area. This small BIF outcrop occurs outside the proposed disturbance and clearing areas and is some 12 kilometres from the proposed clearing described in this VCP application.

Prior surveys have identified Priority 1 status flora in restricted areas, however these populations were not located during the November survey effort. The November 2011 field survey identified one Priority 2 species and four species of Priority 3 flora in the Minjar Gold Project tenements that are the subject of this VCP application.

The priority flora identified during the November survey and their potential to be impacted is described below.

#### **Micromyrtus trudgenii** Rye MYRTACEAE (Priority 3)

*Micromyrtus trudgenii* is an erect, open shrub growing to 2m tall. This species occurs on red-brown loamy clay on the tops and slopes of hills and ridges. The Western Australian State Herbarium has at least 29 records in the collection. This species was recorded numerous times at numerous sites, commonly in conjunction with *Drummondita fulva* (P3) and often constituting a major community component on the rocky rises common to the area.

Within the 124 hectare Bugeye survey area more than 1631 *M. trudgenii* plants were found. It is expected that 70 individual plants or approximately 4.29% of the population would be impacted by the proposed 32 hectares of new clearing at Bugeye (Table 2-6).

**Table 2-6: Population locations and sizes of *Micromyrtus trudgenii* Rye (P3)**

Prospect	Estimated Population size	Percentage of population impacted by proposed clearing	Individual plants impacted by proposed clearing
Bugeye	1631+	4.29%	70

***Drummondita fulva* A.S. Markey & R.A. Meissn. RUTACEAE (Priority 3)**

*Drummondita fulva* is an erect, branching shrub from 0.5-1.5m tall. Its flowers are red and occur in September to October. This species grows on shallow, acidic soils of orange-red-brown sandy loams on clayey silts on lower to upper slopes. The Western Australian State Herbarium has more than 15 records in the collection. *Drummondita fulva* was found to comprise a major part of the understory in vegetation communities of rocky rises and skeletal soils of low slopes. Although listed as a Priority 3, this species appears to be locally abundant, particularly on rocky rises, most often in conjunction with *Micromyrtus trudgenii* (P3).

Within the 124 hectare Bugeye survey area more than 530 *D. fulva* were found. It is expected that 102 individuals or 19.24% of the population within the survey area will be impacted by the proposed 32 hectares of new clearing (Table 2-7).

**Table 2-7: Population locations and sizes of *Drummondita fulva* A.S. Markey & R.A. Meissn (P3)**

Prospect	Estimated Population size	Percentage of population impacted by proposed clearing	Individual plants impacted by proposed clearing
Bugeye	530+	19.24%	102

***Grevillea scabrida* C.A. Gardner PROTEACEAE (Priority 1)**

*Grevillea scabrida* is a densely & irregularly branched shrub, 0.6-1.5 m high. Flowers green-white/green-yellow/white in July. Herbarium collection records indicate a preference for red clay loam or stony loam in the Central Yalgoo region and into the margins of the Avon wheatbelt. This species can be found growing in semi shaded areas often beneath tall Acacia shrubs and it was also found growing beneath Eucalyptus species.

Within the 124 hectare Bugeye survey area, 280 *G. scabrida* were found. It is expected that the 222 individuals located within the survey area will be impacted by the proposed 32 hectares of clearing (Table 2-8). The species has previously been identified in the Minjar area in sparse, scattered groups of one to three individuals (APM, 2011).

In previous surveys, a total of six populations of *G. scabrida* were found within the Minjar tenements. It is estimated that between 34 and 70 individuals exist within these known populations (Mattiske, 2009).

This *Grevillea* species has been long described and considered locally numerous, but spatial distribution is restricted to the central Yalgoo bioregion and into the margins of the adjacent Avon wheatbelt. Clearing of the scattered groups of individuals is unlikely to have a negative impact on the health and vigour of the overall populations.

*Grevillea scabrida* is distributed across the southern areas of the Minjar tenement package. It has been recorded at Bugeye and Keronima tenements (Mattiske 2009d, e), Bobby McGee, Beryl West and Lexie tenements (Woodman 2007, 2007a, b), along the main haul road and Monaco tenement (Woodman 2003) and the Promises tenement (Woodman 2004).

*Grevillea scabrida* was also detected by APM at the Riley tenement, as part the 2012 survey program. At Riley it was found to be widespread throughout the haul road and prospect sections of the Riley survey area.

During 2013 Terratree made nearly 900 *Grevillea scabrida* records with a total count of 9993 individuals. These were distributed from South Island (13 km NNW), an area 2 km north of Mugs Luck, multiple locations 20-26 km south of Bugeye/South Island and 40 km SW of Bugeye/South Island.

**Table 2-8: Population locations and sizes of *Grevillea scabrida* C.A. Gardner (P1)**

Prospect	Estimated Population size	Percentage of population impacted by proposed clearing	Individual plants impacted by proposed clearing
Bugeye	280	79.28%	222

***Allocasuarina tessellate* C.A. Gardner CASUARINACEAE (Priority 1)**

Eighteen records of *Allocasuarina tessellata* (P1) with a total of 351 individuals have been recorded at the Bugeye/South Island deposit and in adjacent survey locations by Terratree in 2013 and 2014. One hundred and two individuals occur within the proposed clearing envelope.

Terratree (2013 and 2014) has made a further approximately 380 records of *Allocasuarina tessellata* with a total of greater than 6250 individuals in areas to the south of the Bugeye/South Island deposit at Mugs Luck (7 records: 34 individuals)); to the south of Mugs Luck and to the east and south of the Southern Deposits (20-26 km S) 332 records, 5789 individuals); and 45 km to the SW of Bugeye/South Island (42 records, 482 individuals).

*Allocasuarina tessellata* is a dioecious shrub or tree, 3-5 m high and has been recorded as growing on loam and sand with substrate of greenstone & dolerite boulders. At Bugeye/South Island the taxa is found within the vegetation community:

S5 - Shrubland of *Dodonaea inaequifolia*, *Thryptomene costata*, *Acacia tetragonophylla* and *Hybanthus floribundus* subsp. *curvifolius* with occasional emergent *Allocasuarina dielsiana* on brown orange sandy loam granite outcropping on slopes.

While records for the *Allocasuarina tessellata* are limited, the clearing of 102 individuals within the Bugeye/South Island location is unlikely to threaten the viability of the remaining populations of *Allocasuarina tessellate* (Table 2-9).

**Table 2-9: Population locations and sizes of *Allocasuarina tessellata* (P1)**

Prospect	Estimated Population size	Percentage of population impacted by proposed clearing	Individual plants impacted by proposed clearing
Bugeye	380	26.84%	102

***Persoonia pentasticha* P.H Weston PROTEACEAE (Priority 1)**

An erect, spreading shrub from 0.4-1.8 metres high. This species has been recorded on sand or loam on the base of granite outcrops, and with yellow flowers from August to November.

*Persoonia pentasticha* is found broadly across Minjar's tenement package. It often grows as scattered individuals and small populations across a variety of vegetation communities and substrates within the broader Minjar location.

The clearing of eight *Persoonia pentasticha* is likely to have no impact on the local and regional viability of the taxa.

**2.3.4 Vegetation Units (Community Types)**

The vegetation of the survey area encompasses a range of community types related to landscape, soils and disturbance. The descriptions presented here are reproduced from the most recent sources listed in Table 2-5 and give a greater understanding of the distribution of the flora of conservation significance encountered in the recent field survey, and in the context of ecological communities of conservation significance. Communities have been reviewed in light of the phytosociological work of Markey & Dillon (2008) in the Banded Ironstone Formation (BIF) hills of the district.

***Bugeye – Mattiske (2009a)*****EUCALYPT WOODLANDS**

**E3** Low Woodland to Low Open Woodland of *Eucalyptus loxophleba* subsp. *supralaevis* over *Eremophila pantonii*, *Acacia burkittii*, *Exocarpos aphyllus*, *Senna artemisioides* subsp. *fillifolia* and *Eremophila* spp. over *Maireana triptera*, *Rhagoddrummondii*, *Ptilotus obovatus* and chenopods on orange-brown sandy loam on flats.

*Grevillea scabrida* was located within vegetation community of E3. This species was recorded to occur in a small population of woodland that is considered to be in very good condition.

**E4** Low Open Woodland of *Eucalyptus loxophleba* subsp. *supralaevis* with *Eucalyptus striatocalyx* over *Eremophila pantonii*, *Exocarpos aphyllus* over *Tecticornia doleiformis*, *Maireana triptera*, *Maireana ?georgei*, chenopods and annuals on white-brown clay loam on flats.

**ACACIA SHRUBLANDS**

**A11** Tall shrubland of *Acacia ramulosa* var *ramulosa* with *Acacia tetragonophylla* and *Acacia burkittii* over *Scaevola spinescens*, *Senna* sp. Austin and mixed low shrubs over *Ptilotus obovatus*, *Cheilanthes adiantoides* and annuals on orange sandy loam with rock cover on flats.



- A12** Shrubland of *Acacia ?kalgoorliensis* with *Eremophila oppositifolia* subsp. *angustifolia*, *Exocarpos aphyllus* and *Hakea preissii* over *Tecticornia doleiformis* with *Scaevola spinescens*, *Rhagodia drummondii*, *Frankenia ?setosa* and *Atriplex bunburyana* on orange-brown sandy loam with rock cover on flats.
- A13** Tall shrubland of *Acacia ramulosa* var. *ramulosa* with *Acacia burkttii*, *Acacia tetragonaphylla* and *Acacia acuminata* over *Ptilotus obovatus*, mixed low shrubs and annuals on orange brown sandy loams on flats and slopes.
- A14** Tall shrubland of *Acacia ramulosa* var. *ramulosa* with *Acacia burkttii*, *Allocasuarina acutivalvis* subsp. *prinsepiana*, *Acacia sibina* and *Acacia ayersiana* over *Hibbertia arcuata* and mixed low shrubs on brown orange sandy loam with laterite pebbles on slopes.

#### SHRUBLANDS

- S5** Shrubland of *Dodonaea inaequifolia*, *Thryptomene costata*, *Acacia tetragonaphylla* and *Hybanthus floribundus* subsp. *curvifolius* with occasional emergent *Allocasuarina dielsiana* on brown orange sandy loam granite outcropping on slopes.
- S6** Shrubland of *Aluta aspera* subsp. *hesperia* and *Drummondita fulva* (P3) with *Eremophila latrobei* subsp. *latrobei* with emergent *Allocasuarina acutivalvis* subsp. *prinsepiana*, *Acacia ramulosa* var. *ramulosa*, *Grevillea obliquistigma* subsp. *obliquistigma* and *Acacia burkttii* on light brown sandy loam with laterite pebbles on laterite breakaways and ridges.
- S7** Tall open shrubland of *Melaleuca lateriflora* subsp. *lateriflora* and *Acacia burkttii* with *Eremophila oppositifolia* subsp. *angustifolia*, *Eremophila oldfieldii* subsp. *oldfieldii* and mixed shrubs over *Scaevola spinescens* and mixed low shrubs on light brown sandy loam with rock cover at the base of a laterite breakaway.

*Micromyrtus trudgenii* (P3) and *Drummondita fulva* (P3) are distributed in the community types S5 and S6.



### 2.3.5 Vegetation Condition Maps

In terms of the condition rating scale (Table 2-10) the vegetation condition ranged from Very Good (VG) to Completely Degraded (D) across the survey area (Figure 2-4: Bugeye Vegetation Condition and Location of Priority Flora). The main impacts were from old earthworks and vehicular disturbance, historic grazing from when the pastoral leases were active, current grazing by feral goats and a few minor weed incursions.

Vegetation condition, according to the modified Keighery scale (Table 2-10), was mapped using aerial photos of the areas of investigation.

**Table 2-10: Vegetation Condition Rating Scale (adapted from Keighery 1994)**

Vegetation Condition	Description
E – Excellent	Pristine or nearly so, no obvious signs of damage caused by human activities since European settlement.
VG - Very Good	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.
G – Good	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.
P – Poor	Still retains basic vegetation structure or ability to regenerate after very obvious impacts of human activities since European settlement, such as grazing, partial clearing, frequent fires or aggressive weeds.
D - Completely Degraded	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.

As feral goats prefer areas adjacent to the pits, there was an improvement in vegetation condition with increased distance from the pit. Feral goats graze and browse the vegetation, but the major contribution to declining vegetation condition comes from their propensity to knock shrubs over, breaking them at the base or pulling them out of the ground. In locations where large groups of goats frequent areas for lengthy periods, only the tall shrubs with woody stems too thick to break persist.

Extensive rehabilitation has been carried out on exploration tracks within the project area. Rehabilitation is generally done using an excavator to fill in sumps, reinstate the natural ground surface and drainage, re-spread topsoil and scarify compacted areas. Good regrowth is occurring in rehabilitated areas. The dissection of the vegetation by exploration tracks increases the edge effect and impacts the way water flows through the ecosystem.

There are very few drainage lines in these localities and surface flow of water generally occurs as sheet flow over the soil surface. The presence of ground disturbances and tracks will divert flows and may cause channelling, erosion and prohibit water from flowing. Increased canopy gaps caused by tracks also affects the air flow and temperatures experienced beneath the canopy, increasing the desiccation of vegetation in the hot dry summer months. For these reasons, even where the vegetation structure is intact, the condition of the vegetation surveyed is at best Very Good.



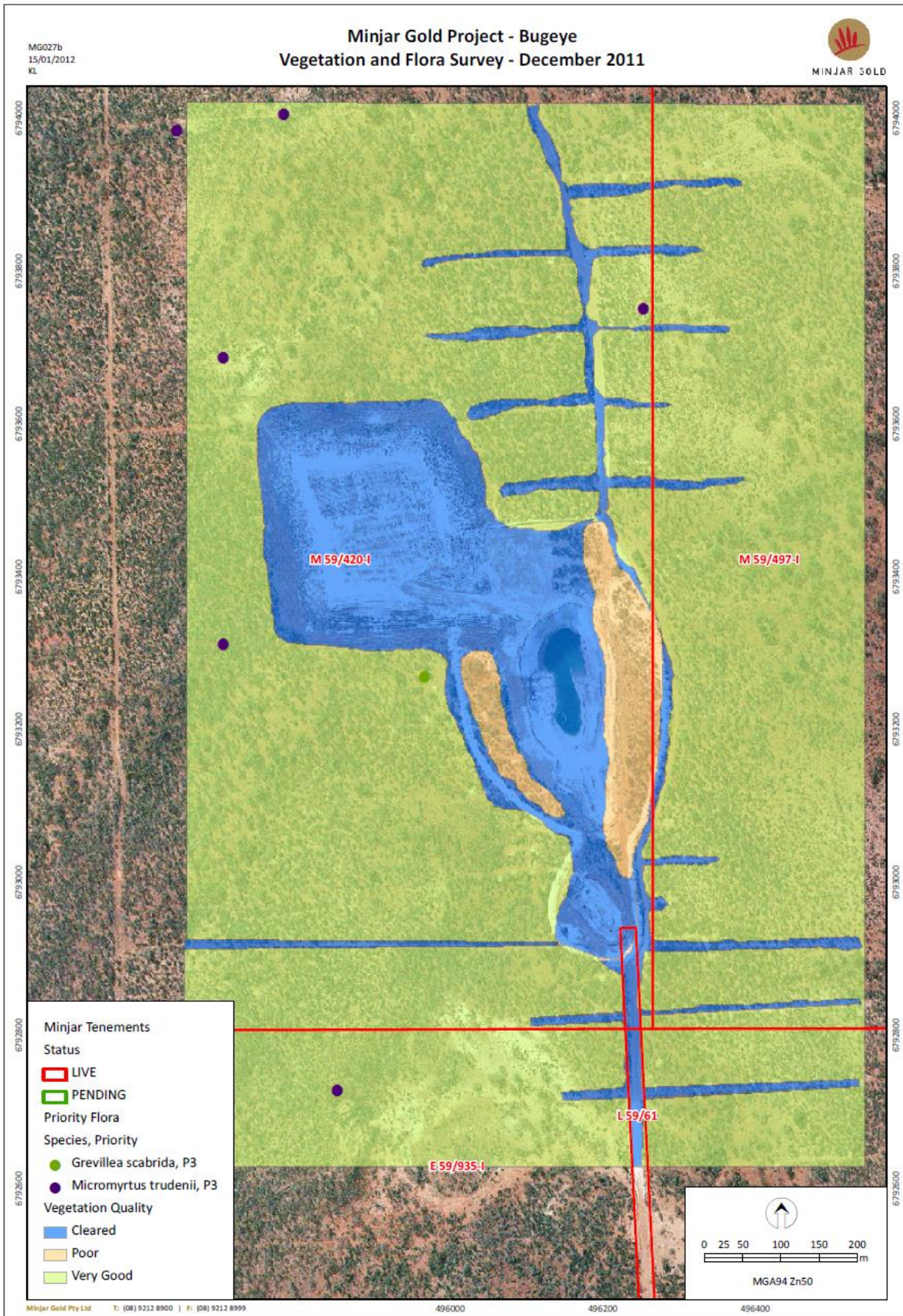


Figure 2-4: Bugeye Vegetation Condition and Location of Priority Flora

### 2.3.6 Weeds

Vegetation assessments conducted by Hart, Simpson & Associates (2000), Woodman (2003) and Mattiske (2009a-e) identified eleven invasive weed species in low numbers (Table 2-11). These were all herbaceous and grass species found mainly on disturbed ground or in wet areas. Most are pastoral weeds, roadside weeds or weeds of agricultural and urban areas.

Of the eleven identified weeds, no weeds are defined as a Declared Weed pursuant to Section 37 of the *Agriculture and Related Resources Act 1976* [WA]. These weed species are all common and widespread in the region and cannot be controlled locally in small sites. Eighty-seven species of declared weeds are listed by the Department of Agriculture and Food (DAF 2011) as potentially occurring in the Yalgoo agricultural district.

**Table 2-11: Weed species recorded at Minjar Gold Project**

Species	Family
<i>Pentstemon airoides</i>	Poaceae
<i>Emex australis</i>	Polygonaceae
<i>Cuscuta epithymum</i>	Cuscutaceae
<i>Sonchus oleraceus</i>	Asteraceae
<i>Hypochaeris glabra</i>	Asteraceae
<i>Cotula turbinata</i>	Asteraceae
<i>Arctotheca calendula</i>	Asteraceae
<i>Mesembryanthemum nodiflorum</i>	Aizoaceae
<i>Monoculus monstrosus</i>	Asteraceae
<i>Erodium cicutarium</i>	Geraniaceae

### 2.3.7 *Stylidium scintillans* targeted search results

No individuals, populations or potential habitat for Declared Rare Flora (DRF) *Stylidium scintillans* (T) were found within the revised clearing envelope when surveyed by Terratree in 2013.

Potential habitat was found approximately 120 metres to the north of the revised permit application area at the Bugeye WRL. It must be noted that no individuals or populations of *Stylidium scintillans* were located during the survey. With a 50 metre buffered area around the potential habitat, the revised permit application area remains outside of a potential Environmentally Sensitive Area (ESA) (see Figure 2-5).



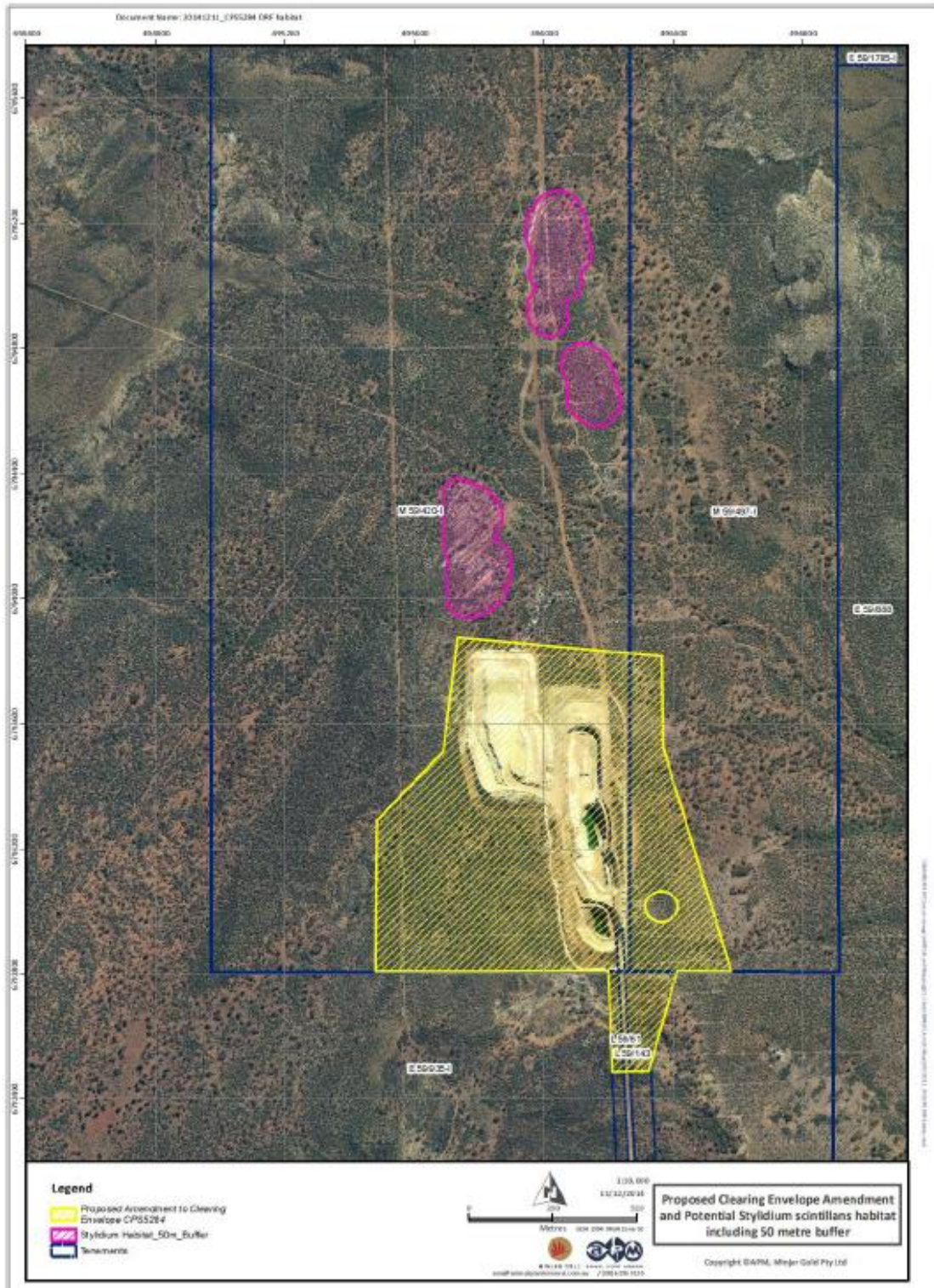


Figure 2-5 Potential *Styliidium scintillans* habitat (with 50 metre buffer) in relation to the Proposed Clearing Envelope Amendment

### 2.3.8 Shield-backed Trapdoor Spider Impacts

The original assessment of CPS 5824/1 considered a habitat risk assessment relating to potential impacts on *Idiosoma nigrum* (Shield-backed Trapdoor Spider). In 2013 Bamford Consulting Ecologists conducted targeted surveys for the Shield-backed Trapdoor Spider over broad areas of the Minjar tenement package including quadrats at South Island.



Utilising Bamford’s report and relevant vegetation community mapping, APM calculated suitable habitat at Minjar deposits (Table 2-12).

**Table 2-12: Summary workings for calculating potential populations of Shield-backed Trapdoor Spiders in the Minjar Gold tenement area**

Deposit	Suitable Habitat (ha)	Total Vegetation Mapping Area (ha)
Mugs Luck	76.00	92.23
Highland Chief	576.00	818.00
Austin Haul Road	0.07	25.14
Bug Eye	56.07	123.48
M1	35.12	183.00
Keronima	24.19	184.39
Monaco	81.10	191.79
Silverstone	41.64	332.00
Windinne Well	21.42	89.03
Austin	23.34	98.00
<b>Total</b>	<b>934.95</b>	<b>2137.06</b>

Workings to Calculate Spider Populations		
Minjar Total Tenement Area		140,000 .00
Proportion of Total Vegetation Area Mapped that is suitable for Shield-backed Trapdoor	934.95 / 2137.06	44%
Hectares Suitable Habitat	.44 x 140,000	61,249.10
Number of Spiders per Hectare	As per Bamford result (mean)	236.00
<b>Total Spiders</b>	<b>61,249.10 x 236</b>	<b>14,454,787</b>

At South Island, Bamford undertook surveys of five quadrats and calculated a population of 380 spiders per hectare applied to the 28 ha South Island survey target.

Utilising vegetation community mapping for the Bugeye/South Island clearing permit application area it has been found that there is approximately 50.54 ha of potential Shield-backed Trapdoor Spider habitat.

Considering that the application remains for 32 ha of permitted clearing within the application area, the potential impact to Shield-backed Trapdoor Spiders is the potential loss of 12,160 individuals (380 spiders per ha x 32 ha utilising the higher than mean Shield-backed Trapdoor Spider population data from South Island).

### 2.3.9 Fauna

The Minjar tenement package is comprised of four broad fauna habitat types; *Eucalyptus* woodlands, *Callitris* woodlands, *Acacia* shrublands and Mixed shrublands. A total of 114 bird species, 34 species of reptile, 8 mammal species and 3 amphibians have been recorded within a 40km radius of the Bugeye area which is the middle of Minjar prospects (See Appendix 2 for complete list). Various assemblages of these species will occur in the proposed clearing areas. However, different habitats support different species assemblages and over the extent of Minjar Gold tenements no single species or distinct population of species is likely to be

impacted to the point where it cannot recover. For a comprehensive discussion of fauna expected in Minjar tenements, refer to Bamford, 2003 (Appendix 3).

Relevant species listed as being threatened or of conservation significance under the *EPBC Act 1999* or the *Wildlife Conservation Act 1950* or that are on the DEC Priority and Threatened Species list are shown in Table 2-13.

**Table 2-13: Fauna of conservation significance recorded in Minjar Project areas**

Potentially Occurring Species (based on known distributions and available habitats)	Documented Occurrence (Coords 116°58'00"E, 28°59'39"S)		Conservation Status		
	NatureMap (40km radius)	Atlas of Living Australia (20km radius)	Commonwealth (EPBC Act)	State (Wildlife Act)	DEC (Priority Status)
<b>Mammals</b>					
<i>Macropus irma</i> Western Brush Wallaby	✓				P4
<b>Reptiles</b>					
<i>Cyclodomorphus branchialis</i> Slender Blue-tongue	✓			Schedule 1 (Division 3)	
<i>Egernia stokesii</i> subsp. <i>Badia</i> Western Spiny-tailed Skink	✓		Endangered	Schedule 1 (Division 3)	
<b>Birds</b>					
Australian Bustard <i>Ardeotis australis</i>		✓			P4
Crested Bellbird <i>Oreica gutturalis</i> subsp. <i>gutturalis</i>	✓	✓			P4
White-browed Babbler <i>Pomatostomus superciliosus</i> subsp. <i>ashbyi</i>	✓	✓			P4
Major Mitchell's Cockatoo <i>Cacatua leadbeateri</i>		✓		Schedule 4 (Division 1)	
Malleefowl <i>Leipoa ocellata</i>	✓	✓	Vulnerable/ Migratory Terrestrial		
Night Parrot <i>Pezoporus occidentalis</i>	✓		Endangered	Schedule 1 (Division 2)	
Masked Owl <i>Tyto novaehollandiae</i>	✓				P3
Rainbow Bee-eater <i>Merops ornatus</i>	✓		Migratory Terrestrial		

The only mammal of conservation significance recorded in the NatureMap search area was the Western Brush Wallaby, *Macropus irma* (P4). Optimum habitat for Western Brush Wallaby is open forest or woodland, particularly favouring open, seasonally wet flats with low grasses

and open scrubby thickets. It is also found in some areas of mallee and heathland. There are no seasonally wet flats within the Minjar prospects proposed for clearing. It is expected that habitat at the Minjar prospects would not generally be suitable for Western Brush Wallaby.

Two reptiles of conservation significance have been recorded in the NatureMap search area. These are *Cyclodomorphus branchialis* (Schedule 1 (Division 3)) and *Egernia stokesii* subsp. *badia* Western Spiny-tailed Skink (Endangered and Schedule 1(Division 3)). The *Cyclodomorphus branchialis* relies on habitat that is broadly represented in the Minjar tenements but not specifically in proposed clearing areas. Habitat for the *Egernia* occurs throughout Minjar tenements. Where suitable habitat occurs it has been identified and preserved.

Migratory marine and wetland avifauna protected under the EPBC Act as Matters of National Environmental Significance are unlikely to occur in the Minjar Project area due to lack of required habitat. Avifauna of conservation significance that have been recorded in the search area include the Australian Bustard *Ardeotis australis* (P4), Crested Bellbird *Oreoica gutturalis* subsp. *gutturalis* (P4), White-browed Babbler *Pomatostomus superciliosus* subsp. *ashbyi* (P4), Major Mitchell's Cockatoo *Cacatua leadbeateri* (Schedule 4 (Division 1)), Malleefowl *Leipoa ocellata* (Vulnerable/ Migratory Terrestrial), Night Parrot (*Pezoporus occidentalis* (Endangered), Masked Owl *Tyto novaehollandiae* (P3) and the Rainbow Bee-eater *Merops ornatus* (Migratory Terrestrial).

The Australian Bustard, Crested Bellbird, White-browed Babbler, Night Parrot, Masked Owl and the Rainbow Bee-eater are not expected to be exclusively reliant on habitat within the Minjar prospects. The Major Mitchell's Cockatoo nests in woodlands and large trees along creeklines. The proposed clearing areas do not intersect creeklines and are generally low open woodlands that do not support appropriate nesting habitat. Habitat for Malleefowl occurs throughout Minjar tenements.

The two fauna species of greatest conservation significance for the region are the Western Spiny-tailed Skink and the Malleefowl.

#### ***Western Spiny-tailed Skink (Egernia stokesii badia)***

The Western Spiny-tailed Skink is restricted to the northern Wheatbelt of Western Australia, from the Mullewa area south to Kellerberrin, with isolated records from Callagiddy on the lower Gascoyne and Dirk Hartog Island (Storr 1978).

The skink lives in small family groups and inhabits timber and rock crevices. Habitat data is available only for a few individuals of this subspecies.

Surveys undertaken for environmental impact assessments of proposed mining projects in the region have identified that the species is more common than originally thought. However, access to information on habitat requirements is not readily available in the public domain.

#### ***Habitat***

Habitat for *Egernia* at Bugeye is considered marginal. Potential habitat includes a very small rock outcrop which occurs adjacent to a dump of rock boulders. In close proximity were a number of hollow logs at the base of eucalyptus species. Trapping was undertaken at Bugeye with 20 Elliott traps set over four nights. No direct evidence or secondary evidence of *Egernia* was recorded.

### **Summary**

The Bugeye survey area has been thoroughly investigated and any areas of potential *Egernia* habitat were identified. Habitat for the species occurs in isolated pockets that are broadly distributed over the Minjar tenement package.

Sufficient targeted trapping was undertaken for *Egernia* and no direct evidence or secondary evidence was recorded. Therefore Minjar is confident that no significant impact will occur to individuals or populations of this species and no significant impact on habitat on which this species depends will occur as a result of vegetation clearing.

### **Malleefowl (*Leipoa ocellata*)**

Malleefowl are sedentary, grouping in pairs and remaining in the same area throughout the year (see Frith, 1962; Marchant & Higgins, 1993; Benshemesh, 1999; Garnett & Crowley, 2000). Over the course of a year, adult pairs may roam over an area of one to several kilometres. During the breeding season, males remain close to the nest most of the time. Individuals may display local shifts in home range between seasons or years.

Egg-laying usually starts in September and continues until mid- to late-summer or sometimes early autumn. Chicks usually begin hatching and emerging from the mound in November. Most usually emerge before January but in some seasons hatching may continue until March. Young birds disperse long distances after leaving the nest without any assistance or parental care from the adults.

The Malleefowl occupies semi-arid to arid shrublands and low woodlands dominated by mallee and associated habitats, such as broombush *Melaleuca uncinata* and native pine *Callitris* spp. scrub (Frith 1962, b; Marchant & Higgins, 1993; Benshemish, 1999; Garnett & Crowley, 2000). Malleefowl favour mallee that is long unburnt and ungrazed.

A Malleefowl mound was located at Bugeye, and further mounds have been discovered on neighbouring tenements within the Minjar Gold Project area. The Bugeye historic Malleefowl mound is more than 80 metres outside of proposed clearing and disturbance areas and therefore will not be impacted by clearing.

An inactive Malleefowl mound identified within the clearing permit application area, along with a 50 metre buffer, is to be excluded from the approved permit.

Previously this mound was at the very edge of the CPS 5284/1 clearing envelope, with no clearing proposed close to it. The revised pit design and haul road necessitate that the mound and buffer is formally excluded from the permit application area in order to comply with the Particular Manners that were applied as a result of the referral to the Department of Environment under the Environment Protection and Biodiversity Conservation Act 1999 (Cth).

The Minjar Gold Project was assessed as Not a controlled action if undertaken in a particular manner. In accordance with particular manner 2 of the decision notice (EPBC 2012/6646 referral), construction activities must not be undertaken within Malleefowl buffer zones. The buffer zone for the relevant Malleefowl mound is 50 metres.

Any active Malleefowl mounds or those that may be used in the future will be buffered and management actions put in place to prevent disturbance of the mounds where possible. Historic mound sites that have the potential to be used in the future, i.e. those that have maintained their structural integrity, must also be buffered from disturbance activities.

In order to prevent potential fatalities to Malleefowl the following management strategies will be implemented:

- Traffic speeds lowered in vicinity of historic mounds.
- Existing mounds will be surveyed annually for evidence of use.
- Avoid disturbance of any actively used mound with a buffer of 250 metres.
- Disturbance to existing but historic mounds will be avoided and buffered by at least a 50 m no disturbance zone, wherever possible.
- Where disturbance of a Malleefowl mound is unavoidable, development will be undertaken with regard to advice from the Commonwealth Department of Sustainability, Environment, Water, Population and Communities (SEWPaC) and the WA DEC.
- Malleefowl identification training to be conducted during induction.
- Sightings of Malleefowl to be recorded.
- Any discovery of previously undiscovered Malleefowl mounds to be recorded.

Significant areas of suitable Malleefowl habitat occurs outside of proposed disturbance areas within the Minjar tenements.

#### **Short Range Endemic Species**

One species of Mygalomorph spider, *Idiosoma nigrum*, was previously recorded and is identified in the NatureMap and DEC database search areas. Recent surveys found two burrows that were unlikely to be *I. nigrum* habitat, to the north west of the Bugeye prospect. These were located well outside of the proposed clearing and disturbance area.

The soil and vegetation composition of the prospects that are subject to clearing are not generally suitable for *I. nigrum* as they prefer to build their burrows in heavy clay soils in open York Gum (*Eucalyptus loxophleba*), Salmon Gum (*E. salmonophloia*), Wheatbelt Wandoo (*E. capillosa*) woodland, with Jam (*Acacia acuminata*) forming a sparse understorey. A thin layer of permanent Eucalyptus, Casuarina and Acacia litter is also required, within which the spiders forage (Main 1987). The vegetation associations and soils at Minjar prospects subject to clearing are not likely to support the *I. nigrum*.

#### **Stygofauna**

To assess the potential impacts from the proposed clearing to a subterranean fauna population (Stygofauna) that may exist, a survey was commissioned and undertaken in July 2009 by Outback Ecology (Appendix 4). Outback Ecology sampled a line of bores along the gold bearing shear horizon (20km), and tested two shallow pastoral wells and four deep water bores installed during the previous mining phases.

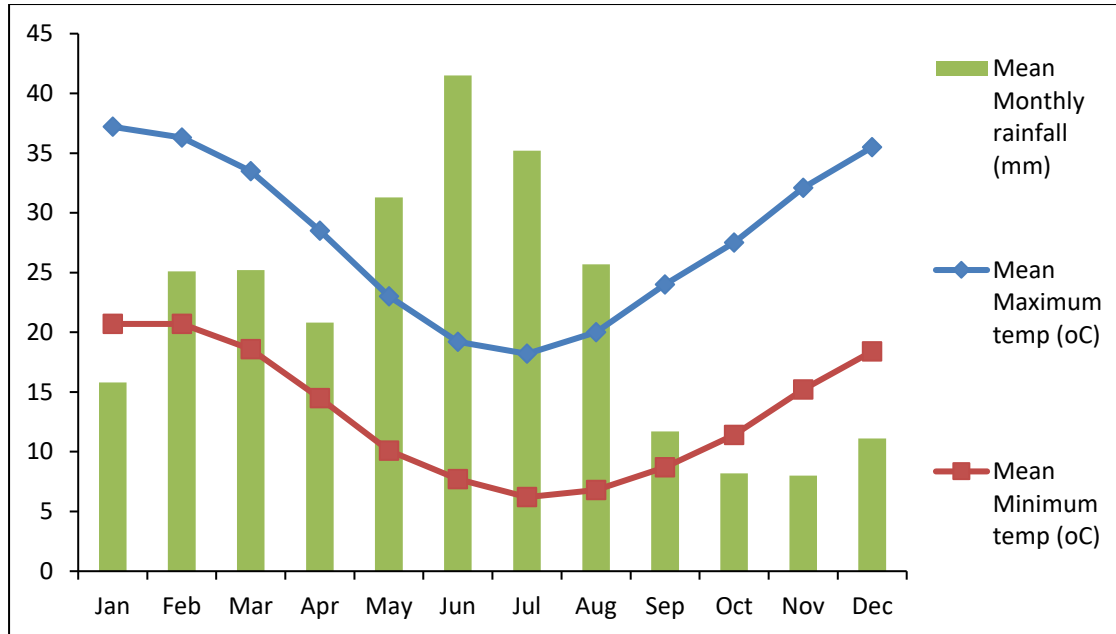
The deep bores, which struck the main shear hosted aquifer at 30 metres, contained no Stygofauna. One shallow pastoral well sampled positive for Stygofauna. On review of the hydrology and geology it was resolved that the shallow bores intersected perched, non-conductive, isolated aquifers, whilst the deep bores intersected the conductive shear hosted aquifer. It was concluded that there is no impact to the shallow alluvium based Stygofauna

population as mining will be centred on the deep shear hosted aquifer, where no Stygofauna was detected (Outback Ecology, 2009).



## 2.4 CLIMATE

The climate at Minjar Gold Project is considered arid and is described in Figure 2-6 from Yalgoo Weather Station – the closest to Minjar. Temperatures are strongly seasonal with hot summers (Dec-Feb) and cooler winters (Jun-Aug).



**Figure 2-6: Yalgoo Meteorological Data Chart**

Information accessed from [http://www.bom.gov.au/climate/averages/tables/cw\\_007091.shtml](http://www.bom.gov.au/climate/averages/tables/cw_007091.shtml)

Rainfall predominantly occurs during late summer, autumn and winter with low rainfall totals from spring to mid-summer. The long term average rainfall is 260 to 280mm per year and pan evaporation is 2,500 to 3,100mm per year.

Rainfall intensity, duration and recurrence data has been assessed from Australian Rainfall and Runoff 1988. Table 2-14 below shows intensities (mm/hr) for selected recurrence levels and storm durations.

**Table 2-14: Rainfall Intensity (mm/hr), Duration and Recurrence**

Duration	Recurrence Interval		
	1:10 yr	1:50 yr	1:100 yr
1 hr	26.0	37.0	41.9
12 hr	4.62	6.65	7.56
72 hr	1.21	1.77	2.03

## 2.5 HYDROLOGY

### 2.5.1 Surface Water

Thicker tree growth and larger trees illustrate where surface water concentrates during major rainfall events, but typically, runoff occurs as sheet wash over wide areas. The haul/access road has been designed to allow water overflow across its length, to avoid the concentration of overland flow, and as far as practical, preserve current wash conditions.

Runoff will be diverted around open cut pits, with specifically excavated drains and culverts under haul roads. The pit expansions will require earthen bunding to a minimum of 0.6m above the natural surface for the prevention of surface water sheet flows draining into the pit.

To minimise the potential for erosion of cleared areas during severe rain events, a series of strengthened water channels will be designed to divert the water into silt traps before allowing the water to flow into the shrubland.

### 2.5.2 Groundwater

The Minjar project area was subject to a detailed hydrological study, Hydrogeological Assessment of Austin, Riley, Mug's Luck, Keronima, Trench and Camp Gold Deposits for Mining Proposal, undertaken by Rockwater Proprietary Limited in August 2012 (Appendix 5).

The Bugeye pit is proposed to be approximately 70m deep and will intersect the water table at 48m below the surface. Pit dewatering from the Bugeye deposit will be utilised for dust suppression.

## 2.6 SOCIAL ENVIRONMENT

The Minjar Gold Project tenements appear within the Badja and Warriedar pastoral leases with the Bugeye tenements occurring within the Warriedar lease. Warriedar Station was destocked some time ago but retains fencing, watering points and other livestock related structures. Warriedar pastoral lease is now managed as a conservation reserve (CPL46) by DBCA.

A desktop review of archaeological and ethnographic sites was undertaken using a search of the Aboriginal Heritage Inquiry System's Register of Aboriginal sites (Department of Indigenous Affairs, 2011). Table 2-15 contains a summary of results from the search. The search shows that within the tenement areas, there are currently no Registered Sites within the meaning of Section 5 of the *Aboriginal Heritage Act 1972*. Four sites that are not registered sites but are considered heritage places occur within Mining Lease M59/420. These are outside the proposed clearing area at the Bugeye prospect.

The closest known heritage place to the proposed clearing area is Site Miop27, 0.35km from the Bugeye clearing area. Appendix 6 contains the database search including descriptions of the heritage places found.

A number of Heritage Surveys have been conducted at Minjar tenements since 2000. These are summarised in Table 2-16 below. No Heritage Sites have been found during the surveys of these tenements.

**Table 2-15: Aboriginal Heritage Inquiry System Tenement Search Summary Results**

Project area	Tenement	Site ID	Site Name	Status	Site Type	Additional info	Distance from clearing area
Bugeye	L59/61	-	-	-	-	-	
	M59/420	26801	Miop27 (Silverstone Artefacts 04)	Heritage Place	Artefacts/ Scatter	Water source Access open No restriction	0.35km
		26802	Miop29 (Silverstone Quarry 02)	Heritage Place	Quarry, Artefacts/ Scatter	Access open No restriction	0.68km
		26803	Miop30 (Silverstone Quarry 03)	Heritage Place	Quarry, Artefacts/ Scatter	Access open No restriction	0.60km
		26805	Miop31 (Silverstone Quarry 04)	Heritage Place	Quarry, Artefacts/ Scatter	Access open No restriction	4.84km
	M59/497	-	-	-	-	-	

**Table 2-16: Summary of Aboriginal Heritage Surveys Completed at Minjar Tenements**

Surveyors	Year	Survey type	Tenements	Summary
J Harris and T O'Reilly	2000	Archaeological	M1, Windinne Well, Silverstone and Bugeye, M59/406, 219, 420, 421 & 458	No archaeological sites found in the Project Area
Dr Barrie Machin with the Widi Mob, Pandawn and Badimia people	2000	Ethnographic	E59/518, M59/219-406,420,421,457 & 458	No significant heritage sites found in the Project Area

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Surveyors	Year	Survey type	Tenements	Summary
Terra Rosa and the Widi Mob	2012	Archaeological and Ethnographic	Austin L59/121, M59/457, M59/732	Many isolated artefacts found and one sites recorded. Section 18 approval sought for haul road.
			Windinne Well M59/219, M59/421	One site recorded – Rockholes. To be avoided during development.
			Silverstone/Eastern Creek M59/421, M59/458	No sites recorded
			Monaco M59/420, M59/458	No new sites recorded
			Riley Haul Road North and South L59/122 and L59/123	One site recorded in South Haul Rd route. To be avoided by using North Haul Rd route.
Terra Rosa and the Badimia People	2012	Archaeological and Ethnographic	Riley Haul Road North and South Routes, Riley, L59/122, M59/591, L59/123, Mugs Luck L59/124, M59/431, Keronima, M59/379, M59/380, Blackdog and Highland Chief, M59/425, M59/460	Rock holes found on Riley Southern Haul Rd route – determined to be an ethnographic site - not being developed.  Several isolated artefacts found near Riley Southern Haul Rd route – not being developed.
Terra Rosa and the Badimia People Trip 1	2013	Archaeological and Ethnographic	M59 / 460, M59 / 425, M59 / 425, M59 / 387, M59 / 387. New Target 2 / 20, New Target 13, New Target 17 / Hurley, Paradise city, New Target 10, New Target 16, New Target 18 / 4, New Target 14, New Target 21 and South Island	A total of six heritage places have been newly identified within three of the ten PDAs and recorded to site avoidance standard. A total of 51 isolated objects were identified
Terra Rosa and the Badimia People - Addendum to Trip 1		Archaeological and Ethnographic	M59/425-1, M59/425-1, M59/386-1, M59/425-1, M59/386-1, M59/387-1, M59/497-1, M59/386-1	A total of ten heritage places have been newly identified within five of the ten PDAs and recorded to site avoidance standard. A total of 42 isolated objects were identified
Terra Rosa and the Badimia People	2014	Archaeological and Ethnographic	Target 38, Target 64 and Fairey Well	One (1) not clear area and eleven (11) isolated objects were identified within the Target 38 survey area.

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Surveyors	Year	Survey type	Tenements	Summary
Terra Rosa and the Badimia People	2016	Archaeological and Ethnographic	Curara Kink, Curara Shear South, E58_441 and Target 31 Project Area	<ul style="list-style-type: none"> <li>135 drill holes and associated access tracks were assessed as being clear for works to proceed;</li> <li>1 drill hole (K48) was deemed not clear for works to proceed and was relocated to a clear position within the project area.</li> <li>ISOLATED OBJECTS COMPRISING BAM WERE IDENTIFIED WITHIN THE AREA; AND</li> <li>Access tracks were surveyed to a width of 10 m (5 m on either side of the centreline).</li> </ul>
Terra Rosa	2016	Desktop – Heritage assessment of archival data	Covered all survey reports and associated spatial data dating between 2000 and 2011	<p>Minjar Gold is advised that 617 km<sup>2</sup> of their tenement areas have previously been subject to heritage surveys. Of these areas:</p> <ul style="list-style-type: none"> <li>33.44 km<sup>2</sup> has been surveyed, with high confidence in the survey results;</li> <li>508.43 km<sup>2</sup> has been surveyed, with moderate confidence in the survey results; and</li> <li>75.85 km<sup>2</sup> has been surveyed, with low confidence in the survey results.</li> </ul> <p>These survey areas should be archived (also see item 2, below).</p> <p>Minjar Gold is advised that 32 HRZs have been previously identified within the surveyed areas, but insufficient information exists regarding their associated heritage values. Subsequently, these HRZs have not been sufficiently quantified to allow any fair assessment to be made under sections 5 or 39 of the Act.</p> <p>It is recommended that, depending on their project requirements, Minjar Gold arrange for archaeological and ethnographic site avoidance or site identification level assessment of these HRZs to occur to better define their values under sections 5 and 39 of the Act.</p>
Terra Rosa and the Badimia People	2017	Archaeological and Ethnographic	M59/420, M59/497	As a result of the heritage survey: Zero DAA registered Aboriginal sites were identified; Zero DAA OHPs were identified; and Zero newly identified heritage places were recorded to site identification standard. One isolated object comprising BAM was also recorded within the survey area..

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Surveyors	Year	Survey type	Tenements	Summary
		Archaeological and Ethnographic	Allegro, Black Jack East, Windinne Pit South, Curara Kink E59/1199, M59/431, E59/1329, M59/421, E59/1775, M59/233	"Project areas Allegro, Black Jack East, Curara Kink and Windinne Pit are clear for the proposed program of works to proceed; Access tracks were surveyed to a width of 20 m (10 m on either side of the centreline); No not clear areas were identified; and One isolated artefact was identified within Black Jack East. The Badimia Traditional Owners request that the location of this artefact be avoided if possible."
		Archaeological and Ethnographic	Allegro, Chulaar East (AC), Riley Haul Rd, Riley SE, Sprite Sth Gap, settling pond E59/1199, E59/2153, M59/591, E59/985, M59/420, M59/497, E59/1268	Two not clear areas were identified within the Chulaar East Northern Area and Fields Find project areas. With the exception of the not clear areas noted, Minjar Gold is advised that the Allegro, Chulaar East Northern Area, Chulaar East Southern Area, Fields Find including Golden Eagle), Riley Haul Road, Riley SE, Settling Pond and Sprite South Gap project areas is clear for the proposed program of works to proceed.
		Archaeological and Ethnographic	"Allentown, Keranne, Keronima, Mugs Luck, Riley Haul Road and Tickford" "E59/1327, E59/1333, E59/2153, L59/135, M59/379, M59/380, M59/421, M59/425"	DPLH OHP 24589 is not present within the Allenton survey area. While the lodged boundary of this site does overlap with the area, no material or spiritual values associated it were identified during the survey of the Allentown area. The proposed works within this area will not impact on known elements of this site;  Six newly identified sites (MJG17-01, MJG17-02, MJG17-03, MJG17-04, MJG17-05, and MJG17-06) were recorded to site avoidance standard and should be avoided by future works; and A total of 55 isolated artefacts were recorded within the survey areas. Isolated artefacts are not considered to contain any values under the AHA, and no further mitigation is considered necessary."
		Archaeological and Ethnographic	"Allentown, Eastern Creek, Keranne, Keronima, Mugs Luck, Riley Haul Road and Tickford" "E59/1327, E59/1333, E59/2153, L59/0135, M59/379, M59/380, M59/421, M59/425, M59/458, M59/431"	- One newly identified site (MJG17-07) was recorded to site identification standard and should be avoided by future works; and  - A total of 9 isolated artefacts were recorded within the survey areas. Isolated artefacts are not considered to contain any values under the Act, and no further mitigation is considered necessary."
		Archaeological and Ethnographic	Beryl West, East India, E59/1332, E59/1871, Metters, P59/2023 and South Windinne Beryl West, East India, E59/1332, E59/1871, Metters, P59/2023 and South Windinne	No DPLH registered Aboriginal sites, lodged or stored DPLH OHPs were identified; No new sites were identified; and A total of 3 isolated artefacts were recorded within the survey areas.



### 3 PROJECT DESCRIPTION

#### 3.1 AREAS OF DISTURBANCE

Minjar's tenement package covers approximately 1,700 km<sup>2</sup> in the Yalgoo bioregion.

There is historical disturbance associated with the Bugeye prospect as it has been previously extensively explored and mined. Bugeye originally had a clearing envelope of approximately 76 hectares in 2012 (CPS 5284/1). This was later amended and updated to 96.2 hectares in 2015 (CPS: 5284/2). Within the envelope, 22.8 hectares has now been cleared for pits, waste rock dumps, roads and an abandonment bund (Figure 3-1).

Figure 3-1 illustrates the current disturbance area within the Bugeye project area, primarily the completion of South Island pit, re-alignment of the haul road and the provision of room in order to batter down and rehabilitate the existing waste rock dump, which was undertaken in 2015.

The previously disturbed 22.8 hectares was undertaken under CPS 5284/1, which was approved 27 December 2012 as well as under CPS 5284/2, which was an amendment of the original and recently expired (19 January 2018) (Figure 3-1 & 3-2). The key reason behind this supplementary document and NVCP application is to receive approval for a new permit to clear native vegetation under the same parameters as CPS 5284/2. This will allow Minjar to utilise the remaining 14.03ha available for clearing, with 10 hectares being allocated to the waste rock dump extension (Figure 3-3) and the remaining 4.03 hectares for contingency purposes (i.e. stockpiling).

Clearing is to be undertaken progressively. In the first instance a raised blade on a dozer will be used. Preliminary raised blade clearing reduces the immediate impact to fauna and provides an opportunity for fauna to disperse prior to the next phase of ground disturbance. The cleared vegetation, along with recovered topsoil and subsoil is stockpiled for later use in rehabilitation works.

Table 3-1 below shows the breakdown of disturbance associated with the Bugeye project on M59/420. It shows the disturbance approved and the actual disturbance for the various categories. Existing disturbance in the Bugeye project area is 44.49ha from a total approval area of 58.52ha. A variance of 14.03ha of the total approved disturbance area remains.

Note that there are variations in the survey allocations of disturbance categories to the existing disturbance. However, the total waste dump allocation has 9.37ha remaining undisturbed, requiring only minor additional allocation (0.63ha) from the remaining approved area.

**Table 3-1: Approved disturbance and Current Actual disturbance on M59/420 (Bugeye only)**

Disturbance Category	Approval Instrument	Disturbance Approved (ha)	Disturbance Actual (ha)
Pits	Existing pre 2013	8.85	8.11
	Reg. ID: 39643	2.15	
	Reg. ID: 54026	0.86	
	<b>Total</b>	<b>11.86</b>	
WRL	Existing pre 2013	13.86	14.08
	Reg. ID: 39643	7.5	
	Reg. ID: 54026	2.09	
	<b>Total</b>	<b>23.45</b>	
ROM	Existing pre 2013	1.88	0
	Reg. ID: 39643	0	
	Reg. ID: 54026	1.74	
	<b>Total</b>	<b>3.62</b>	
Haul Road	Existing pre 2013	9.9	5.41
	Reg. ID: 39643	0	
	Reg. ID: 54026	0.24	
	<b>Total</b>	<b>10.14</b>	
Access Roads	Existing pre 2013	0.5	0
	Reg. ID: 39643	0.2	
	Reg. ID: 54026	0	
	<b>Total</b>	<b>0.7</b>	
Abandonment bunds	Existing pre 2013	1.6	0
	Reg. ID: 39643	0.2	
	Reg. ID: 54026	0.02	
	<b>Total</b>	<b>1.82</b>	
Topsoil	Existing pre 2013	0	0
	Reg. ID: 39643	0	
	Reg. ID: 54026	0.02	
	<b>Total</b>	<b>0.02</b>	
Other Clearing	Existing pre 2013	6.16	16.89
	Reg. ID: 39643	1.15	
	Reg. ID: 54026	0	
	<b>Total</b>	<b>7.31</b>	
<b>Totals</b>		<b>58.52</b>	<b>44.49</b>
<b>Variance</b>			<b>+14.03</b>

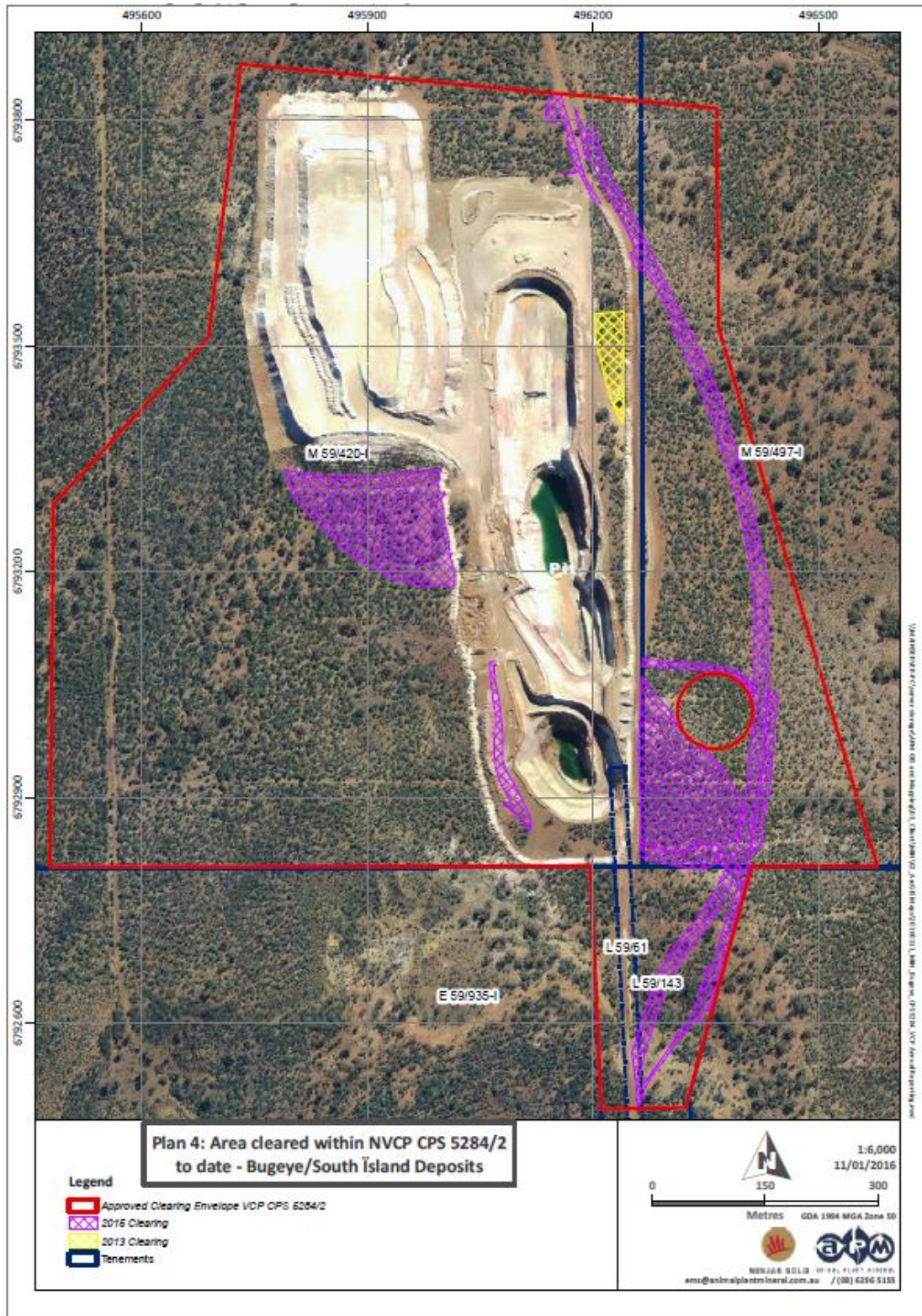


Figure 3-1: Existing disturbance within the Bugeye project area, illustrating the recently expired NVCP CPS5284/2



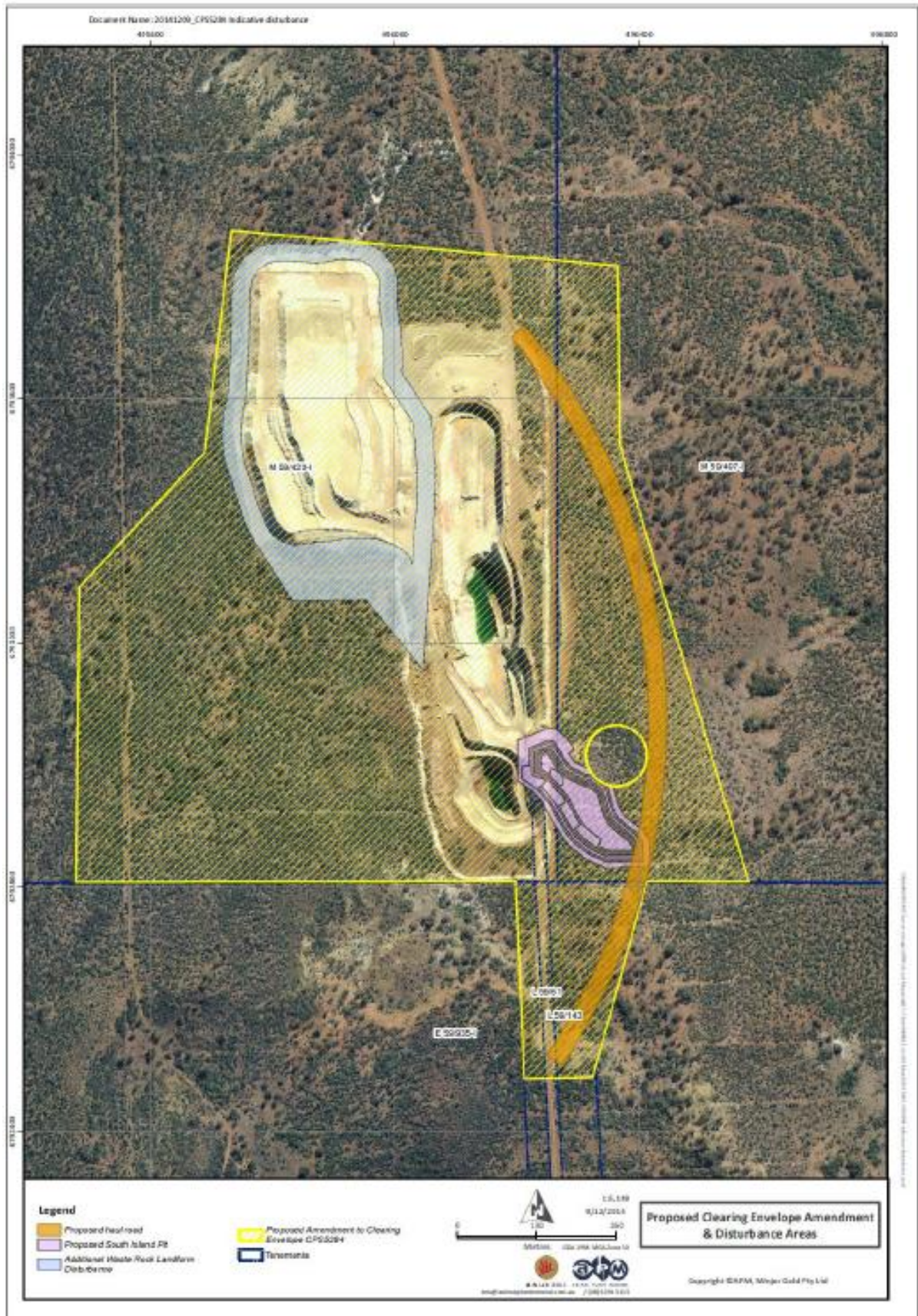


Figure 3-2: Aerial illustrating the clearing envelope and disturbance areas that were completed post-2015 amendment.



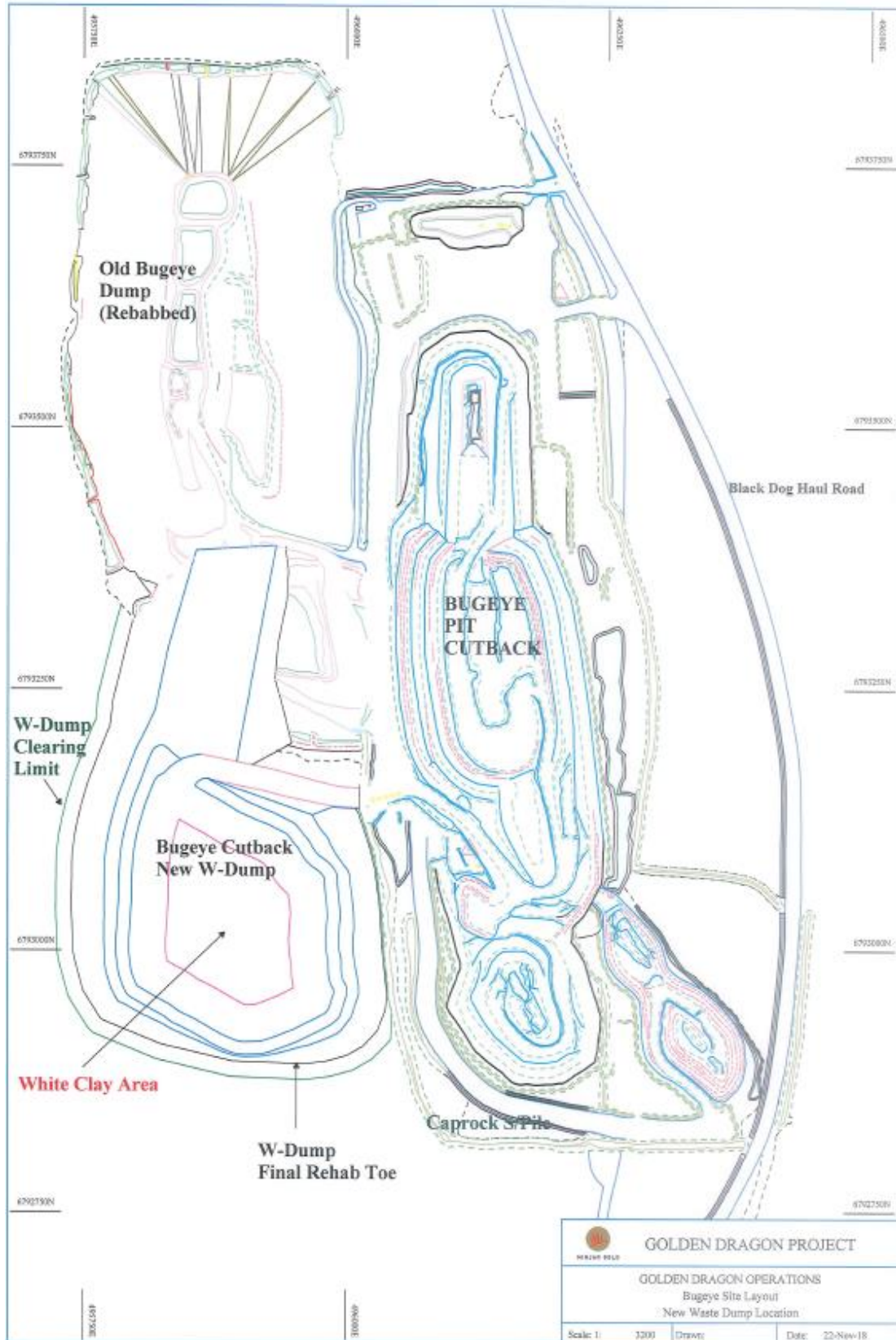


Figure 3-3 – Proposed extension of Waste Rock Dump, to the south of existing landform (10 hectares).

#### 4 PRINCIPLES FOR ASSESSING CLEARING PERMIT APPLICATIONS

Land clearing activities associated with the Minjar Gold Project are considered below against the ten clearing principles outlined in Schedule 5 of the *Environmental Protection Amendment Act*, which address issues associated with biodiversity, land degradation and ground and surface water quality. These principles are based on those addressed by Animal Plant Mineral in the attached Biological Assessment which includes the Vegetation and Flora Survey Report (Appendix 1).

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

The Bugeye prospect is 18km south of the Minjar M1 processing plant and office facilities, linked via an existing haul road.

Biologically diverse ecosystems with high levels of endemism occur 70 and 95 km to the south-east of the Bugeye prospect at Mount Singleton and Mount Gibson respectively; approximately 25 km to the west of the southern end of the Minjar tenements in the Karara Station Blue Hills district; and approximately 30 km east of the southern end of the Minjar tenements in the Gnows Nest Minjar Hills locality. The area lies within the south-west centre of diversity for Acacias. The Central Yalgoo centre of endemism for Acacia species is located adjacent to the tenements to the east (Gonzales-Orzoco et al. 2011).

Proposed vegetation clearing addressed in this application refers to expansion of existing pits, where transport corridors and infrastructure are already existing and permits have historically been issued to clear areas immediately adjacent to the current proposed sites. The biologically significant areas of Mount Singleton, Mount Gibson, Karara Blue Hills and Gnows Nest Minjar Hills are adequately distant and separated by landscape barriers not to be impacted by proposed clearing.

The south-west centre of diversity for Acacia species runs from west of Esperance on the south coast to south of Shark Bay in the north, and is the largest of Australia's three centres for Acacia diversity. The proposed clearing is small enough to have a negligible impact on the diversity of this vast area. The area is however, immediately adjacent to the Central Yalgoo centre for endemism of Acacia species where, out of 45 species of Acacia in the area, ten are classified as regionally endemic and another ten are locally endemic.

Three species with the most limited range in this centre are *Acacia diallaga* (P2), *A. sulcatacaulis* (P1) and *A. woodmaniorum* (T). The ranges of these species are centred around the Mount Gibson and Mount Singleton localities. *Acacia sulcatacaulis* (P1) and *A. woodmaniorum* (T) were not identified in the flora searches conducted at Minjar Gold Project for the current application (November 2011), or in any of the other numerous flora searches conducted at the tenements historically. Approximately 60 individuals of *Acacia diallaga* (P2) were found 20km south of Bugeye in seven populations ranging in size from one to twenty individuals. These will not be impacted by the current proposal.

The proposed developments are not likely to be at variance with Principle 1.

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

The results of an extensive desktop review of the Naturemap, EPBC Protected Matters and Atlas of Living Australia databases and from Bamford (2003) show that two conservation



significant species, the Western Spiny-tailed Skink and the Malleefowl could potentially inhabit the proposed Minjar Gold Project area. If present, the impact to these species is considered to be low as the habitat within the area is well represented in the local region and therefore would not be considered necessary for the maintenance of these species.

A search of the Bugeye prospect has revealed some potential habitat for both species. Trapping was undertaken for the Western Spiny-tailed Skink and no primary or secondary evidence of *Egernia* was found. The only evidence of Malleefowl within these prospects is a historic mound, which was discovered during the Matiske (2009a) vegetation and flora survey.

If found, Malleefowl mounds will be inspected prior to clearing. Any active Malleefowl mounds or those historic mound sites that have the potential to be used in the future, i.e. those that have maintained their structural integrity, will be buffered from disturbance activities and management actions put in place to prevent disturbance of the mounds where possible.

The proposed developments will not be at variance with Principle 2.

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

No declared rare flora has been identified from any Minjar Gold Project tenements in field surveys to date. Declared rare flora of the region is generally confined to banded ironstone outcrops. Centres of abundance are around the Mount Singleton, Mount Gibson, Karara Blue Hills and Gnows Nest Minjar Hills localities. No banded ironstone occurs within the disturbance areas relevant to this application.

Three Priority 3 species (*Drummondita fulva*, *Micromyrtus trudgenii* and *Grevillea subtiflora*) were identified from tenements searched in the November 2011 field survey. *Drummondita fulva* and *Micromyrtus trudgenii* were major understory components of the rocky rises of the Bugeye prospect (in excess of 500 individuals of each species). It is likely these two co-occurring species are locally abundant on the rocky, skeletal rises of the area, where they have been recorded multiple times in prior surveys. Twenty-two local records exist for *Micromyrtus trudgenii* in the Western Australian Herbarium database.

*Grevillea scabrada* (P1) occurred as an isolated population of two plants on the western edge of the Bugeye tenement (APM, 2011), and has been recorded from the Minjar Gold Project tenements numerous times in previous surveys (Matiske, 2009a) usually in scattered populations of 1 – 5 individuals. The *G. scabrada* population of two individuals from the Bugeye prospect will be cleared; however clearing these individuals is unlikely to impact on the vigor of the population locally.

Clearing in areas where *Drummondita fulva* (Bugeye 19.24% of population) and *Micromyrtus trudgenii* (Bugeye 4.29% of population) are dominant will disturb large numbers of these P3 species, however they appear to be locally quite abundant and the proposed clearing here is unlikely to effect the vigor of the population locally.

The proposed developments are unlikely to be at variance with Principle 3.

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

No threatened ecological communities (TEC's) are present within the tenements proposed for clearing. Mapping for PEC's shows that Bugeye is within buffer zones for BIF formation

vegetation complexes, however the location of proposed disturbance is not within BIF outcropping and its associated vegetation complexes.

The proposed developments will not be at variance with Principle 4.

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

The areas applicable to this application for vegetation clearing are situated in the central part of the Yalgoo Bioregion. The Avon Wheatbelt Bioregion boundary 50 – 80 km to the west marks the boundary of extensive agricultural clearing, with the Yalgoo Bioregion host to the less intensive industry of rangeland grazing and more recently, mining.

At 2006, 61% of Yalgoo's 50,575km<sup>2</sup> was under pastoral lease and as of 2008, 22.8% was in the conservation estate. The area should not be considered a significant remnant as it consists of contiguous vegetation with isolated patches of clearing.

The major cause of vegetation clearing in the region is from mining, and from a regional perspective, these areas are very small. No area proposed to be cleared in this application could be considered remnant vegetation.

The proposed development will not be at variance with Principle 5.

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

No wetlands or watercourses are found on areas proposed to be cleared in this application. Watercourses in this area are scarce and surface water flow following precipitation occurs as sheet flow.

The closest wetlands to the Minjar Gold Project tenements are Lake Moore 50 km south west, Mongers Lake 50 km to the south east and Weelhamby Lake 50 km to the west. These were not identified as Wetlands of National Significance and clearing at Minjar project will have no effect on these wetlands.

The proposed developments are unlikely to be at variance with Principle 6.

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

All vegetation clearing will be carried out in a manner that enhances restorative capacity of the land, and minimises unnecessary land degradation.

The minimum possible clearing is undertaken to achieve the necessary mining outcomes. Good planning and site management will reduce the risk of excessive clearing. In particular:

- Staged clearing will be undertaken where a raised blade on a dozer will be used followed by a period whereby any fauna that may have been present are allowed to disperse.
- Woody vegetation to be cleared and stored in windrows for use in restoration.
- Topsoil cleared to a maximum of 10 cm and stored in stockpiles no greater than 1.8m high, and not combined with materials from greater depths. Topsoil to be stored for the minimum possible time period.

- Engineering solutions will be used where necessary to prevent wind and water erosion of post clearing surfaces.
- Bund walls will be used to inhibit surface water flows moving in and out of cleared areas, and to protect patches of remnant vegetation within the clearing envelope.

The soils of the Minjar prospects are classified as a medium sandy soil. Based on geochemical analyses the soil is mineral and carbon enriched and as such is classified as a Class 7 soil, suitable for vegetation regrowth when reseeded. Particle size distribution and Emmerson aggregate tests show no evidence for fines dispersion with the classification of the topsoil ranked as Category 2 (non-dispersive) with minimal sand grains of silica or gypsum developed less than 1 mm. The soil contains no hazardous chemical components and is therefore not likely to contribute to appreciable land degradation.

The development proposal will not be at variance to Principle 7.

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

Almost 23 % of the Yalgoo Bioregion (approximately 11,500 km<sup>2</sup>) is in the conservation estate, and includes areas immediately adjacent to the Minjar project tenements in the former Badja, Warriedar and Lochada Stations. The clearing proposed in this application (32 hectares or 0.32 km<sup>2</sup>) will not constitute a significant risk to the environmental values of these or any other conservation areas.

This development is not at variance with Principle 8.

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

Appropriate surface water land management will occur as outlined in (7), prohibiting the movement of turbid or erosive surface flows. At the local scale, vegetation removal is likely to increase deep drainage of water into below ground storage, as removal of stored soil water by plants is ceased. This is unlikely to have a negative impact on below ground water sources.

The proposed development is unlikely to be at variance with Principle 9.

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

No such consequences are anticipated from the clearing proposed in this application as clearing is not within or adjacent to significant surface water catchments or drainage lines.

The proposed development is not expected to be at variance with Principle 10.

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## 6 APPENDICES



**APPENDIX 1 Minjar Gold Biological Assessment November 2011**

**APPENDIX 2 Potentially Occuring Fauna at Minjar Tenements – Search of Naturemap, EPBC Protected Matters Tool, Atlas of Living Australia Databases and Bamford (2003)**

**APPENDIX 3 Bamford 2003 - Fauna Assessment for the Highland Chief Project**

**APPENDIX 4 Stygofauna Study - Outback Ecology**

**APPENDIX 5 Hydrogeological Assessment of Austin, Riley, Mug's Luck, Keronima, Trench and Camp Gold Deposits for Mining Proposal, undertaken by Rockwater Proprietary Limited in August 2012.**

**APPENDIX 6 Results of Aboriginal Heritage Inquiry System Database Search for Relevant Minjar Gold Tenements**



**Appendix 7 Targeted surveys for *Idiosoma nigrum* – Shield-backed Trapdoor Spiders,  
Minjar Gold Tenements by Bamford Consulting Ecologists 2013**

**Appendix 8 Report of an archaeological and ethnographic site avoidance heritage assessment of 10 proposed development areas within the Minjar Gold project, conducted by the Badimia Traditional Owners and Terra Rosa Cultural Resource Management Pty Ltd**