

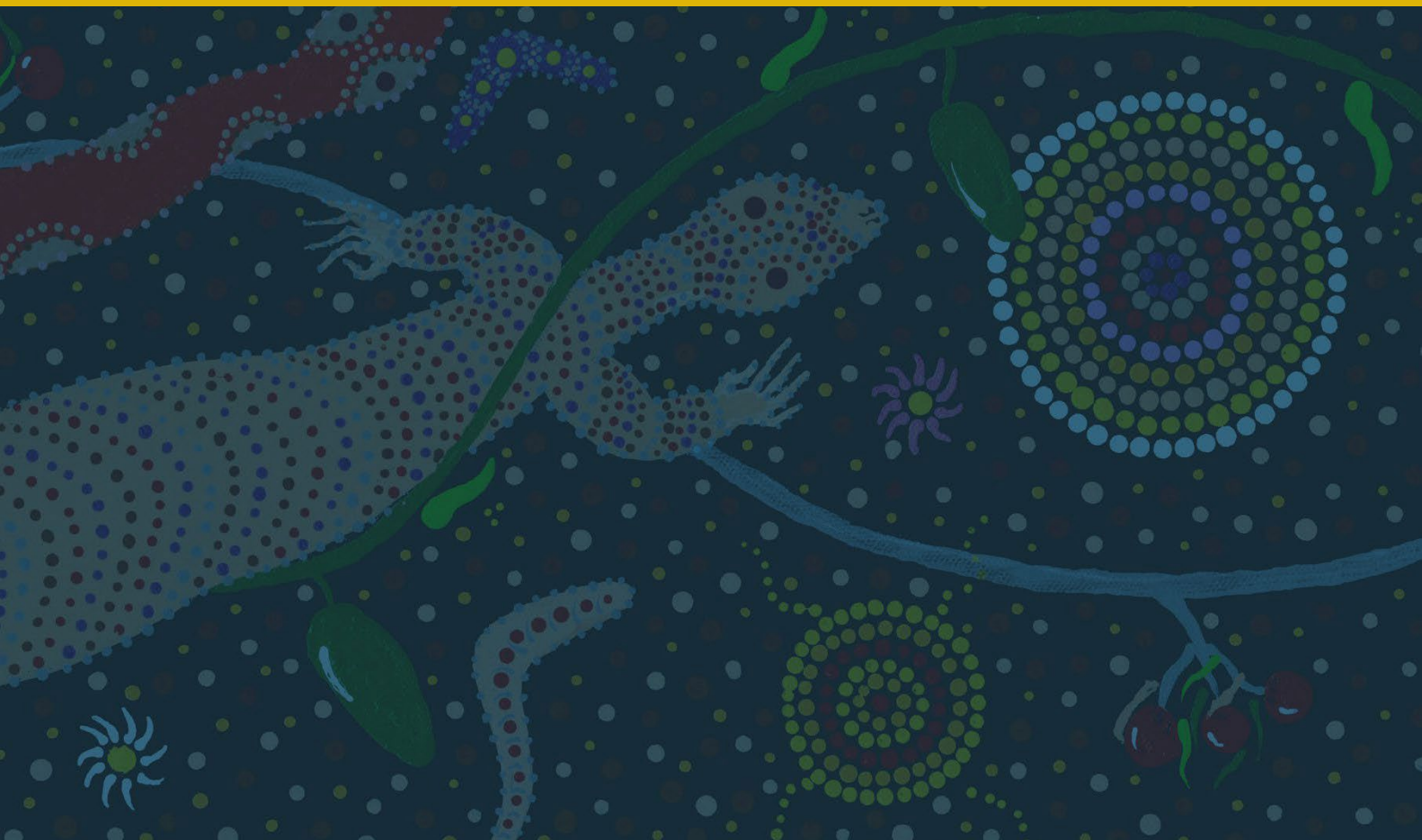


KCGM

# SIGNIFICANT SPECIES MANAGEMENT PLAN

## FAUNA

FIMISTON GOLD MINE OPERATIONS EXTENSION (STAGE 3)  
FIMISTON SOUTH PROJECT  
v8 March 2026



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## VERSION CONTROL

Version	Date	Document Changes
1	Oct 2022	New Document. Specific Species Management Plan (SSMP) developed to meet the requirements of the Western Australian Environmental Protection Agency.
2	Mar 2023	Updated in Response to RFI to include more comprehensive management actions and monitoring
3	Mar 2024	Updated in response to Revised Proposal - ERD Response to Submissions second RFI
4	Jul 2024	Document updated to address clarification from the Revised Proposal - ERD Response to Submissions consultation.
5	Oct 2024	Document updated in response to Response to Submissions RFI and subsequent consultation
6	Nov 2024	Document split into two – flora and fauna – to assist with conditioning
7	Nov 2025	Updated to align with new Ministerial Statement 1258; submitted post MS approval
8	Mar 2026	Updated to reflect DBCA comments

A full document history in the correct format is located in Section 6 of this document

# 1. SUMMARY

Kalgoorlie Consolidated Gold Mines Pty Ltd) (KCGM) is the proponent for the Fimiston South Project (FS Project). The objective of the proposal is to continue the ongoing operations of the Fimiston Gold Mine and enable uninterrupted mining and mineral processing until approximately 2034.

The FS Project is summarised in Section 2.2 of this Significant Species Management Plan (SSMP) for ease of reference.

This SSMP was prepared in accordance with the 'Instructions on how to prepare Environmental Protection Act 1986 – Part IV Environmental Management Plans' (2024) published by the Western Australian (WA) Environment Protection Authority (EPA). This SSMP details the measures that are required to manage potential impacts to conservation significant species from the FS Project. Table 1 summarises the information contained in this SSMP.

**Table 1 Management Plan Summary**

<b>Title of Proposal</b>	Fimiston Gold Mine Operations Extension (Stage 3) and Mine Closure Planning: Revised Proposal
<b>Proponent</b>	Kalgoorlie Consolidated Gold Mines Pty Ltd
<b>Ministerial Statement Number</b>	MS 1258
<b>Purpose of the SSMP</b>	The SSMP is submitted to fulfil the requirements of 'Instructions on how to prepare Environmental Protection Act 1986 – Part IV Environmental Management Plans' (2024).
<b>Key Environmental Factors and Objectives</b>	<u>Key Environmental Factors:</u> Terrestrial fauna EPA Objectives: <u>Terrestrial fauna</u> 'To protect terrestrial fauna so that biological diversity and ecological integrity are maintained' (EPA, 2023).
<b>Condition Clauses</b>	B2-1(1), B2-1(2), B2-1(3) C1, C2, C3, C4
<b>Proposed Construction Date</b>	Continuation of existing operations and implementation of MS1258 after Ministerial approval received on 20 October 2025.
<b>EMP requirements pre - construction</b>	<p><b>B2-3</b> The proponent must review and update the Significant Species Management Plan Fauna (Version 6, November 2024, or any future revisions) that demonstrates how achievement of environmental outcomes in condition B2-1 will be monitored, substantiated and satisfies the requirements of C4, and submit it to the CEO.</p> <p><b>B2-1</b> The proponent must ensure the implementation of the significant amendment proposal achieves the following outcome:</p> <p>(1) Disturb no more than two (2) plants considered to be breeding shrubs for the Inland Hairstreak Butterfly (<i>Jalmenus aridus</i>).</p> <p>(2) Branches of the breeding shrubs described in condition B2-1(1) are to be relocated to other breeding shrubs within the development envelope.</p> <p>(3) No adverse impacts to breeding shrubs for the Inland Hairstreak Butterfly (<i>Jalmenus aridus</i>) other than the disturbance described in condition B2-1 (1).</p> <p><b>B2-2</b> During ground disturbing activities, the proponent must undertake the following actions:</p> <p>(1) Only undertake disturbance/relocation of branches of the breeding shrubs identified in condition B2-1(1) for the Inland Hairstreak Butterfly (<i>Jalmenus aridus</i>) during non-breeding/non-active times of the year.</p>

(2) Ensure the presence of relevant fauna expert/handler(s) during disturbance/relocation activities.

**C1-1** The proponent must not undertake:

(1) Mining activities forming part of the expanded and revised proposal until the CEO,

(a) in consultation with the Department of Biodiversity, Conservation and Attractions, has confirmed in writing that the environmental management plan required by condition B1-2; and

(b) has confirmed in writing that the environmental management plan required by condition B3-3,

meets the requirements of those conditions and condition C4.

(2) Construction of the Waste Rock Dumps forming part of the expanded and revised proposal until the CEO, in consultation with the Department of Biodiversity, Conservation and Attractions, has confirmed in writing that the environmental management plan required by condition B2-3 meets the requirements of those conditions and condition C4.

## **2. CONTEXT, SCOPE, AND RATIONALE**

### **2.1 The Project**

KCGM manages and operates the following assets for the owner, Northern Star Resources Limited (NSR):

- Fimiston Operational Area: open pit mining, waste rock disposal and tailings facilities;
- Mt Charlotte Underground Mine: underground mining;
- Gidji Gold Processing Plant: mineral processing and tailings disposal, and
- Exploration: mineral resource definition drilling and core processing.

The following operational areas are incorporated within the revised Fimiston Operational Area:

- Fimiston Open Pit;
- Fimiston Tailings Storage Facilities (TSFs);
- Fimiston Processing Plant; and
- Fimiston Waste Rock Dumps (WRD).

#### **2.1.1 Location of the Fimiston Operations**

The Fimiston operations are located adjacent to the City of Kalgoorlie-Boulder approximately 600 kilometres (km) east of Perth, Western Australia.

### **2.2 The Revised Proposal – Fimiston South Project**

The approved Ministerial Statement 1258 for a significant amendment to the Fimiston South project extends the current operational life to approximately 2034.

The Fimiston South project includes:

- A cut back of the Fimiston Open Pit, the Ivanhoe cutback
- Additional Fimiston II Extension Tailings Storage Facility cell;
- Construction of the new Fimiston III TSF and 3<sup>rd</sup> cell for Fim IIE TSF;
- An extension to the existing Southern WRD; and
- Development of areas for supporting infrastructure and services are also required.

Fimiston Operations will continue to operate under the new Ministerial Conditions and revised Management Plans.

## 2.3 Key Environmental Factors

This SSMP specifically addresses the Terrestrial Fauna; environmental factors, as defined within the EPA's *Statement of Environmental Principles, Factors and Objectives and Aims of EIA* ([EPA, 2023](#)). The environmental objective of the Terrestrial Fauna factor, as defined within the EPA's *Environmental Factor Guideline: Terrestrial Fauna* ([EPA, 2016](#)), is:

*To protect terrestrial fauna so that biological diversity and ecological integrity are maintained.*

### 2.3.1 Activities affecting Key Environmental Factor – Terrestrial Fauna

Potential threats and impacts on terrestrial fauna potentially resulting from the FS Project are:

- loss of habitat and/or habitat fragmentation due proposed vegetation clearing;
- vehicle strike causing injury or death;
- fauna entrapment leading to injury or death;
- dust generation, noise and vibration causing temporary displacement of fauna;
- increase in pest species impacting native fauna due to predation and competition;
- altered surface water hydrological regimes impacting on vegetation health; and
- altered fire regimes.

## 2.4 Condition Requirements

Ministerial Statement MS1258 conditions are set out in Table 2.

The Environmental Protection Act 1986 (EP Act) and Biodiversity Conservation Act 2016 (BC Act) has been considered in preparation of this SSMP for the Inland Hairstreak Butterfly, *Jalmenus aridus* (Priority 2). Regional surveys completed by KCGM support significant growth in species knowledge, home range and understanding of this species.

The Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act) is not applicable to *J. aridus* as this species is not listed under federal legislation.

The Malleefowl, *Leipoa ocellata* (Vulnerable) is listed under the EPBC Act, and is potentially found in the area, based on generalised information obtained from a national vegetation mapping tool. To provide more information on this species, a targeted Malleefowl habitat condition and mound survey was completed in March 2023 by [Alexander Holm and Associates](#).

This targeted survey resulted in the identification of small areas of marginal foraging area along the eastern boundary of a proposed tailings dam and confirmed that there are no recently active mounds. The targeted survey and assessment concluded that *L. ocellata* (Malleefowl) are unlikely to utilise these small areas for breeding or mound construction due to unsuitable soils.

As a consequence of these findings, management actions and targets for Malleefowl have not been included in this SSMP. Approvals would be sought if tailings storage development was to extend further east, but this is not currently envisaged by KCGM.

To acknowledge the importance of *L. ocellata* under Federal regulatory requirements, NSR have developed and released a “NSR – Malleefowl Awareness Training” (2023) session online (INX network learning system) to all personnel who are working on NSR sites that are located near areas of known or potential Malleefowl populations.

**Table 2 Condition requirements for *Jalmenus aridus***

Condition requirements	Addressed in Section
<p>"B2-1 The proponent must ensure the implementation of the significant amendment proposal achieves the following outcome:</p> <p>(1) Disturb no more than two (2) plants considered to be breeding shrubs for the Inland Hairstreak Butterfly (<i>Jalmenus aridus</i>).</p> <p>(2) Branches of the breeding shrubs described in condition B2-1(1) are to be relocated to other breeding shrubs within the development envelope.</p> <p>(3) No adverse impacts to breeding shrubs for the Inland Hairstreak Butterfly (<i>Jalmenus aridus</i>) other than the disturbance described in condition B2-1(1)."</p>	<p>3.1.1.1 3.1.1.1 3.1.1.1</p>
<p>"B2-2 During ground disturbing activities, the proponent must undertake the following actions:</p> <p>(1) Only undertake disturbance/relocation of branches of the breeding shrubs identified in condition B2-1(1) for the Inland Hairstreak Butterfly (<i>Jalmenus aridus</i>) during non-breeding/non-active times of the year.</p> <p>(2) Ensure the presence of relevant fauna expert/handler(s) during disturbance/relocation activities."</p>	<p>3.1.1.1 3.1.1.1</p>
<p>B2-3 The proponent must, in consultation with the Department of Biodiversity, Conservation and Attractions, review and update the Significant Species Management Plan Fauna (Version 6, November 2024, or any future revisions) that demonstrates how achievement of environmental outcomes in condition B2-1 will be monitored, substantiated and satisfies the requirements of C4, and submit it to the CEO.</p>	<p>This SSMP</p>
<p>"C1-1 The proponent must not undertake:</p> <p>(2) Construction of the Waste Rock Dumps forming part of the expanded and revised proposal until the CEO has confirmed in writing that the environmental management plan required by condition B2-3 meet the requirements of those conditions and condition C4."</p>	
<p>"C4-1 The environmental management plans required under conditions B1-2, B2-3 and B3-3 must contain provisions which enable the substantiation of whether the relevant outcomes of those conditions are met, and must include:</p> <p>(1) Threshold criteria that provide a limit beyond which the environmental outcomes are not achieved;</p> <p>(2) Trigger criteria that will provide an early warning that the environmental outcomes are not likely to be met;</p> <p>(3) Monitoring parameters, sites, control/reference sites, methodology, timing and frequencies which will be used to measure threshold criteria and trigger criteria. Include methodology for determining alternate monitoring sites as a contingency if proposed sites are not suitable in the future;</p> <p>(4) Baseline data;</p> <p>(5) Data collection and analysis methodologies;</p> <p>(6) Adaptive management methodology;</p> <p>(7) Contingency measures which will be implemented if threshold criteria or trigger criteria are not met; and</p> <p>(8) Reporting requirements."</p>	<p>(1) 3.1.1.1 (2) 3.1.1.1  (3) Sections 2.9, 2.10 and Table 5  (4) 2.6.1 (5) 2.10 (6) Section 4 (7) 3.1.1.1  (8) 3.1.1.1</p>
<p>"C4-3 The plan required under condition B2-3 is also required to include:</p> <p>(1) Confirmation of the following:</p> <p>(a) <i>Jalmenus aridus</i> breeding at proposed control sites</p> <p>(b) location and number of each <i>Jalmenus aridus</i> habitat transect</p>	<p>(1) (a) Table 9 (b) Figure 2</p>

(c) location and number of each breeding and potential <i>Jalmenus aridus</i> breeding shrub	(c) Figure 3 and 4
(d) location and number of each monitoring point to identify indirect impacts to <i>Jalmenus aridus</i> breeding shrubs.	(d) Table 5
(2) Justification for the proposed monitoring regime in its ability to identify indirect impacts to <i>Jalmenus aridus</i> breeding shrubs.	(2) 2.10
(3) Protocol for any new <i>Jalmenus aridus</i> breeding shrubs identified as a result of monitoring undertaken for this significant amendment proposal."	(3) 2.9, Table 5

## 2.5 Rationale and Approach

The FS Project has been designed to avoid, where possible, impacts to key environmental factors located within the design footprint, including the location of *J. aridus* in relation to key landform placement.

Adjustments to designs have been undertaken to ensure there is the best possible balance between preservation of environmental values and project requirements.

The location of the significant species were considered when selecting a preferred location for landforms. Whenever possible, these locations were avoided, or landform designs were adjusted.

## 2.6 Survey and Study Findings

### 2.6.1 Terrestrial Fauna

Extensive field surveys were undertaken for *J. aridus* and *L. ocellata* for the FS Project. Results from terrestrial fauna surveys have been utilised to support the assessment of potential impacts of the FS Project implementation on terrestrial fauna. The most recent assessments were completed by Phoenix Environmental Sciences and Dr Rod Eastwood, Dr Floyd Holmes, Caitlin Nagle (2024) and Phoenix Environmental Sciences and [Alexander Holm & Associates](#) in 2023. Additional surveys and consolidation of collected information has been completed by KCGM and Phoenix since the October 2022 Revised Proposal submission. These additional surveys and assessments of data have expanded local and regional knowledge of both fauna species (*J. aridus* and *L. ocellata*) (Figure 1).

Local and regional surveys are planned to occur each spring to further knowledge on the *J. aridus* species and to provide more detailed regional knowledge to use as reference for species monitoring. Known *J. aridus* habitat shrubs on KCGM's tenements location and condition will be used as the baseline for monitoring over time to evaluate long term resilience to indirect impacts to maintain viable populations throughout and beyond the mine life. These populations will be compared with references sites at Karrawang Nature Reserve and Yarri Road. Karrawang and Yarri have been confirmed in 2024 as appropriate reference sites as they do have healthy populations present and they are near Fimiston and therefore do have breeding shrubs that are comparable with Fimiston.

Reports that document regional terrestrial fauna within the surrounding area of the Mine Development Envelope (MDE) are also included within the revised consolidated terrestrial assessment ([Phoenix, 2023](#)), as outlined in Table 3.

**Table 3 Terrestrial Fauna Surveys 2017-2024**

Report	Survey Description	Field Survey Date
Fauna survey (Level 2 – Phase 1 and 2). Proposed Tails Storage Facility Expansion ( <a href="#">Harewood, 2015</a> ).	Fauna survey (Level 2 – Phase 1 and 2).	-
Flora and vegetation, and fauna surveys for proposed infrastructure within the Development Envelope of the Fimiston Gold Mine Operations, ( <a href="#">Phoenix, 2018</a> ).	Investigation of proposed infrastructure areas in the floodway and north of the Fimiston II TSF.	6-8 September and 11-12 November 2017.
Flora and SRE review for the Fimiston II Tailings Storage Facility Expansion Project. ( <a href="#">Phoenix, 2018a</a> )	Flora and SRE review	
Gap analysis, biological survey and consolidation report for the Fimiston Gold Mine Operations. ( <a href="#">Phoenix, 2018b</a> )	Gap analysis	
Regional flora, vegetation and terrestrial fauna survey for the Gidji Operation, ( <a href="#">Phoenix, 2019</a> ).	Level 1 terrestrial fauna	10–11 November 2017 & 8 November 2018.
Targeted flora and SRE survey for the FIM IIE Project. ( <a href="#">Phoenix, 2019a</a> ).	Targeted <i>E. praecox</i> and general short range endemic survey for the Fimiston II Cell E TSF	13-14 November 2018.

Report	Survey Description	Field Survey Date
	Project, December 2019.	
Terrestrial flora and fauna review for the Golden Mile Growth Strategy, ( <a href="#">Phoenix, 2019b</a> ).	Review of terrestrial flora and fauna	
Memo report: records of <i>J. aridus</i> at Fimiston, ( <a href="#">Phoenix, 2022</a> ).	Completion of on ground Targeted <i>J. aridus</i> survey (as basic fauna survey) to the east of the WRD and Fimiston TSF, included eastern floodway.	14-15, 26 and 29 October 2021.
Flora and vegetation assessments for the Fimiston Gold Mine Operations, ( <a href="#">Phoenix, 2022a</a> )		
Basic fauna and SRE survey and targeted SRE survey for the Fimiston Gold Mine Operations. ( <a href="#">Phoenix 2022b</a> )	Basic fauna and SRE survey and targeted SRE survey	
Regional habitat reconnaissance survey for Critically Endangered Arid Bronze Azure Butterfly ( <i>Ogyris subterrestris petrina</i> ) and P1 Inland Hairstreak Butterfly ( <i>J. aridus</i> ), ( <a href="#">Phoenix 2022c</a> ).	To locate suitable habitat for the target species of butterfly, ground truthing potential habitat within approximately	25 March 2022 Evolution site 28 March 2022 KCGM site 29 March and 1 April 2022
	100 km of the Fimiston operations.	
Consolidated Memo Report: <i>Jalmenus aridus</i> at Fimiston, ( <a href="#">Phoenix, 2023</a> )	Desktop consolidation of site and regional information. 14/04/2023.	N/A consolidation of information – Desktop.
Targeted <i>L. ocellata</i> activity and mound searches within the FS Project DE. ( <a href="#">Holm &amp; Associates, 2023</a> )	Infield survey (tracked) for physical evidence of <i>L. ocellata</i> and nesting mounds.	Mapping and assessment March 10 to 15, 2023.
Current distribution, behaviour, and habitat preferences of the Inland Hairstreak, <i>Jalmenus aridus</i> Graham & Moulds, 1988 (Lepidoptera: Lycaenidae) in the Goldfields of Western Australia. ( <a href="#">Eastwood et. al, 2023</a> )	Paper presented based on Kalgoorlie surveys	Conference paper
Terrestrial Fauna assessments for the Fimiston Gold Mine Operations (Revised) ( <a href="#">Phoenix, 2023a</a> )	Revised and consolidated report of data to date. Included with the EPA referral as Appendix I.	
Consolidated Memo report: <i>Jalmenus aridus</i> at Fimiston, April 2024 ( <a href="#">Phoenix, 2024</a> )	Memo summarising survey data and current knowledge of the <i>J. aridus</i> species	Summary report and recommendations for protection

Report	Survey Description	Field Survey Date
Unpublished field notes from Spring 2024 regional survey	Known regional population numbers doubled in the Spring 2024 from XX to 25.	14 September 2024; 21 September 2024, Various between 28 September – 10 October 2024, 17-18 October 2024
<i>Jalmenus aridus</i> baseline monitoring survey for the Fimiston Gold Mine Operations Extension (Stage 3) Fimiston South Project. ( <a href="#">Phoenix, 2024a</a> ).	Baseline monitoring survey for <i>Jalmenus aridus</i>	<b>YEAR 1, 2023</b> 11 – 14 September 12 and 15 October
		<b>YEAR 2, 2024</b> 14 - 15 September 21 - 23 September 28 September – 11 October 17 – 18 October
Revised Flora and vegetation assessments for the Fimiston Gold Mine Operations, ( <a href="#">Phoenix, 2024b</a> )		

***Leipoa ocellata***

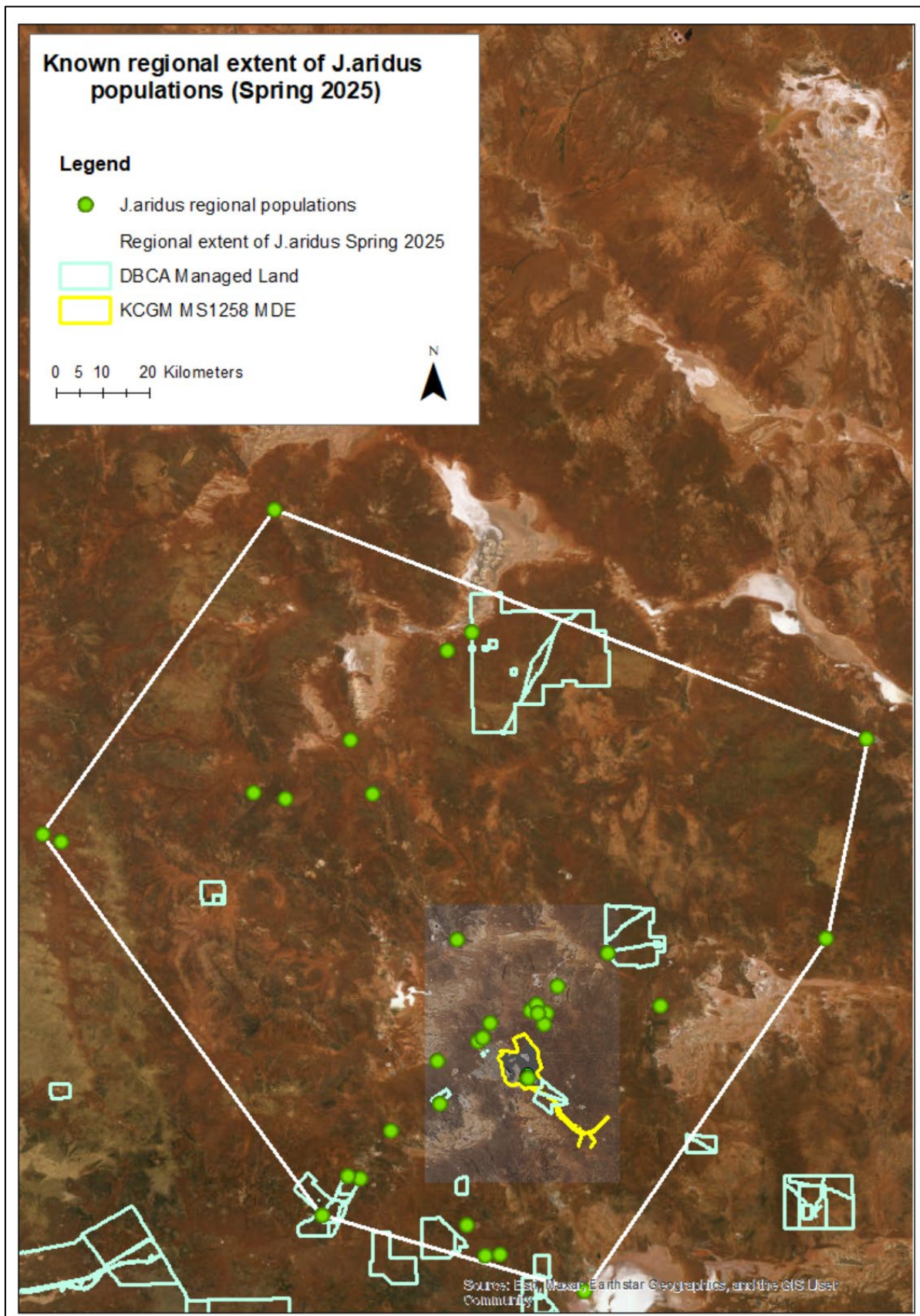
This species has not been found within the project MDE and as such is unlikely to be impacted by the project. Refer to Section 2.4 for a more detailed explanation.

***Jalmenus aridus***

The Priority 2 butterfly, *J. aridus* was identified opportunistically during early fauna and SRE surveys being implemented to support the Revised Proposal, and as a result separate targeted surveys for this species were completed by KCGM and Phoenix. Collected information has been maintained under a cover of confidentiality to aid protecting the species, although IBSA data has been continually shared with Department of Biodiversity Conservation and Attractions (DBCA).

Until recently, *J. aridus* was only known from its type locality at Lake Douglas approximately 12 km SW of Kalgoorlie. It was discovered in November 1983 breeding on a single *Acacia tetragonophylla*, but soon after its discovery the tree started to die, and the butterflies disappeared. The last sighting of *J. aridus* at Lake Douglas was in 2011 (R. P. Weir pers. comm. to R. Eastwood, 2022).

A consolidated confidential report has been provided to both the EPA and DBCA (23/05/2023 by Phoenix) with a 24/01/24 revised and submitted to DBCA.



**Figure 1 Known Regional Extent of J. aridus populations (Spring 2025)**

## 2.6.2 Hydrology

A catchment assessment was undertaken (WSP 2022 and revised in 2023) to identify and estimate the size of potential contributing catchments upslope of the *J. aridus* habitat areas (originally based on KCGM 2022 populations only, then updated population size in 2023). The population itself is not located in floodway areas, but on slightly elevated ground, and relies on incident rainfall.

The climatic conditions at the site are semi-arid, characterised by low annual rainfalls averaging approximately 265 mm, high rainfall variability, and a low frequency of rainfall events with an average of approximately 40 days of rainfall greater than 1 mm per year (BoM, 2023).

The impact assessment investigated both existing and post-development scenarios of the TSF cell G. Two sub-catchments were identified during the assessment, which drain generally north to south following natural topography. These have been referred to as sub-catchment A and sub-catchment B and have areas of approximately 395 ha and 1113 ha respectively (Table 4). The site hydrological conditions are highly ephemeral in nature with surface water runoff occurring as shallow sheet flow on the rare occasion that flows occur. Due to the estimated high infiltration rates of the local soils within the study area, a period of prolonged rainfall (i.e. large total rainfall depth) or high rainfall intensity is required to generate surface water runoff within the catchment. These prolonged or high intensity rainfall events are typically associated with tropical low-pressure systems (such as remnant cyclonic activity) occurring during summer months (typically January – March) and their occurrence is highly variable (WSP, 2023).

As the local sub-catchment conditions within the immediate areas that currently sustain this vegetation are unlikely to change due to the upslope Fimiston IIE TSF Cell G development, the project impacts on the *J. aridus* populations from changes in surface hydrology are considered to be negligible. All breeding shrubs, except for one occur within Catchment B, which will remain unchanged. Due to the breeding shrubs occurring on slightly elevated ground, they are typically reliant on incident rainfall.

**Table 4 Estimated Reduction in sub-catchment Areas Upslope of *J. aridus* Habitat Areas**

Potential Habitat Area ID	Sub-catchment	Sub-catchment area (Ha)		% Difference
		Existing	Post-Development	
North	A	395	173	-44%
South	B	1113	0	0%
Total		1508	1335	-11%

## 2.6.3 Weeds

Weeds are usually opportunistic plant species that are not native to an area, but once introduced, are able to compete effectively for resources (often out competing and displacing native vegetation). They can also be inadvertently or intentionally introduced and spread past their intended range, such as garden plants or even commercial crops.

The Fimiston Operational area has been altered and degraded from ‘natural’ conditions by historical mining, pastoral, livestock farming and other agricultural activities as well as urbanisation. Impacts include disturbance and alteration of the ground surface, higher rates of erosion by water and wind and recreational activities.

Vegetation in the regional area surrounding Kalgoorlie-Boulder has also been substantially altered by clear felling for wood (firewood, mining timber, boiler feed) in the 1900s, with most trees in the region considered regrowth. As a result, many weed species have been introduced to the area and have become widespread. The region’s low annual rainfall restricts weed populations to a large extent.

Weeds which have been found on the KCGM lease area, are considered a significant environmental

or agricultural risk and are targeted for control and eradication, these include:

- *Rumex vesicarius* - Ruby Dock;
- *Echium plantagineum* - Paterson's Curse (Declared Weed (DW));
- *Opuntia strict* - Prickly Pear (Weed of National Significance (WoNS) and DW);
- *Silybum marianum* - Milk Thistle, Variegated Thistle (DW);
- *Carthamus lanatus* - Saffron Thistle (DW);
- *Lycium ferocissimum* - African Boxthorn (WoNS); and
- *Datura stramonium* - Thornapple (DW).

The WA Biosecurity and Agriculture Management Act 2007 requires removal of declared weeds. Weed management at KCGM is controlled as per the Northern Star Weed Management procedure 2023 (Appendix A).

## 2.7 Key assumptions and uncertainties

A number of assumptions and uncertainties based on surveys undertaken to date form the basis of the proposed management approach, as set out below.

### 2.7.1 Assumptions

Key assumptions include:

- Utilising areas of existing disturbance to minimise clearing and implementing progressive rehabilitation throughout the life of the project will minimise the impacts of the Proposal on conservation significant species.
- The MDE and broader regional areas have been adequately surveyed for terrestrial fauna, no other significant species identified that could be affected by the proposed mine development activities.

### 2.7.2 Uncertainties

Key uncertainties include:

- The extent to which climatic factors outside of KCGM control, including dust and fire, may impact on the health and extent of populations of significant species, including *S. artemisioides* subsp. *filifolia* as a host plant.
- The extent to which dust generated from implementation of the Proposal will travel from the source to receptor.
- Occurrence of extreme rainfall events, drought or fire during the proposed life of mine and post-closure time frames.
- Incomplete understanding of *J. aridus* ecology, including breeding and feeding habitat preferences and influences on breeding activity. This will improve as further survey work is conducted on the species. Management approach for *J. aridus* therefore needs to be adaptable as new information about the species becomes available.
- Difficulties in surveying for *J. aridus*; abundance is not practical to measure due to unpredictability of life cycle timing, potential for extended diapause and typically low densities. Similarly, confirmed breeding shrubs are difficult to detect in sufficient abundance to allow statistical analysis.

## 2.8 Management approach

Management measures to minimise the intensity of the potential effects of implementing the proposed mine waste storage development activities are necessary to ensure the proposed activities will not have a significant detrimental impact on key environmental factors.

Specific application of the mitigation hierarchy for the implementation of the proposed mine waste storage development activities is as follows.

### 2.8.1 Avoid

Based on the biology, behaviour and ecology of *J. aridus* and *Froggattella kirbii* (*F. kirbii*) and what we know about the existing breeding site at Fimiston, DBCA recommend that a minimum buffer distance of 50 m be maintained between known or suitable breeding shrubs and any kind of permanent ground disturbance. This buffer only applies to development around the periphery of the Fimiston breeding site, i.e. no development to take place within the Fimiston site (R. Eastwood DBCA, 2024 Pers. Comm.).

Specific controls include:

- Avoid unnecessary habitat disturbance within *J. aridus* area.
- Set exclusion zones of 50 metres around the known breeding shrubs to prevent indirect disturbance.
- Design surface hydrology to avoid changes in hydrology to the western side of the haul road.
- Maximise the use of existing cleared areas for roads and infrastructure corridors.
- Minimise clearing to the maximum extent practicable through implementation of internal clearing permit procedures, which include:
  - Prior and post construction inspections
  - Use of spatial data of significant flora and vegetation location in planning
  - Surveying and demarcation of clearing areas
- Clearing along one front to allow fauna to escape.

### 2.8.2 Minimise

Potential impacts on vegetation and fauna habitat from dust deposition will be managed via the implementation of the KCGM-ENV-010 Dust Monitoring and Management Procedure (DMMP), a subcomponent of the Fimiston Air Quality Management Plan (FAQMP).

Potential indirect impacts to native fauna due to disruption or disturbance to fauna as a result of noise, vibrations, light and dust emissions are managed to minimize any impacts. The KCGM Noise and Vibration Monitoring and Management Plan (NVMMP) includes control measures and operational strategies that contribute to reducing the noise and vibration emissions produced by the site.

A supporting hydrological impact assessment (WSP, 2023) was completed and reviewed against historical climatic conditions of the area. The report reviewed the impacts of the change in hydrology due to the placement of the TSF and WRD landforms and it is considered that the *J. aridus* population vegetation is likely unaffected due to its reliance on incident rainfall and runoff.

Specific controls include:

- Maintain implementation of Fimiston Weed Management Procedure ([Appendix A](#)), with spraying or other suitable action when weed species are identified on KCGM leases or in rehabilitation areas.
- Maintain traffic management rules to minimise the likelihood of fauna injury or mortality. These rules include prohibition of off-road driving unless authorised and reduced speed limits on internal roads.
- Minimise the attraction of feral and native fauna to the proposal by ensuring proper food storage and disposal.

- Remove roadkill from roads to reduce scavenging where necessary.
- Direct light sources towards proposal activities to illuminate operational areas rather than surrounding areas.
- Maintain existing fauna exclusion management including the fencing of the TSFs to prevent fauna entering and management of trenches to allow fauna to escape.
- Minimise dust generation from mining and road use that could cause temporary disturbance to flora and fauna as per the FAQMP.
- Use of additional dust control measures where practical, such as application of saline water on an as needs basis dust suppression as per the FAQMP.
- Continue to implement the Seepage and Groundwater Management Plan (SGWMP) to minimise indirect impacts on vegetation from rising saline water.
- Ensure a fire management and emergency response plan is available at key locations and firefighting equipment is readily available on all vehicles and all facilities.
- Maintain existing procedures for feral animals, including cat trapping when numbers are identified as increasing (usually spring).
- Clearing activities will not be undertaken when the Fire Danger Rating is severe or higher.

### 2.8.3 Remediate

The habitat species *Senna artemisioides subsp. filifolia* and *A. tetragonophylla* are included in the rehabilitation seed mix and will continue to be included in future Fimiston mine revegetation activities and mine closure rehabilitation. These species germinate well and are present in rehabilitated areas. Progressive rehabilitation of bare ground areas will be undertaken to rehabilitate and to reproduce habitat values (as per KCGM Mine Closure Plan).

#### **Rationale for choice of indicators and/or management actions**

Monitoring indicators and triggers have been developed based on recent individual species knowledge has been successfully collected and verified as representative and acceptable to subject matter experts within specialist areas of science and regulatory departments (DBCA). KCGM is currently leading the collection of representative individual species baseline information within Western Australia and Australia (for *J. aridus*). Surveys at opportunistically appropriate times will be undertaken over the next three years in an attempt to increase the knowledge of these species.

This new species data can be used to develop meaningful and practical individual species management indicators (trigger levels and threshold limits). Specific studies where KCGM is assisting the scientific community to understand these species include:

- *J. aridus*: confirmation of species whole of life habitat and life stage requirements to ensure continued population health and diversity; and confirmation of overall distribution within the Kalgoorlie region.
- Continue to work with DBCA to refine the understanding of *J. aridus* and to determine a suitable method for long-term monitoring of this poorly understood species.
- Lead development of understanding and aid identification of conservation management strategies.

## 2.9 Management-based Provisions

The following management actions will assist in meeting the Trigger criteria and Threshold criteria in the outcome-based provisions (Section 3.1.1.1 Outcome-based Provisions). These actions will be reviewed as part of the monitoring and reporting processes, and changes made where required.

The management objectives for this SSMP are:

- Disturb no more than two (2) plants considered to be breeding shrubs for the Inland Hairstreak Butterfly (*Jalmenus aridus*);
- Branches of the breeding shrubs are to be relocated to other breeding shrubs within the MDE;
- No adverse impacts to breeding shrubs for the *J. aridus* other than the disturbance described above;
- Minimise the potential risk of impact on *J. aridus* from clearing activity, vehicle strike;
- Minimise the potential risk of a decline in *J. aridus* populations due to predation from introduced predator fauna;
- Minimise the potential risk of a decline of *J. aridus* populations due to dust, weeds and displacement; and
- Minimise the potential risk of a decline in *J. aridus* habitat condition due to a change in fire regime.

The management actions for this SSMP, as detailed in Table 5, are summarised as:

- Clearing management.
- Hydrology Management.
- Weed management.
- Traffic management.
- Fauna exclusion zones.
- Dust management.
- Fire management.
- Introduced predator management.
- New breeding shrub protocol.

Triggers and thresholds have been established for management targets and are detailed in Section 3.1 Triggers, Thresholds and Contingency Actions. These triggers and thresholds are initial estimates for early warning actions. These will be modified and updated over time as more information is available on the species and habitats. Any modifications and adaptive management will be to improve on protections for the species and will be discussed with stakeholders prior to implementation.

**Table 5 Management-based Provisions**

Management Actions	Target	Monitoring	Reporting
<p><b>Clearing Management</b></p> <ul style="list-style-type: none"> <li>• Implementation of an internal clearing permit procedure, including onsite demarcation and notification procedures.</li> <li>• A relevant fauna expert/ handler will be present during all disturbance/ relocation activities.</li> <li>• <i>J. aridus</i> breeding shrubs within close proximity to operational areas to be delineated with flagging tape, signage or similar to alert all personnel of their location.</li> <li>• Inductions of all site personnel to include information on significant species, management targets, measures and expectations.</li> <li>• Undertake progressive clearing, minimising the amount of active disturbance present.</li> <li>• Progressively rehabilitate areas as appropriate.</li> <li>• Clearing to occur outside the annual <i>J. aridus</i> larval and flight activity period (Spring – August to November) in relevant areas.</li> <li>• Where confirmed <i>J. aridus</i> breeding shrubs are located within the proposed footprint all <i>J. aridus</i> egg material is to be relocated to a suitable shrub outside the clearing footprint (refer to translocation protocol).</li> </ul>	<p>Minimise the potential for incidental damage to priority fauna and shrub habitat</p>	<p>Annual habitat health and butterfly surveys</p>	<p>Annual reporting.</p> <p>Flora and Vegetation health reporting.</p> <p>Incident reports.</p>
<p><b>Hydrology Management</b></p> <ul style="list-style-type: none"> <li>• Design surface hydrology to avoid changes in hydrology to sensitive areas.</li> <li>• Maintain the supernatant pool size, under normal operating conditions, below a maximum of 15% of the total surface area of the paddock in which deposition is occurring on the Fimiston TSFs to mitigate the seepage rate.</li> <li>• Maintain Groundwater level to &gt;4 mbgl to keep water below plant root level in the soil profile to protect the Eucalypt woodland vegetation in the vicinity of the Fimiston TSFs as per the Part V Licence (L6420/1988/14)</li> </ul>	<p>Maintain groundwater levels to &gt;4 mbgl through seepage recovery. Minimise the normal operating supernatant pool size to &lt;15%</p>	<p>Daily monitoring of supernatant pool. Quarterly Groundwater Monitoring as per Licence</p>	<p>Quarterly Groundwater Monitoring Report to Department of Water and Environmental Regulation (DWER)</p> <p>Annual Audit Report of the SGMP in the Annual Environment Report</p>

Management Actions	Target	Monitoring	Reporting
<p>Fire Management</p> <p>Ensure a fire management and emergency response plan is available at key locations and firefighting equipment is readily available on all vehicles and all facilities.</p>	<p>Minimise decline in habitat condition due to changed fire regimes.</p>	<p>Annual vegetation and butterfly surveys.</p>	
<p>Traffic Management</p> <ul style="list-style-type: none"> <li>• Avoid accidental disturbance to fauna and habitat by enforcing strict traffic management rules:               <ul style="list-style-type: none"> <li>○ keeping to designated tracks with no off-road driving permitted</li> <li>○ driving to road and weather conditions</li> <li>○ reduced speed limits within suitable habitat.</li> </ul> </li> <li>• All sightings and interactions to be reported to Environmental personnel.</li> <li>• Worker awareness training.</li> </ul>	<p>Minimise the potential for incidental damage to priority flora and shrub habitat</p>		<p>Internal audit reporting for speeding and off-road driving.</p>
<p>Fauna Exclusion zones</p> <ul style="list-style-type: none"> <li>• Maintain existing fauna exclusion management including the fencing of the TSFs to prevent fauna entering and implementation of a 50m buffer around the <i>J. aridus</i> habitat shrubs to prevent disturbance.</li> <li>• Management of trenches to allow fauna to escape</li> <li>• Minimise the attraction of feral and native fauna to the proposal by ensuring proper food storage and disposal; and</li> <li>• Direct light sources towards proposal activities to illuminate operational areas rather than surrounding areas.</li> </ul>		<p>Annual vegetation and butterfly surveys.</p>	<p>Annual reporting.</p> <p>Flora and Vegetation health reporting.</p> <p>Incident reports.</p> <p>Internal reporting</p>

Management Actions	Target	Monitoring	Reporting
<p>Dust, noise, vibration and light emissions Management</p> <ul style="list-style-type: none"> <li>• Implement the KCGM-ENV-010 Dust Monitoring and Management Procedure</li> <li>• Minimise dust generation from mining and road use that could cause temporary disturbance to flora and fauna</li> <li>• Undertake dust suppression measures that include good house-keeping practices for vehicles, cleared areas, and active stockpiles.</li> <li>• Implement dust suppression measures such as the use of watercarts will be used during dry and windy conditions, as required.</li> <li>• Implement the KCGM Noise and Vibration Monitoring and Management Plan (NVMMP) which includes control measures and operational strategies that contribute to reducing noise and vibration emissions.</li> </ul>	<p>Minimise the potential for decline in population due to dust, light, noise, vibration and displacement.</p>	<p>Annual vegetation and butterfly surveys. Dust, flora and vegetation health monitoring.</p>	<p>Annual reporting.  Flora and Vegetation health reporting.  Incident reports.</p>
<p>New breeding shrub protocol</p> <ul style="list-style-type: none"> <li>• Confirm identification with expert</li> <li>• Set exclusion zone and install demarcation to prevent disturbance</li> <li>• Minimise clearing around the area</li> <li>• Add new breeding shrub to spatial data</li> <li>• Add to monitoring program</li> </ul>	<p>Protect newly Identified breeding shrubs as a result of monitoring</p>	<p>Annual monitoring</p>	<p>Annual reporting.  Flora and Vegetation health reporting.</p>
<p>Alternate monitoring site methodology</p> <p>If proposed monitoring sites are found to be unsuitable as control sites or as indirect impact early warning indicators new sites will be chosen. These new sites will be selected as per the original selection parameters to reflect local environmental changes as a reference site including:</p> <ul style="list-style-type: none"> <li>• Predicted population size</li> <li>• Accessibility</li> <li>• Tenure</li> <li>• Proximity to the Fimiston population</li> <li>• Presence of the host-ant <i>F. kirbii</i> and adult butterflies near host plants.</li> </ul>	<p>Select new monitoring shrubs that are representative of the local population for accurate comparison.</p>	<p>Annual monitoring during the breeding season</p>	<p>Annual reporting.  Flora and Vegetation health reporting.</p>

## 2.9.1 Implementation

Implementation of this SSMP will be assisted through KCGM's Environmental Management System (EMS) incorporating systems, processes, procedures and work instructions relating to the management, monitoring and reporting components of this SSMP.

KCGM is committed to conducting its activities for the Project in an ecologically responsible manner. The key personnel involved in implementation of this SSMP, and their roles and responsibilities are listed in Table 6.

**Table 6 Roles and Responsibilities**

Role	Responsibility
KCGM	KCGM has the overall responsibility for implementation of this SSMP. If any roles are delegated to a contractor or consultant, KCGM has the responsibility to audit compliance and ensure any contingency actions are implemented.
Environmental Superintendent	<p>Overall accountability for auditing and compliance assessment of the SSMP during operation to ensure it is maintained and meets objectives and targets. Provide technical support to all Project personnel to ensure the SSMP is implemented correctly and complied with.</p> <p>Implement and maintain the SSMP, review its effectiveness and review the implementation as required.</p> <p>Obtain relevant approvals from regulatory agencies for disturbance as required.</p> <p>Ensure all personnel involved in the Project are inducted and will adhere to the SSMP requirements.</p> <p>Implement monitoring programs and documenting results.</p> <p>Liaise with stakeholders and technical experts for advice and resolution of management aspects/objectives as required.</p> <p>Review and close out contingency actions as required. Report as required to regulating authorities.</p> <p>May delegate all or part responsibility to an appropriately qualified person.</p>
Construction Manager/ Registered Manager	<p>Overall accountability for auditing and compliance assessment with the SSMP during construction and operations to ensure it is maintained and meets objectives and targets.</p> <p>Overall accountability to ensure the SSMP is implemented, reported and maintained on-site.</p> <p>Ensure personnel attend inductions, have sufficient resources and training to meet the requirements of the SSMP.</p> <p>Support KCGM's fauna and flora management initiative and culture. Comply with all legal requirements and the requirements of the SSMP. Seek advice when in doubt about requirements.</p> <p>Appoint appropriate consultants to undertake specific activities set out in the SSMP if required.</p>
All personnel	<p>Must receive induction prior to commencement of work on site. Comply with all legal requirements and the requirements of the SSMP.</p> <p>Attend area specific environmental inductions/ briefings and any other training required.</p> <p>Participate in toolbox meetings and encourage personnel to suggest improvements.</p>

## 2.10 Monitoring Program

A detailed monitoring program has been prepared for *J. aridus* based on the findings of recent surveys. KCGM consulted with Phoenix Environmental Sciences in the preparation and implementation of the monitoring program.

The monitoring plan will be executed by personnel experienced in conducting similar surveys, ensuring that the data collected is reliable and accurate. The surveys are scheduled to take place during the spring season, specifically between September and November, to capture the optimal emergence time.

Monitoring will be undertaken in accordance with best-practice techniques, a summary of actions is outlined in Table 7.

**Table 7 Monitoring Program Summary**

Monitoring Event	Monitoring Action	Frequency	Responsibility
Pre-clearance Surveys/ desktop	To be undertaken prior to disturbance activities to confirm the locations of <i>J. aridus</i> breeding habitat shrubs. Monitoring of clearing register for compliance to approvals. Review of Indicative Site Layout to determine clearing proximity to habitat shrubs. Add new occurrences of <i>J. aridus</i> breeding habitat shrubs to monitoring inventory and install buffers for protection.	Prior to clearing	Environmental Superintendent
Significant fauna habitat Monitoring	Annual monitoring of health of vegetation that is habitat for significant fauna. Monitoring to detect dust impacts on vegetation	Annually in Spring	Environmental Superintendent
Significant fauna monitoring	Annual monitoring of <i>J. aridus</i> during Breeding season	Annually in Spring or as advised by specialists	Environmental Superintendent
Inspections of supernatant pond	Inspection to maintain <15% of pond area to mitigate seepage.	Daily visual check Survey twice weekly	Environmental Superintendent
Groundwater Monitoring	To maintain groundwater levels >4 mbgl of vegetation.	Quarterly as per Groundwater Licence	Environmental Superintendent

### 2.10.1 Baseline Surveys for *J. aridus*

Due to the difficult and unpredictable nature of butterfly emergence which is dependent on environmental and biological factors, and the life cycle of the species, the detection of *J. aridus*, whether in early stage or adult form is adequate to determine if the species is present at a site.

To enable the best chance of detecting *J. aridus*, searches are undertaken by experienced personnel, within the expected period of larvae, pupae or adult activity, and in ideal conditions, i.e. sunny, above 23°C and low wind.

Adult butterflies are observed opportunistically within suitable habitat by targeting prospective microhabitats, such as nectaring, courtship or breeding areas. Larvae and pupae are searched for on known breeding shrubs, particularly at the site (i.e. *S. artemisoides* subsp. *filifolia*) which have *F kirbii* and is within the range of known breeding shrubs and/or butterfly activity. Adult butterflies are identified on the wing, while some specimens may be collected with a hand net and euthanized with ethyl acetate before placing in a glassine envelope and storing at 3°C until returning to Perth to be lodged in the WAM as primary data recording spatial and temporal distribution of the species. Adult *J. aridus* butterflies will be collected under approved Fauna taking licences.

Baseline monitoring surveys were conducted throughout 2023 and 2024 as per Table 8.

**Table 8 Survey Dates**

Year	Survey Dates
2023- Baseline monitoring year 1	11 – 14 September
	12 and 15 October
2024- Baseline monitoring year 2	14 - 15 September
	21 - 23 September
	28 September – 11 October
	17 – 18 October

In Spring 2023, *J. aridus* adults were recorded at the 3 monitoring sites. Most of these were ‘worn’, i.e. older specimens. In addition to adult butterflies, several juvenile life stages were recorded at Fimiston, however no early stages have been identified at Yarri Road or Kurrawang yet due to the short period the larvae and pupae were present, which did not appear to be at the same time as at Fimiston, despite these being the closest sites. In spring 2024, butterflies were recorded at each of the monitoring sites, however, as in 2023, flight periods were out by a week between Fimiston and Yarri Road or Kurrawang, and no early stages could be located at Yarri Road or Kurrawang.

The initial baseline surveys conducted in 2023 and in 2024 ([Phoenix 2024a](#)) highlighted several important considerations which have been incorporated in the *J. aridus* monitoring program below.

### 2.10.2 Monitoring Procedure for *J. aridus*

The monitoring procedure for *J. aridus* involves several key steps, starting with the selection of experienced personnel and the timing of the surveys. The surveys are led by Dr. Eastwood, a specialist Lepidopterist, and are conducted during the primary flight season, which typically occurs between late September and November. Initial reconnaissance surveys are carried out in September to gauge the expected activity of *J. aridus*, followed by more targeted surveys that coincide with the butterflies' emergence and flight periods.

#### Timing

Monitoring of *J. aridus* will be undertaken annually during the breeding season at the Fimiston population (impact site) and two reference populations (Kurrawang and Yarri Road).

### Site Selection

Site selection is crucial for effective monitoring. Two reference sites have been chosen based on their predicted population sizes, accessibility, tenure, and proximity to Fimiston (Table 9). The selected sites are Yarri Road, which hosts a potentially large population and is located 15 km north of Fimiston, and Kurrawang Nature Reserve, which has a smaller population and is situated 20 km west of Fimiston. These sites are close enough to the Fimiston site to reflect any local environmental changes affecting all three populations.

**Table 9 Habitat shrubs in monitoring program**

Site code	Years in which <i>F. kirbyii</i> present	Years in which Early stages present	Latitude	Longitude	Health score 2023	Health score 2024 <sup>1</sup>
<b>Fimiston</b>						
1602-Ja-Fim-01	2022		-30.7947	121.5499	6	6
1602-Ja-Fim-02			-30.7947	121.5500	6	6
1602-Ja-Fim-03			-30.7945	121.5499	6	6
1602-Ja-Fim-04			-30.7948	121.5500	6	6
1602-Ja-Fim-05			-30.7945	121.5497	6	6
1602-Ja-Fim-06		2022 unconfirmed	-30.7932	121.5494	6	6
1602-Ja-Fim-07		2022 unconfirmed	-30.7932	121.5494	6	6
1602-Ja-Fim-08		2022	-30.7932	121.5494	6	6
1602-Ja-Fim-09		2022	-30.7930	121.5496	6	6
1602-Ja-Fim-10		2022	-30.7930	121.5497	6	6
1602-Ja-Fim-11		2022	-30.7857	121.5511	2	1
1602-Ja-Fim-12		2022	-30.7857	121.5510	2	6
1602-Ja-Fim-13			-30.7856	121.5518	2	1
1602-Ja-Fim-14			-30.7857	121.5519	2	0 (died)
1602-Ja-Fim-15	2024		-30.7857	121.5519	2	0 (died)
1602-Ja-Fim-17		2022, 2023, 2024	-30.7947	121.54997	6	6
1602-Ja-Fim-18		2022, 2023	-30.7947	121.54996	6	6
Fim-19	2024	2024	-30.7928	121.5498	n/a	6

Site code	Years in which <i>F. kirbyii</i> present	Years in which Early stages present	Latitude	Longitude	Health score 2023	Health score 2024 <sup>1</sup>
Fim-20	2024	2024	-30.7928	121.5498	n/a	2
Fim-21	2024		-30.7928	121.5498	n/a	6
Fim-22	2024	2024	-30.7928	121.5498	n/a	6
Fim-23	2024	2024	-30.7921	121.5501	n/a	Not scored
Fim-24	2024	2024	-30.7857	121.5511	n/a	6
Fim-25	2024	2024	-30.7889	121.5508	n/a	6
<b>Average</b>					<b>4.8</b>	<b>4.8</b>
<b>Yarri Road</b>						
1602JaYar-01	2022		30.6602	121.5594	6	6
1602-Ja-Yar-02	2022		-30.6601	121.5595	2	2
1602-Ja-Yar-03	2022		-30.6600	121.5597	2	2
1602-Ja-Yar-04	2022		-30.6601	121.5598	2	2
1602-Ja-Yar-05			-30.6602	121.5590	2	2
1602-Ja-Yar-06	2022, 2024		-30.6600	121.5589	2	2
1602-Ja-Yar-07			-30.6601	121.5592	2	2
1602-Ja-Yar-08			-30.6601	121.55957	2	2
1602-Ja-Yar-09			-30.6601	121.55965	2	2
1602-Ja-Yar-10	2022		-30.6601	121.55960	2	2
1602-Ja-Yar-11			-30.6601	121.5593	2	2
1602-Ja-Yar-12			-30.6600	121.5589	2	2
<b>Average</b>					<b>2.3</b>	<b>2.3</b>
<b>Kurrawang NR</b>						
1602-Ja-Kur-01			-30.8387	121.3496	2	2
1602-Ja-Kur-02			-30.8385	121.3501	6	6
1602-Ja-Kur-03			-30.8382	121.3501	6	6
1602-Ja-Kur-04			-30.8384	121.3500	6	6
1602-Ja-Kur-05			-30.8385	121.3499	6	6
1602-Ja-Kur-06			-30.8387	121.3499	2	2
1602-Ja-Kur-07			-30.8386	121.3499	2	2
1602-Ja-Kur-08			-30.8387	121.3496	2	2
1602-Ja-Kur-09			-30.8386	121.34997	2	2
1602-Ja-Kur-10			-30.8386	121.34996	2	2
<b>Average</b>					<b>3.6</b>	<b>3.6</b>

### Breeding Habitat Assessment

Identifying breeding shrubs is a key component of the monitoring process. Indicators such as the presence of the host ant *F. kirbii* and adult butterflies near host plants help locate potential breeding shrubs. The search involves looking for eggs, larvae, and pupae in various parts of the *Senna* plants, including under the bark, in debris around the base, and in borers holes. Both confirmed and potential breeding shrubs are selected for monitoring to ensure comprehensive data collection.

Breeding shrub selection will include (as priority) any shrubs that have been observed to have breeding activity at any point in time. Where insufficient confirmed breeding shrubs are available for monitoring, potential breeding shrubs may be selected. Potential shrubs should be chosen from known breeding species within the vicinity of known breeding shrubs and/or records of butterflies. Additional shrubs may be added to the monitoring each year if suitable/confirmed shrubs are encountered.

Health assessment of the breeding shrubs is conducted using a systematic approach. The locations of selected shrubs are recorded using GPS, and the presence or absence of *F. kirbii* and *J. aridus* larvae is noted. All potential breeding shrubs are marked with peg markers to facilitate identification in future surveys. This method ensures that the health and breeding status of the shrubs are accurately tracked over time.

Confirmed/potential breeding shrubs will be established for regular monitoring per site to enable statistical analysis of results. The presence/absence of *F. kirbii* ants (attendant ant species) will be incorporated into the breeding shrub health assessment.

Health scoring of the breeding shrubs is performed using a Condition and Defoliation scale (Table 10), which was found to be more appropriate than the previously used Casson's scale.

**Table 10 Monitoring indices, Condition and defoliation**

Scale	Description
Condition 5	very healthy plants showing signs of vigorous growth
Condition 4	generally robust and healthy
Condition 3	leaf tip dieback but general health appears satisfactory
Condition 2	branch dieback and yellowing leaves
Condition 1	total defoliation or dead
Defoliation 1	0-25% defoliation
Defoliation 2	25-50% defoliation
Defoliation 3	50-75% defoliation
Defoliation 4	75-100% defoliation

Dust scoring of breeding shrubs will be completed using a dust scale (Table 11 Dust scale).

**Table 11 Dust scale**

Scale	Rating	Description
1	No dust	0% of shrub dusty
2	Slight dust	1-25% of shrub dusty
3	Moderate dust	26-50% of shrub dusty
4	Heavy dust	51-75% of shrub dusty
5	Very heavy dust	76-100% of shrub dusty

Data collection involves measuring breeding shrub health, recording heights and phenology, and determining overall canopy cover per transect. This comprehensive approach allows for detailed analysis of the health of the breeding shrubs.

## Butterfly Activity Monitoring

Butterfly activity monitoring will focus on detecting presence and evidence of butterfly breeding at each site, including presence of eggs, larvae or pupae and/or adult butterflies. Measuring abundance is not practical due to unpredictability in detections and low densities.

Initial monitoring surveys will be conducted early in the breeding period. Where evidence of breeding activity is not detected in the initial survey, additional surveys will be conducted within the same season to attempt to confirm breeding activity for that year (it is possible that breeding may not occur in some years, due to natural factors).

Success of relocating branches will be measured by determining the percentage of eggs that hatched (Eastwood 2024). Ongoing monitoring is unable to be applied to the translocation process. Eggs will be translocated to an existing breeding shrub outside the impact area, the translocated eggs will hatch into larvae, and the larvae will pupate with the surrounding *J. aridus* larva on the breeding shrub. The next generation of *J. aridus* the following year will be entirely different (Eastwood 2024).

## Nectaring Habitat Assessment

Nectaring habitat assessment is another important aspect of the monitoring procedure. This involves using 50 m intercept transects to measure canopy covers of selected genera such as *Eremophila*, *Scaevola*, and *Maireana* species. Data on species flowering, not flowering, shrub/tree height and dust cover are also recorded. This information helps in understanding the availability and condition of nectaring habitats, which are crucial for the survival of *J. aridus*.

In spring 2023, one 10 x 10 m quadrat was set up as a trial monitoring method, but not found to adequately describe the nectaring habitat. Vegetation health was assessed using the [Casson et al. \(2009\)](#) Vegetation Health Scale (Table 12), where the quadrat is scored as a single unit and given a single score.

**Table 12**      **Vegetation Health Scale ([Casson et. al. 2009](#))**

Health rating	Description
4	Healthy no signs of stress
3	Some early signs of stress, a few individuals, likely one species
2	Signs of stress in several individuals, one or more species
1	Signs of stress in many individuals, several species
0	Advanced decline and/or death of many individuals and several or most species

The methodology for nectaring habitat shrub health is:

- 1 Canopy covers for selected nectaring habitat genera will be measured in the same 50 m intercept transect utilised for breeding shrub health assessment. All species are recorded for nectaring habitat assessment with a focus on *Eremophila*, *Scaevola*, and *Maireana* species.
- 2 Overall canopy cover per transect will be determined from the sum of covers of all species measured.
- 3 Data will be recorded for species flowering/not flowering during the monitoring, as well as shrub/tree height.

## Data Analysis and Reporting

Data analysis is conducted to interpret the collected information. Condition and defoliation scores are analysed using descriptive statistics (e.g. mean, median, and range) to determine changes in shrub health. Ordinal condition and defoliation scores will be compared among sites using suitable non-

parametric statistical tests, with post-hoc pairwise comparisons where needed.

Data from the monitoring surveys will be compared between sites (Fimiston, Kurrawang NR and Yarri Road) at the time of survey, rather than variance between years, as activity is expected to be represented across all three sites concurrently. Interpretation of monitoring results will consider the findings for all factors as a whole, rather than in isolation. A report outlining the findings and recommendations will be published within 2 months of monitoring. If the trigger criterion thresholds are reached (i.e. a significant reduction in breeding or nectaring vegetation health, or lack of evidence of breeding) these will be communicated immediately after the survey to determine if further investigation is required.

The monitoring plan for *J. aridus* will allow for review and refinement following each monitoring round (i.e. an adaptive management approach), as knowledge of the species ecology, behaviour, distribution and susceptibility to impacts increases.

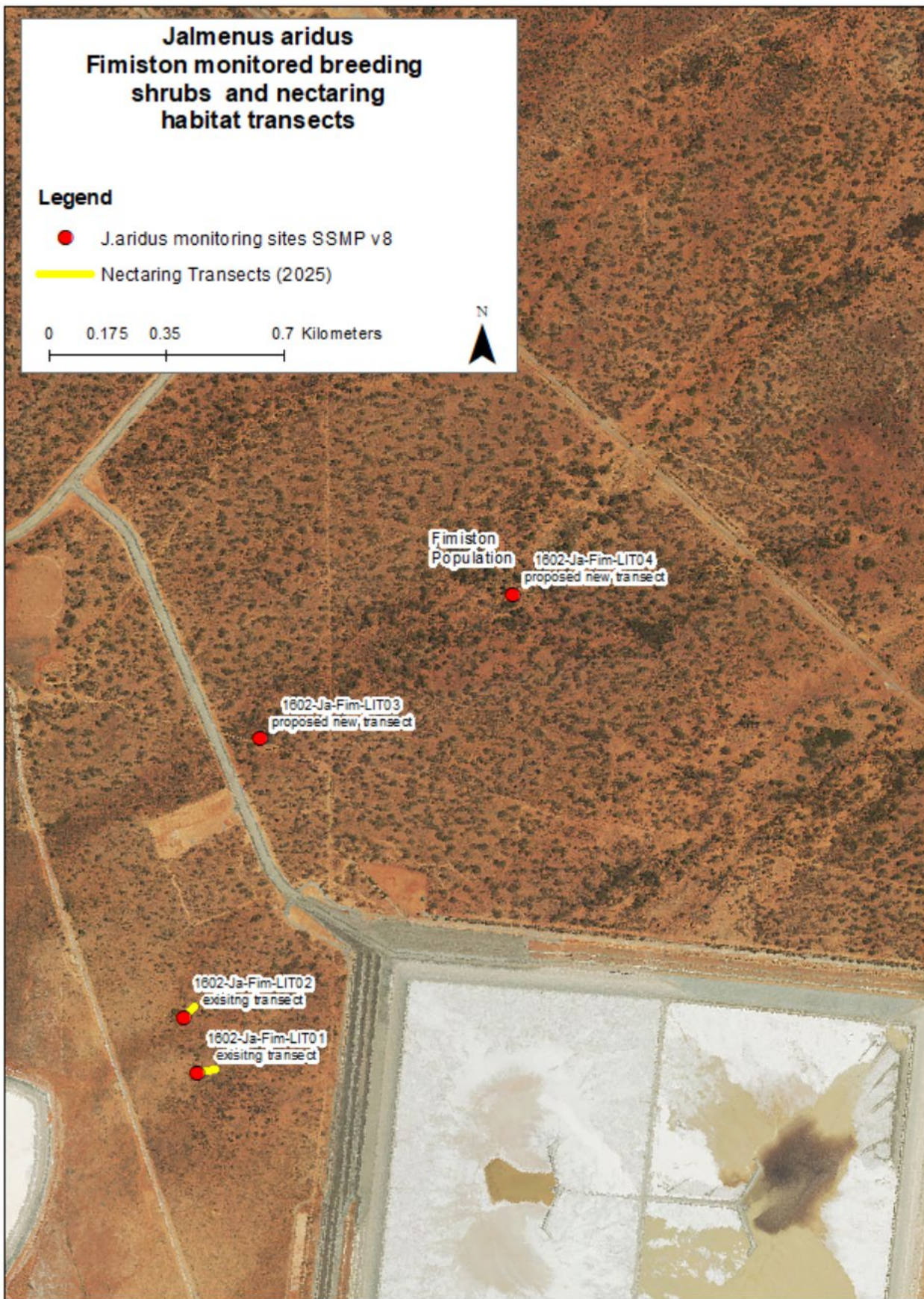


Figure 2 Fimiston - Location of Monitored Breeding Shrubs & Nectaring Habitat

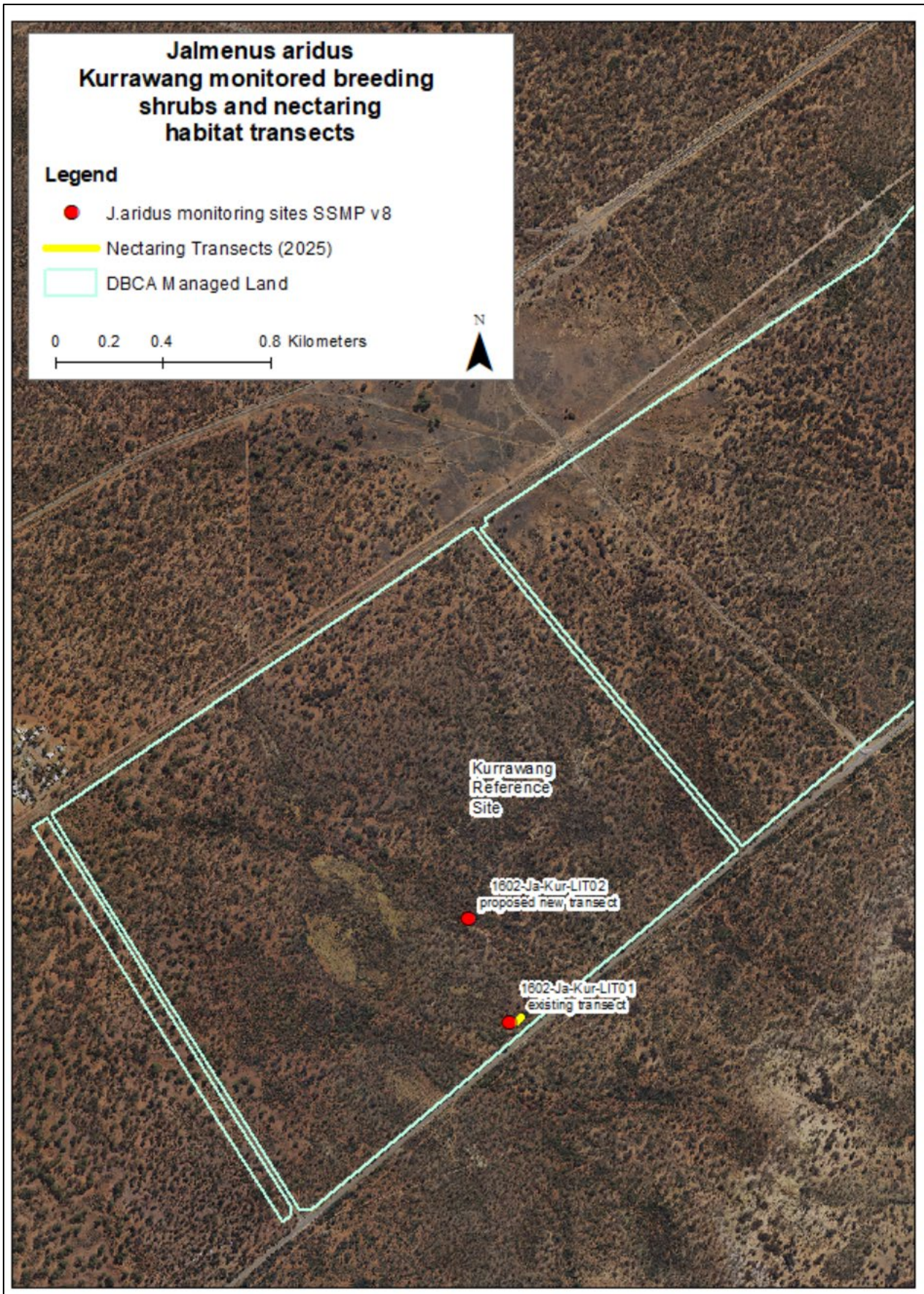


Figure 3 Kurrawang Reference Site - Location of Monitored Breeding Shrubs & Nectaring Habitat

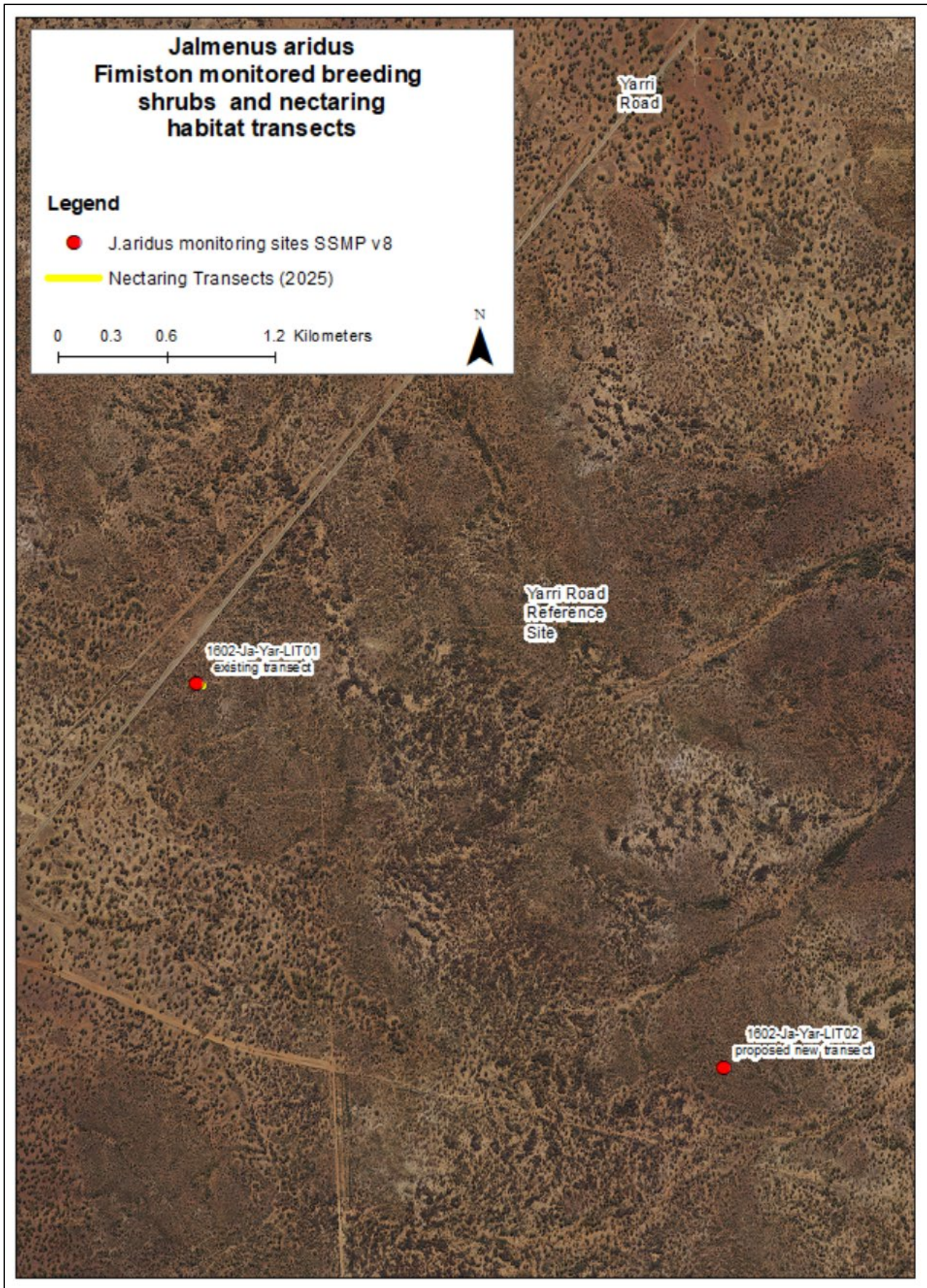


Figure 4 Yarri Reference Site - Location of Monitored Breeding Shrubs & Nectaring Habitat

### 2.10.3 Triggers and Threshold Rationale

Rationale for chosen outcome-based thresholds and triggers for this SSMP are outlined in Table 13. Rationale for chosen objective-based provisions are discussed in Table 14.

**Table 13 Rationale for *J. aridus* outcome-based provisions**

Threshold	Rationale
Disturbance of more than 2 confirmed breeding shrubs for <i>J. aridus</i> .	Disturbance to these plants can significantly impact the butterfly's breeding success. Additionally, <i>J. aridus</i> larvae have a mutualistic relationship with the ant <i>Froggattella kirbii</i> , and disturbing the breeding shrubs can disrupt this relationship, affecting larval survival. Given that <i>J. aridus</i> is recorded from a limited number of locations, any disturbance to its breeding plants can have a disproportionate impact on its population viability. As a species with a restricted distribution and specific habitat requirements, <i>J. aridus</i> is likely a conservation priority, and setting a low threshold for disturbance helps ensure that even minor impacts are mitigated.
Successfully relocate 100% of the disturbed branches identified to be carrying eggs to other breeding shrubs within the development envelope.	Successfully relocating 100% of disturbed branches identified to be carrying eggs to other breeding shrubs within the development envelope is to ensure the preservation and continuity of the habitat of <i>J. aridus</i> . This practice minimizes the impact of habitat disturbance by maintaining the availability of essential breeding resources. Relocating disturbed branches helps sustain the mutualistic relationships between the butterfly larvae and their ant partners, ensuring larval survival and overall population stability.
Ensure that 100% of the breeding shrubs, except those specified in condition B2-1(1), remain undisturbed and free from adverse impacts	Ensuring that 100% of the breeding shrubs, except those specified in condition B2-1(1), remain undisturbed and free from adverse impacts is to protect the critical habitat necessary for the survival and reproduction of species like <i>J. aridus</i> . By maintaining these breeding shrubs in an undisturbed state, the ecological balance and mutualistic relationships essential for the species' lifecycle are preserved. This approach minimizes habitat fragmentation and degradation, ensuring that the specific environmental conditions required for breeding and larval development are consistently available. Additionally, it supports the overall conservation efforts for species with restricted distributions and specialized habitat needs, thereby enhancing their population stability and resilience.
Statistically significant (more than 20%) difference in mean health ratings of confirmed/potential <i>J. aridus</i> breeding shrubs and/or nectaring habitat at Fimiston population in comparison to confirmed/potential breeding shrubs at control populations.	If a difference in health of <i>J. aridus</i> habitat is identified between control and impact sites, the response actions will allow investigation to determine if the causes are attributed to the FS Project and, if necessary, allow for early intervention and further management measures to prevent impacts on <i>J. aridus</i> habitat. The criteria for habitat health decline will be compared between impact and control sites at time of survey, rather than between years as external factors such as climate are likely to influence all three sites concurrently.
No evidence of breeding at Fimiston population compared to control populations identified.	Butterfly monitoring will focus on detecting continued presence and breeding activity of the Fimiston population in each season. Monitoring of presence and breeding activity at the Fimiston population will be compared with the control populations within each season as activity is expected to be

Threshold	Rationale
	represented across all 3 sites concurrently. This approach takes account of the variability in life cycle timing across years, as well as the potential for extended diapause during unfavourable conditions. Abundance measures are not practical for this species given the unpredictability in flying periods and the low densities of adult butterflies encountered.

**Table 14**      **Rationale for *J. aridus* objective-based provisions**

Management	Rationale
Clearing procedure and authorised internal permit process for all clearing activities to prevent unauthorised clearing within the MDE.	If clearing occurs which has not received an approved internal clearing permit within the MDE, it is considered a non-compliance or failure of the procedure which is in place to prevent vegetation clearing of host plants or nectaring vegetation.

### 3. EMP PROVISIONS

The key objectives of the SSMP are to review and ensure compliance against MS1258 and the “Instructions on how to prepare Environmental Protection Act 1986 Part IV Environmental Management Plans” ([EPA, 2024](#)) and ensure that once approval of the FS Project (s38) is received that the impending activities of that Project will not inadvertently impact on Environmental Factors regarding flora and vegetation and terrestrial fauna, as per “Statement of environmental principles, factors, objectives and aims of EIA” ([EPA, 2023](#)).

To meet this objective, management provisions have been established to assist implementation of practical and safe mitigation measures to minimise the potential impacts as summarised in Section 2.6. Environmental impacts incorporate quantifiable and non-quantifiable impacts, outcome-based and management-based provisions (included in this SSMP).

Early response triggers (thresholds) for management-based provisions are detailed in the tables below:

- Outcome-based provisions are performance-based and may be used where part of the environment is able to be objectively measured and reported. Therefore, outcome-based provisions have been established to specify triggers and thresholds of direct impacts and to ensure the Proposal achieves acceptable environmental outcomes.
- Management-based provisions relate to management actions and may be used where the part of the environment is not capable of being objectively measured and reported. Therefore, management-based provisions have been established to specify management actions and targets, particularly for indirect impacts that are non-quantifiable. As monitoring is undertaken and additional population data is gathered, the management targets are expected to be reviewed and quantifiable outcome-based provisions established.

#### 3.1 Triggers, Thresholds and Contingency Actions

The Trigger criteria have been developed with reference to the information available from the baseline surveys and initial monitoring. It is expected that once sufficient monitoring data is collated over time (i.e. 3 years) that Trigger criteria and Threshold criteria will be reviewed by an appropriate fauna specialist and revised as necessary, with this SSMP.

Contingency actions for *J. aridus* include:

- Increase in staff training and awareness on factors which have implications to vegetation health for example dust, changes to hydrology.
- Review impact of unauthorised clearing and report any noncompliance to DWER within 7 days of identification.
- Installation of signage where appropriate.
- Undertake rehabilitation of unauthorised clearing (i.e. disturbance from vehicle tracks, vegetation clearing) by appropriately qualified personnel as required, in accordance with rehabilitation procedure.
- Review all monitoring data (including control sites) in relation to management measures and any other available data such as weather or changes in hydrology to determine if the decrease is due to proposal related impacts.
- Review dust, weather and weed monitoring to compare *J. aridus* breeding shrub and shrubs of the same species at control sites. Determine whether the changes observed in the impact sites are comparable to the observations in the reference sites.
- Investigate potential causes for the observed decline in vegetation health which may include but are not limited to:
  - seasonal conditions (e.g., rainfall and temperatures)
  - effectiveness of weed control
  - spatial variation (near-impact areas) versus sites located further from impact

- Develop strategies based on the outcomes of the investigation to prevent a recurrence and if necessary or possible reverse the decline in health of the breeding shrub. Management measures may include the following:
- Increase the frequency of health monitoring if disturbance is detected.

### 3.1.1 *Jalmenus aridus*

#### 3.1.1.1 Outcome based provisions

**Purpose of EMP:** to comply with MS1258 and EPA Instructions on how to prepare Environmental Protection Act 1986 Part IV Environmental Management Plans.

**Table 15 Outcome-based conditions for *J. aridus***

EPA factor/s and objective/s: Terrestrial Fauna. To avoid direct and minimise indirect impacts to <i>J. aridus</i> to the maximum extent practical Outcome/s: No observable impact to <i>J. aridus</i> from the Fimiston South operations Key environmental values: Presence of Priority 2 species, <i>J. aridus</i> Key impacts and risks: Reduction in presence and population viability of <i>J. aridus</i>				
Outcome-based				
Criteria: Trigger criteria Threshold criteria	Response actions: Trigger level actions, Threshold contingency actions	Monitoring	Timing / frequency of monitoring	Reporting
<p><b>Trigger Criteria</b> Any observed disturbance to the breeding shrubs for <i>J. aridus</i>, such as physical damage, removal, or significant alteration of the habitat.</p> <p><b>Threshold criteria</b> Disturbance of more than 2 breeding plants considered breeding shrubs for <i>J. aridus</i>.</p>	<p><b>Trigger level actions</b></p> <ul style="list-style-type: none"> <li>Review all monitoring data (including control sites) in relation to management measures and any other available data such as weather and climate to determine if the decrease is due to proposal related impacts.</li> <li>Install protective barriers around breeding shrubs to prevent further physical damage or accidental removal</li> <li>Increase monitoring frequency</li> <li>Review clearance procedures</li> <li>Review dust management if related to this disturbance.</li> <li>Alert relevant stakeholders and confirm measures are being undertaken.</li> </ul> <p><b>Threshold contingency actions</b></p> <ul style="list-style-type: none"> <li>Report internally as an incident</li> <li>Investigate cause and extent of disturbance and if it is likely to result in the key environmental outcome not being achieved.</li> <li>Increase monitoring frequency</li> <li>Alert relevant stakeholders and confirm measures are being undertaken.</li> <li>Increase staff training and awareness on factors that can result in disturbance.</li> </ul>	<p>Monitoring of areas that are to be disturbed. Ensuring barriers have been placed around shrubs that are not to be disturbed and these shrubs are recorded in a register.</p>	<p>Annually in Spring during the <i>J. aridus</i> breeding season. Increase frequency as soon as any disturbance is detected.</p>	<p>Annual Compliance Assessment (CAR) Report to DWER/EPA (MS1258).</p> <p>The Annual Environment Report (AER) to DMIRS.</p>

EPA factor/s and objective/s: Terrestrial Fauna. To avoid direct and minimise indirect impacts to *J. aridus* to the maximum extent practical Outcome/s: No observable impact to *J. aridus* from the Fimiston South operations  
 Key environmental values: Presence of Priority 2 species, *J. aridus*  
 Key impacts and risks: Reduction in presence and population viability of *J. aridus*

Outcome-based

Criteria: Trigger criteria Threshold criteria	Response actions: Trigger level actions, Threshold contingency actions	Monitoring	Timing / frequency of monitoring	Reporting
<p><b>Trigger Criteria</b> Initiate the relocation of branches from breeding shrubs described in condition B2-1(1) when development activities require their disturbance.</p> <p><b>Threshold criteria</b> Less than 100% of the disturbed branches are successfully relocated to other breeding shrubs within the development envelope.</p>	<p><b>Trigger level actions</b></p> <ul style="list-style-type: none"> <li>Conduct survey to identify the specific shrubs and branches that need relocation.</li> <li>Schedule the relocation during a period that minimises stress on the plants</li> <li>Evaluate the new location to ensure it provides similar conditions (soil type, sunlight, moisture) to the original site</li> <li>Use appropriate tools and techniques to carefully extract the branches</li> <li>Ensure the presence of relevant fauna expert/handler(s) during disturbance/relocation activities</li> </ul> <p><b>Threshold contingency actions</b></p> <ul style="list-style-type: none"> <li>Delay relocation if adverse weather conditions are expected (too hot, too wet)</li> <li>Implement pest and weed control if detected</li> <li>Provide structural support (staking) to relocated branches if they are unstable or at risk if damage from wind or other environmental factors</li> <li>Monitor health and growth of relocated shrubs adjust care practices as required</li> </ul>	<p>Monitoring of areas that are to be disturbed.</p> <p>Ensuring barriers have been placed around shrubs that are not to be disturbed and these shrubs are recorded in a register.</p>	<p>Pre and post disturbance activities.</p> <p>Continue monitoring and collecting field data</p>	<p>Annual Compliance Assessment (CAR) Report to DWER/EPA (MS1258).</p> <p>The Annual Environment Report (AER) to DMIRS.</p>
<p><b>Trigger criteria</b> A 20% or greater adverse difference in health ratings of <i>J. aridus</i> confirmed/potential breeding shrubs and/or habitat at Fimiston population in comparison to control populations.</p>	<p><b>Trigger level actions</b></p> <ul style="list-style-type: none"> <li>Review all monitoring data (including control sites) in relation to management measures and any other available data such as weather and climate to determine if the decrease is due to proposal related impacts.</li> <li>Increase the frequency of health monitoring.</li> <li>If decrease is due to changes attributable to the project, then engineering and operational controls will be investigated to stop indirect impacts.</li> <li>Alert relevant stakeholders and confirm measures are being undertaken.</li> </ul>	<p>Assessment of <i>J. aridus</i> confirmed/potential breeding shrub health at control and impact populations.</p>	<p>Annually, in spring.</p>	<p>Annual Compliance Assessment (CAR) Report to DWER/EPA (MS 1258).</p> <p>The Annual Environment Report (AER) to DMIRS.</p>

EPA factor/s and objective/s: Terrestrial Fauna. To avoid direct and minimise indirect impacts to *J. aridus* to the maximum extent practical Outcome/s: No observable impact to *J. aridus* from the Fimiston South operations  
 Key environmental values: Presence of Priority 2 species, *J. aridus*  
 Key impacts and risks: Reduction in presence and population viability of *J. aridus*

Outcome-based

Criteria: Trigger criteria Threshold criteria	Response actions: Trigger level actions, Threshold contingency actions	Monitoring	Timing / frequency of monitoring	Reporting
<p><b>Threshold criteria</b>            A 30% or greater adverse difference in health ratings of <i>J. aridus</i> confirmed/potential breeding shrubs and / or habitat at Fimiston population in comparison to control populations.</p>	<p><b>Threshold contingency actions</b></p> <ul style="list-style-type: none"> <li>• Review all monitoring data (including control sites) in relation to management measures and any other available data such as weather or changes in hydrology to determine if the decrease is due to proposal related impacts.</li> <li>• Review dust, weather and weed monitoring to compare <i>J. aridus</i> breeding shrub and shrubs of the same species at control sites. Determine whether the changes observed in the impact sites are comparable to the observations in the reference sites.</li> <li>• Investigate potential causes for the observed decline in vegetation health which may include but are not limited to:               <ul style="list-style-type: none"> <li>- seasonal conditions (e.g., rainfall and temperatures)</li> <li>- effectiveness of weed control</li> <li>- spatial variation (near-impact areas) versus sites located further from impact</li> <li>- natural aging of the shrub</li> </ul> </li> <li>• Develop strategies based on the outcomes of the investigation to prevent a recurrence and if necessary or possible reverse the decline in health of the breeding shrub. Management measures may include the following:               <ul style="list-style-type: none"> <li>- Increase the frequency of health monitoring.</li> <li>- Increase staff training and awareness on factors which have implications to health for example dust, changes to hydrology.</li> </ul> </li> </ul>			

**EPA factor/s and objective/s:** Terrestrial Fauna. To avoid direct and minimise indirect impacts to *J. aridus* to the maximum extent practical **Outcome/s:** No observable impact to *J. aridus* from the Fimiston South operations  
**Key environmental values:** Presence of Priority 2 species, *J. aridus*  
**Key impacts and risks:** Reduction in presence and population viability of *J. aridus*

Outcome-based				
Criteria: Trigger criteria Threshold criteria	Response actions: Trigger level actions, Threshold contingency actions	Monitoring	Timing / frequency of monitoring	Reporting
<b>Trigger criteria</b> Difference in health ratings of <i>J. aridus</i> confirmed/potential nectaring habitat at Fimiston population in comparison to confirmed/potential nectaring habitat at control populations.	<b>Trigger level actions</b> Review all monitoring data (including control sites) in relation to management measures and any other available data such as weather and climate to determine if the decrease is due to proposal related impacts. Review general access to the area and any other potential cause of change of condition. Confirm that alternative breeding shrubs nearby.	Assessment of <i>J. aridus</i> confirmed/potential nectaring habitat health at control and impact populations.	Annually, in spring.	Annual Compliance Assessment (CAR) Report to DWER/EPA (MS1258). The Annual Environment Report (AER) to DMIRS.

**EPA factor/s and objective/s:** Terrestrial Fauna. To avoid direct and minimise indirect impacts to *J. aridus* to the maximum extent practical **Outcome/s:** No observable impact to *J. aridus* from the Fimiston South operations  
**Key environmental values:** Presence of Priority 2 species, *J. aridus*  
**Key impacts and risks:** Reduction in presence and population viability of *J. aridus*

**Outcome-based**

Criteria: Trigger criteria Threshold criteria	Response actions: Trigger level actions, Threshold contingency actions	Monitoring	Timing / frequency of monitoring	Reporting
<p><b>Threshold criteria</b>            Statistically significant (more than 20%) adverse difference in mean health ratings of confirmed/potential <i>J. aridus</i> nectaring habitat at Fimiston population in comparison to confirmed/potential <i>J. aridus</i> nectaring habitat at control sites.</p>	<p><b>Threshold contingency actions</b>            Review all monitoring data (including control sites) in relation to management measures and any other available data such as weather or changes in hydrology to determine if the decrease is due to proposal related impacts.            Review dust, weather and weed monitoring to compare nectaring habitat and similar vegetation at control sites.            Determine whether the changes observed in the impact sites are comparable to the observations in the reference sites. Investigate potential causes for the observed decline in vegetation health which may include but are not limited to:</p> <ul style="list-style-type: none"> <li>• seasonal conditions (e.g., rainfall and temperatures)</li> <li>• effectiveness of weed control</li> <li>• natural aging of shrub</li> <li>• spatial variation (near-impact areas) versus sites located further from impact</li> </ul> <p>Develop strategies based on the outcomes of the investigation to prevent a recurrence and if necessary or possible reverse the decline in health of the breeding shrub. Management measures may include the following:</p> <ul style="list-style-type: none"> <li>• Review general access to the area and any other potential cause of change of condition. undertake weed management</li> <li>• staff training and awareness on factors which have implications to health for example dust, changes to hydrology.</li> </ul>			

**EPA factor/s and objective/s:** Terrestrial Fauna. To avoid direct and minimise indirect impacts to *J. aridus* to the maximum extent practical **Outcome/s:** No observable impact to *J. aridus* from the Fimiston South operations  
**Key environmental values:** Presence of Priority 2 species, *J. aridus*  
**Key impacts and risks:** Reduction in presence and population viability of *J. aridus*

**Outcome-based**

Criteria: Trigger criteria Threshold criteria	Response actions: Trigger level actions, Threshold contingency actions	Monitoring	Timing / frequency of monitoring	Reporting
<p><b>Trigger criteria</b> No evidence of breeding at Fimiston population compared to control populations during initial monitoring survey (within each breeding season) identified.</p> <p><b>Threshold criteria</b> No evidence of breeding in additional surveys (within same season) at Fimiston population compared to control populations identified.</p>	<p><b>Trigger level actions</b> Review all monitoring data and any other available data such as weather and changes to hydrology to determine if the decrease is due to proposal- related impacts. Report internally as an incident Investigate cause and extent of mortality and if it is likely to result in the key environmental outcome not being achieved.</p> <p><b>Threshold contingency actions:</b> Report internally as an incident Investigate cause and extent of mortality and if it is likely to result in the key environmental outcome not being achieved. If necessary (deemed to be proposal related), consider measures to prevent a re-occurrence of the incident and/or remediation strategies to address the impact and to protect the species habitat from any further impact. Engagement with key stakeholders including DBCA, and relevant specialists where required to determine any appropriate contingency actions.</p>	<p>Surveys for butterfly presence and breeding activity at control and impact populations.</p> <p>Surveys for additional regional populations.</p>	<p>Annually, in spring for monitoring of impact and control populations – providing suitable spring climate.</p> <p>Further surveys for additional regional populations may be conducted until it has been sufficiently demonstrated that the species is much more common and widespread than currently known. Further surveys in the potential secondary flight season in autumn or opportunistically.</p>	<p>Annual Compliance Assessment (CAR) Report to DWER/EPA (MS1258).</p> <p>The Annual Environment Report (AER) to DMIRS. Engagement with DBCA including provision of scientific results.</p>

### 3.1.1.2 Objective-based EMPs

Purpose of EMP: to comply with MS1258 and EPA Instructions on how to prepare Environmental Protection Act 1986 Part IV Environmental Management Plans.

Table 16 Objective-based conditions for *J. aridus*

EPA factor/s and objective/s: Terrestrial fauna. To avoid direct and minimise indirect impacts to <i>J. aridus</i> to the maximum extent practical. Objective/s: To avoid clearing and impacts to <i>J. aridus</i> Key environmental values: Presence of Priority 2 species, <i>J. aridus</i> Key impacts and risks: Reduction in presence of <i>J. aridus</i>				
Objective-based				
Management targets	Management actions	Monitoring	Timing / frequency of actions	Reporting
<p><b>Objective</b></p> <p>Manage clearing boundaries and clearing permitting process to prevent unauthorised clearing.</p> <p><b>Non-compliance</b></p> <p>Near miss – clearing within 20 m of known habitat without appropriate clearing procedures followed.</p>	<p><b>Management Actions</b></p> <ul style="list-style-type: none"> <li>• Train staff in clearing procedures</li> <li>• Survey and peg boundaries of areas prior to clearing</li> <li>• Environmental Officer to confirm boundaries prior to clearing occurring.</li> <li>• Maintain clearing buffer of 50m for <i>J. aridus</i> breeding shrubs</li> <li>• Clearing only with an authorised internal permit within the MDE.</li> </ul> <p><b>Contingency actions</b></p> <p>Report internally as an incident in accordance with internal procedures. Review management strategies and implement changes to prevent future occurrences which may include the following:</p>	<p>Internal monitoring of recorded <i>J. aridus</i> and continued engagement with DBCA.</p>	<p>Annual auditing of internal clearing permits and documentation of any contingency actions.</p> <p>Annual report cycle to assist annual fees and calculation of disturbance footprint.</p> <p>Monitoring and reporting of areas cleared and/or rehabilitated in the previous 12 months.</p>	<p>Annual Compliance Assessment (CAR) Report to DWER/EPA (MS1258).</p> <p>The Annual Environment Report (AER) to DMIRS.</p>
	<ul style="list-style-type: none"> <li>• Audit and review of training and staff inductions i.e. Increase in staff training and awareness to include information on legislative requirements, appropriate clearing procedures).</li> <li>• Ground Disturbance Permit competency training</li> <li>• Review impact on species and reinstate area, if possible, to prevent further damage.</li> </ul>			

EPA factor/s and objective/s: Terrestrial fauna. To avoid direct and minimise indirect impacts to *J. aridus* to the maximum extent practical. Objective/s: To avoid clearing and impacts to *J. aridus*  
 Key environmental values: Presence of Priority 2 species, *J. aridus*  
 Key impacts and risks: Reduction in presence of *J. aridus*

Objective-based

Management targets	Management actions	Monitoring	Timing / frequency of actions	Reporting
<p><b>Non-conformance</b>            Clearing without an authorised internal permit within the MDE but outside the approved clearing areas.</p>	<p><b>Contingency actions</b></p> <ul style="list-style-type: none"> <li>Review impact of unauthorised clearing and report any noncompliance to DWER within 7 days of identification.</li> </ul> <p>Undertake rehabilitation of unauthorised clearing (i.e. disturbance from vehicle tracks, vegetation clearing) by appropriately qualified personnel as required, in accordance with rehabilitation procedure.</p>			
<p><b>Objective</b>            Design facilities to Minimise changes to hydrology to potential <i>J. aridus</i> habitat areas.</p> <p><b>Non-conformance</b> Near miss – Ground Disturbance Permit not reviewed for potentially impacting facilities.</p> <p><b>Non-conformance</b>            Construction of facilities that impact upon the hydrology of the <i>J. aridus</i> potential habitat areas.</p>	<p><b>Management Actions</b>            Assess design for new facilities with potential to impact on hydrology of <i>J. aridus</i> area through Ground Disturbance Permit.</p> <p><b>Contingency actions</b>            Report internally as an incident in accordance with internal procedures.            Ensure Ground Disturbance Permit process is followed.            Implement engineering controls such as diversions to maintain ecological flows to habitat</p> <p><b>Contingency actions</b>            Report internally as an incident in accordance with internal procedures.            Review impact on hydrology and determine if remedial works are required            Review Ground Disturbance Permit process.</p>	<p>New Projects to identify potential development/ construction or disturbance footprint very early during pre-feasibility phase studies.</p> <p>Conduct spring surveys if potential for <i>J. aridus</i> occurrence.</p> <p>Conduct environmental impact assessments and apply risk and probability.</p>	<p>Annual auditing of internal clearing permits and documentation of any contingency actions.</p> <p>Annual report cycle to assist annual fees and calculation of disturbance footprint. Monitoring and reporting of areas cleared and/or rehabilitated in the previous 12 months.</p>	<p>Annual Compliance Assessment (CAR) Report to DWER/EPA (MS1258).</p> <p>The Annual Environment Report (AER) to DMIRS.</p>

## 4. ADAPTIVE MANAGEMENT AND REVIEW OF THE SSMP

KCGM operations recognises the dynamic nature of both natural ecosystems, man-made work areas and changing legislative environment and supports adaptive management under this SSMP.

Adaptive management involves:

- Monitoring and evaluation against management targets (including trigger thresholds) and environmental criteria (trigger limits);
- Implementing mitigation measures, reviewing and assessing new technologies or survey techniques; and
- Systematically adapting management of change to assist maintaining the under pinning environmental factor objectives of the EP Act.

Any changes to a Project will instigate a review and consideration of risks, mitigation controls and management actions. Assumptions and uncertainties will be evaluated against collected monitoring data on a recurrent basis in a process of continual improvement and establishing early response indicators/criteria. Any review and consideration of management actions or additions to this plan made in relation to adaptive management/continuous improvement may be made available to DBCA and/or DWER on request.

Examples of adaptive management include:

- The introduction of a different / alternative species-specific monitoring technique;
- The identification of potential trigger criteria to aid identification and development of conservation management strategies;
- Change to conservation status of a species triggers a review in the requirements of this SSMP;
- Changes to state or national regulatory or other standards triggering a review of this SSMP;
- Early identification of new proposal/projects which may pose potential risk, whether actual or frivolous, and complete environmental impact assessment if unclear identification or magnitude of impact/s.
- Because knowledge of *J. aridus* is still emerging and confidential, it is proposed to review this SSMP after three years of implementation to adapt the program to the latest understanding of the species.

## 5. STAKEHOLDER CONSULTATION

KCGM has undertaken extensive stakeholder engagement with regards to the development of the Revised Proposal. Reflecting the diverse range of stakeholders, their needs and engagement preferences, KCGM has employed a range of strategies to inform stakeholders of the Fimiston South Revised Proposal over the last two years and collate their feedback.

The consultation and engagement process involved:

- Identifying key stakeholders and interests
- Developing and implementing the consultation and engagement program
- Recording stakeholder feedback.

The outcomes of consultation are recorded in a Stakeholder Consultation Register. Consultation to date has been comprised predominately of meetings and correspondence with a number of State agencies, Local Government, Traditional Owners and non-government organisations and interest groups.

KCGM is committed to ongoing stakeholder identification, communication, engagement and consultation through the expansion planning and approval phase, and through to construction, operational and closure phases of the Project.

The relevant stakeholders for this SSMP are:

- Department of Biodiversity, Conservation and Attractions (DBCA): Conservation of Priority Species.
- Western Australian Environmental Protection Authority (EPA): Assessment of the proposal under Part IV of the EP Act and assessment of this SSMP.
  - All comments received during the assessment period from decision-making authorities and the public that relate to this SSMP will be considered and changes made as/where required.
  - Provision of technical reports and field opportunities have been arranged with DBCA.
- Community: Part of public consultation phase under Revised Proposal assessment.

At this stage KCGM would prefer that this EMP remain confidential to protect the significant species from detection and most particularly to protect *J. aridus* from butterfly collectors.

Phoenix has been working in close collaboration for several years with R Eastwood and A Williams from DBCA to undertake additional surveys at Fimiston and regionally to add to the scientific knowledge of the poorly known *J. aridus* species. This work is ongoing and means that survey methods will be refined over time as the scientific knowledge grows and details about the species habitat, breeding and persistence at the site is better understood. This collaboration has already resulted in a peer reviewed scientific publication on the current state of knowledge of *J. aridus* including distribution, biology, behaviour and habitat preferences ([Eastwood et. al. 2023](#)).

The community have not been consulted specifically about the SSMP as it is considered confidential information in order to protect the species. The community has been consulted about the Fimiston Project.

## 6. DOCUMENT HISTORY

<b>Complexity of changes</b>	Minor revisions <input type="checkbox"/>	Moderate revisions <input checked="" type="checkbox"/>	Major revisions <input type="checkbox"/>
<b>Number of Key Environmental Factors</b>	One	2-3 <input checked="" type="checkbox"/>	> 3 <input type="checkbox"/>
<b>Date of revision</b> for submission to EPA: 31/10/2024			
Proponent's operational requirement timeframe for approval of revision	< One Month <input checked="" type="checkbox"/>	< Six Months <input type="checkbox"/>	> Six Months <input type="checkbox"/>
Reason for Timeframe:	None <input type="checkbox"/>		

Item no.	EMP section no.	EMP pg. no.	Summary of change	Reason for change
	Original document		Changes to EMP	Updated to align with EPA EMP template
			<b>Version 4 as of July 2024</b>	
1 2	2.9		Whole document updated	Addressed comments from DBCA for the ERD consultation period.
			<b>Version 5 as of 31 October 2024</b>	
	2.6.1 and 2.6.2		Added in reference to regional surveys for both <i>E. praecox</i> and <i>J. aridus</i> and updated population numbers based on recent surveys	To confirm that these will be undertaken
	2.9		Added adaptive management for triggers.	As requested by DBCA
	2.10		Committed to adding newly found shrubs to the monitoring program.	As requested by DBCA
	3.1		Additional actions included in adaptive management	As requested by DBCA
	3.1.1		Updates to response actions. Removed reference to changing monitoring frequency	As requested by DBCA
	3.1.2		Updated triggers and thresholds and actions	As requested by DBCA
	Appendix C		New/ updated <i>J. aridus</i> monitoring plan	As requested by DBCA
			<b>Version 6 21 November 2024</b>	

			SSMP revised to separate into two separate management plans, a Fauna and a Flora SSMP	As requested by DWER
			<b>Version 8 March 2026</b>	
			Fauna SSMP updated as per MS1258 conditions	Requirements of new conditions
			New outcomes triggers and thresholds added to the outcomes table in line with MS1258	Requirements of new conditions

## 7. GLOSSARY

Term	Explanation
DBCA	Department of Biodiversity, Conservation and Attractions
DWER	Department of Water and Environmental Regulation
EMP	Environmental Management Plan
EPA	Environmental Protection Authority (Western Australian)
EP Act	Environmental Protection Act 1986 (Western Australian)
Fimiston	KCGM's Fimiston gold mine
FS Project	Fimiston South Project
KCGM	Kalgoorlie Consolidated Gold Mines Pty Ltd
MDE	Mine Development Envelope
SSMP	Significant Species Management Plan
TSF	Tailings Storage Facility
WRD	Waste Rock Dump

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## **9. APPENDIX A: WEED MANAGEMENT PROCEDURE**

## 1. PURPOSE

The purpose of this document is to provide control and management actions to minimise the impact of weeds on the natural environment located within and surrounding all Northern Star Resources Ltd (Northern Star or the Company) tenements.

A list of weeds commonly found on Northern Star tenements can be found in Appendix I.

## 2. SCOPE

This procedure applies to all Northern Star's Australian Operations and covers the management of weeds.

## 3. ROLES AND RESPONSIBILITIES

Role	Key Responsibilities
General Manager - Environment	<ul style="list-style-type: none"> <li>Communicate all requirements to site.</li> <li>Ensure resources are available to implement this procedure.</li> </ul>
Environmental Personnel	<ul style="list-style-type: none"> <li>Communicate all requirements to site.</li> <li>Assist site departments to comply with this procedure.</li> <li>Review and update this procedure as required.</li> <li>Work collaboratively with Department Heads/Managers to ensure up to date information is provided to all concerned parties with respect to weed management and hygiene practices.</li> <li>Plan and perform weed management programs when required.</li> <li>Educate staff and contractors of obligations relating to weed management and control when working for the Company.</li> <li>Maintaining the Weed Register.</li> </ul>
Operations Manager	<ul style="list-style-type: none"> <li>Provide the resources and time for personnel to comply with this procedure.</li> <li>Ensure this procedure is implemented on site.</li> </ul>
Managers	<ul style="list-style-type: none"> <li>Ensure investigations and corrective actions are carried out according to Northern Star minimum standards.</li> </ul>
Superintendent and Supervisors	<ul style="list-style-type: none"> <li>Maintain awareness of this procedure applicable to their area of responsibility.</li> <li>Ensure awareness is provided to personnel regarding their obligations under this procedure.</li> <li>Ensure all weed hygiene certification requirements are in place for vehicle/machinery movements.</li> </ul>
Site Personnel and Contractors	<ul style="list-style-type: none"> <li>Comply with this procedure.</li> <li>Report suspected weed infestations to their immediate supervisor/site contact and the appropriate Environmental Representative.</li> <li>Follow instructions from Superintendents and Supervisors.</li> </ul>

## 4. DEFINITIONS AND ACRONYMS

Declared pests – weeds (DW)	Plants which have been declared as a Declared Pest under section 22 of the <i>Biosecurity and Agriculture Management Act 2007</i> . These plants are prevented entry into Western Australia or have control or keeping requirements.
SDS	Safety Data Sheet: a document that outlines the health and safety information about hazardous chemicals.
Weed	An environmental weed is a non-native or non-locally occurring plant that invade native ecosystems and adversely affect the survival of native flora and fauna.

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Weed of National Significance (WoNS)	A weed which has been identified by the Federal Government as a problematic plant species in Australia.
Weed Hygiene Certificate (Exploration specific)	An exploration specific certificate required for all new machinery coming to site or vehicles that have been in areas with potential weeds, to ensure they are weed free.
Weed Hygiene Clearance Form	An internal certificate required for all new machinery coming to site or vehicles that have been in areas with potential weeds, to ensure they are weed free.

## 5. PROCEDURE

### 5.1 Notification and Reporting

Weed infestations identified by employees or contractors are to be reported as hazards through the Northern Star site incident reporting system to ensure controls are followed up. The following information should be included in the hazard report:

- GPS coordinates or a clear description of the location.
- A clear description of the suspected weed (and photo if available).
- Approximate number of weeds or area of coverage.

Actions are to be sent out via INX and the Environmental Department are responsible for controlling introduced weed species on Northern Star tenements.

All weeds identified as Declared Pests or Weeds of National Significance (WoNS) should be reported to The Department of Agriculture and Food, Western Australia (DAFWA) using the MyWeedWatcher app or contacting DAFWA's Pest and Disease Information Services ([info@agric.wa.gov.au](mailto:info@agric.wa.gov.au)). Declared Pests and WoNS are identified in Appendix I, and can be found on the Department of Primary Industries and Regional Development Website.

### 5.2 Record Keeping

The Environmental Department is responsible for maintaining weed maps and the GIS-based weed register. All reported infestations will be entered in the weed register and include the following information:

- Site.
- Project EGS.
- GPS coordinates.
- Weed species.
- Weed category (significance status – WoNS, Declared or general).
- Date Identified.
- Control implemented (yes/no).
- Control Type (spray, hand pulling ect).
- Control implementation date.
- Person Responsible.

### 5.3 Monitoring Schedule

Areas that pose a higher risk to weed infestation, such as rehabilitated areas, topsoil stockpiles, drainage lines, areas close to site boundaries, previously infested or controlled areas and any area where material has been brought in should be inspected periodically to ensure potential weed infestations are managed and controlled. These inspections can be included as part of routine vegetation monitoring, or general housekeeping monitoring.

Prior to topsoil stripping, surveys should be undertaken to identify and record the presence of any significant weed species to reduce the risk of contaminating rehabilitation materials. In addition, topsoil stockpiles should be periodically inspected for weed populations and control measures put in place to remove any weeds prior to use in rehabilitation.

Weed monitoring should also be included in the scope of annual waste dump monitoring conducted by a qualified consultant.

Any weeds that are identified during any monitoring activities should have their location noted, and a control program arranged as soon as practical.

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## 5.4 Control Methods

There are a number of control methods used to manage and remove weeds across Northern Star sites, including but not limited to, preventative, physical and chemical. In some circumstances, external providers may be brought onto site to assist with the management of weeds. For the best results, the control of weeds should be undertaken prior to the plants going to seed, where practicable. If the weeds have gone to seed, a blower-vac may be used to capture seeds that have fallen prior to germination.

### 5.4.1 Preventative Weed Control

Preventative methods such as minimising soil disturbance, using established tracks, limiting vehicle access to rehabilitation areas and practicing vehicle weed hygiene can help in reducing the spread of weeds across Northern Star operations.

Weed hygiene refers to preventing the spread of weeds or invasive plant species by actively inspecting and thoroughly cleaning any vehicle or equipment prior to and post entry to areas that harbour weed species or present an opportunity for weed species to propagate.

Weed transportation opportunities:

- As seeds stuck in tyres/rims, radiators, seats, grills etc.
- As pieces of plant trapped in bash plates, suspensions, bar work, earthmoving attachments.
- In dirt or soil in air filters, foot wells and trays of vehicles.
- In mud stuck to the vehicle underside or wheel arches, chassis rails, running boards etc.

### 5.4.2 Vehicle Movements

All vehicles and equipment will arrive onsite clean and leave site clean. Contractors will be advised of Northern Star's commitment to weed hygiene and if possible, ensure vehicles and equipment have been weed checked and cleaned prior to arriving onsite. Where this is not practical, vehicles will need to be inspected on arrival.

Where vehicles have been working in areas of known weed infestation, inspections should also be done at the completion of such works.

### 5.4.3 Inspections

All vehicles and equipment that are planned to be used in natural bush areas or areas of ground disturbance where weeds are established or may establish, should be inspected for signs of seed, soil, mud or other vegetative material. Where inspections determine that there is material that poses a weed hygiene risk, the vehicle should be cleaned and certified to be able to enter the work site. Vehicles and equipment should be thoroughly inspected in any areas that are deemed a potential trap for vegetative material, but particularly in the following areas:

- Engine bay, including radiator and areas that can trap seed.
- Underbody, including wheel arches and areas that can trap mud or vegetation.
- Interior, including floor mats, foot wells, seats etc.
- Buckets, cutting edges, tracks etc.
- Toolboxes, spare wheel carriers, tyre and rims etc.

### 5.4.4 Cleaning

- Cleaning should be undertaken at a purpose-built wash down facility where debris is trapped in a sump for suitable disposal.
- If a wash down facility is unavailable, the vehicle should be washed where there is no possibility of seed entering waterways or the environment.
- Cleaning may involve the use of high-pressure water or air.
- A sheeted drill pad or laydown area would be considered acceptable as an alternate wash down area. Additional bunding may be required to prevent contaminated water dispersal.
- For remote area works, a portable firefighting unit may be required to assist with weed hygiene.
- Earthmoving equipment should be unloaded from floats or low loaders before washing down to prevent the float and deck becoming contaminated.

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## 5.4.5 Certification

Inspection personnel should inspect and certify vehicles and equipment are clean and issue the appropriate clearance document (NSR-ENV-COR-002-FOR Weed Hygiene Clearance). Please note that all Exploration related activities should refer to NSR-EXP-COR-025-PRO Weed Hygiene Certification Procedure and use the NSR-EXP-COR-025A-FOR Weed Hygiene Certificate.

Should a vehicle present for inspection after being cleaned and still be found to have a weed hygiene risk, the inspector should note the unclean areas on the certificate and instruct the representative to re-clean these areas before submitting for a final inspection.

Certificates are only valid for entry to a single project. If, for example, a drill rig is to head to another prospect after drilling at a local prospect, it should be re-certified as clean before entering the second prospect. Please contact your Site Environment Department if you have any questions regarding Weed Hygiene Clearance.

Once a vehicle has been certified weed free, it can remain so only whilst it travels on sealed or well-maintained graded gravel roads that are free from weeds and other vegetation.

## 5.4.6 Chemical Weed Control

Chemical control involves the use of herbicides to control weeds. Herbicides are an important and effective component of the weed control programme as, in some situations, herbicides offer the only practical, cost-effective and selective method of managing certain weeds. As herbicides reduce the need for cultivation or ground disturbance, they can prevent soil erosion and water loss.

Herbicides should be applied using a dedicated vehicle mounted spray tank or backpack weed sprayer (Figure 1). When applying herbicides, all Northern Star personnel and contractors should follow the Herbicide Spraying for Weed Management Safe Work Procedure NSR-EXP-COR-024-SWP. Weed sprayers and herbicides are to be used in line with the manufacturers' instructions and safety requirements of the herbicide SDS.



**Figure 1 Backpack weed sprayer**

## 5.4.7 Physical weed control

Physical control methods often depend on the type and size of the area of weeds to be managed, what the land is used for, physical characteristics and the value of the land. Physical control methods can include:

- Hand pulling.
- Mowing.
- Blower-vac.
- Grazing.
- Mulching.
- Tilling; or
- Burning.

## 5.4.8 Engaging External Contractors

Where required, an external contractor may be engaged to control a weed infested area. In these cases, Northern Star personnel are required to follow the WHSMS – Contractor Management Framework Manual NSR-OHS-103-MAN.

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## 6. LEGISLATION AND REGULATORY REQUIREMENTS

- Biodiversity Conservation Act 2016
- Biosecurity and Agricultural Management Act 2007
- Commonwealth Environment Protection and Biodiversity Conservation Act 1999
- Conservation and Land Management Act 1984
- Environmental Protection Act 1986
- Mining Act 1978

In addition to the above legislation, all sites should adhere to any conditions against tenements, licences, approvals, Mining Proposals and Ministerial Statements.

Further information and guidance about weeds in Western Australia can be found on the Department of Biodiversity Conservation and Attractions (DBCA) website.

## 7. RELATED DOCUMENTS

Document Name	Document Number
Weed Hygiene Clearance	NSR-ENV-002-FOR
Herbicide Spraying for Weed Management Safe Work Procedure	NSR-EXP-COR-024-SWP
WHSMS – Contractor Management Framework Manual	NSR-OHS-103-MAN
Weed Hygiene Procedure	NSR-EXP-COR-025-PRO
Weed Hygiene Certificate	NSR-EXP-COR-025A-FOR

## 8. REVISION HISTORY

Revision Number	Date	Changes made to document
1	01/08/2023	New standardised document
1.1	14/10/2024	Minor revision - addition of blower-vac information and minor edit to the "control methods" section
2.0	22/08/2025	Scheduled 2yr review. Minor update of role titles and additional definition for Weed Hygiene Clearance Form.




## 9. APPENDICES

APPENDIX I - Weeds Commonly Found on Northern Star Tenements

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## 9.1 APPENDIX I – Weeds Commonly Found on Northern Star Tenements

Species	Description	Suggested Methods of Control	Image
Agave americana (Century Plant)	A rhizomatous, perennial tree-like monocot that grows to 6 m high. The leaves are fleshy & spine-tipped. Has yellow flowers in Jan or Apr. Grows in sand. Found in cultivated, occasionally naturalised around old habitations & along roadsides.	Needs to be removed mechanically by hand.	
Alhagi maurorum (Camel-thorn) <b>Declared Weed</b>	A rigid, spiny shrub, that grows up to 1.5m high. Has yellow & red & purple pea flowers.	Hand remove isolated plants & small populations. Apply Grazon® (triclopyr & picloram) when plant is actively growing. Because of the plants extensive root system, a close watch must be kept on treated areas for several years to detect any regrowth. Consult product's information sheet on herbicide application.	
Amaranthus viridis (Green Amaranth)	An erect or ascending annual herb that grows up to 1 m high. Has green flowers from Nov to Dec or Jan to Aug. Found in disturbed areas.	Hand remove isolated plants & small populations. Apply glyphosate (e.g. Roundup®) in early stages of plant's growth. Grazon® (triclopyr & picloram) can be applied in later stages of plant's growth to provide some selective control. Consult product's information sheet on herbicide application.	




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Species	Description	Suggested Methods of Control	Image
Arctotheca calendula (Cape Weed)	A decumbent or ascending, annual herb that grows up to 30cm high. Has yellow flowers from Aug to Nov. It is a weed of roadsides, waste places & cultivated land.	For large infestations apply Lontrel® in early growth stages. Spraying glyphosate will control cape weed at all growth stages. A combination of chemical and physical control with follow up treatment provides optimal control. Consult product's information sheet on herbicide application.	
Argemone ochroleuca (Mexican Poppy)	An erect prickly shrub that grows up to 1-1.5m high. The flowers have six petals, are pale yellow and roughly 3-7cm in diameter.	Hand removal, slashing or mowing of plants prior to seed formation. Apply glyphosate (e.g. Roundup®) in early stages of plant's growth. Gramoxone® (paraquat) can be applied in later stages of plant's growth to provide some selective control. Consult product's information sheet on herbicide application.	
Asclepias curassavica (Redhead Cottonbush)	An erect shrub that grows up to 1.5m high. Has orange & red flowers. Grows in sandy soils.	Hand remove isolated plants & small populations. Apply glyphosate (e.g. Roundup®) in early stages of plant's growth. Grazon® (triclopyr & picloram) can be applied in later stages of plant's growth to provide some selective control. Consult product's information sheet on herbicide application.	




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Species	Description	Suggested Methods of Control	Image
Brassica tournefortii (Mediterranean Turnip)	An annual herb that grows up to 60cm high. Has yellow-cream-white flowers from Jun to Nov. Grows in sandy soils. Is an aggressive weed of disturbed ground, roadsides, cultivation & seaside.	Hand remove isolated plants & small populations. Apply glyphosate (e.g. Roundup®) in early stages of plant's growth. Grazon® (triclopyr & picloram) can be applied in later stages of plant's growth to provide some selective control. Consult product's information sheet on herbicide application.	
Buglossoides arvensis (Corn Gromwell)	An annual herb that grows up to 60cm high. Has white flowers from Jul to Nov	Hand remove isolated plants & small populations. Apply glyphosate (e.g. Roundup®) in early stages of plant's growth. Grazon® (triclopyr & picloram) can be applied in later stages of plant's growth to provide some selective control. Consult product's information sheet on herbicide application.	
Capsella bursa-pastoris (Shepherd's Purse)	An erect annual herb that grows up to 40cm high. Has white flower from Jul to Nov. Found in lawns & disturbed sites.	Hand remove isolated plants & small populations. Apply glyphosate (e.g. Roundup®) in early stages of plant's growth. Grazon® (triclopyr & picloram) can be applied in later stages of plant's growth to provide some selective control. Consult product's information sheet on herbicide application.	




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Species	Description	Suggested Methods of Control	Image
Carrichtera annua (Ward's Weed)	An erect annual herb that grows up to 40cm high. It has yellow flowers from Sep to Nov. Found in semi-arid regions.	Hand remove isolated plants & small populations. Apply glyphosate (e.g. Roundup®) in early stages of plant's growth. Grazon® (triclopyr & picloram) can be applied in later stages of plant's growth to provide some selective control. Consult product's information sheet on herbicide application.	
Carthamus lanatus (Saffron Thistle) <b>Declared Weed (NT only)</b>	An erect, spiny, annual herb that grows up to 70cm high. The leaves are rigid with spiny lobes and it has yellow flowers in Dec or Jan to Apr. Grows in a variety of soils & is a weed of crops, pastures & waste grounds.	Hand remove isolated plants through spring and early summer. Apply glyphosate (e.g. Roundup®) or alternatively spot spray with Lontrel® Best controlled at rosette stage. Consult product's information sheet on herbicide application.	
Cenchrus ciliaris (Buffel Grass)	A tufted or sometimes stoloniferous perennial, grass-like or herb that grows up 1.5m high. Has purple flowers from Feb to Oct. Grows in white, red or brown sand, stony red loam & black cracking clay.	Cut out and physically remove small populations and seedlings. Entire plants with dormant buds must be removed. Spray with Verdict® or spot spray with glyphosate six weeks after heavy rain. Follow-up with seedling control. Consult product's information sheet on herbicide application	




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Species	Description	Suggested Methods of Control	Image
Centaurea melitensis (Maltese cockspur)	An erect annual or biennial, herb that grows up to 1m high. Has yellow flowers from Sep to Dec or Jan to Mar. It is a weed of roadsides, cultivated areas & other disturbed areas.	Hand remove isolated plants & small populations. Apply glyphosate (e.g. Roundup®) in early stages of plant's growth.  Grazon® (triclopyr & picloram) can be applied in later stages of plant's growth to provide some selective control. Consult product's information sheet on herbicide application.	
Chenopodium murale (Nettle- leaf Goosefoot)	An erect, much- branched annual herb, that grows up to 1m high. Has green flowers from Apr to Dec. An agricultural weed found in cultivated & disturbed areas & coastal sites.	Hand remove isolated plants & small populations. Apply glyphosate (e.g. Roundup®) in early stages of plant's growth. Grazon® (triclopyr & picloram) can be applied in later stages of plant's growth to provide some selective control. Consult product's information sheet on herbicide application.	
Cichorium intybus (Chicory)	A perennial herb that grows up to 1.5 m high. Has blue flowers from Nov to Dec or Jan to May. Found at road verges & waste areas.	Hand remove isolated plants & small populations. Apply glyphosate (e.g. Roundup®) in early stages of plant's growth. Grazon® (triclopyr & picloram) can be applied in later stages of plant's growth to provide some selective control. Consult product's information sheet on herbicide application.	




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Species	Description	Suggested Methods of Control	Image
Citrullus lanatus (Pie Melon)	A trailing annual herb or climber. It has yellow flowers from Jan to Dec. Grows in sandy gravelly soil, loam & clay. Found in plains, river banks, centres of dry lakes, drainage areas & disturbed areas.	Hand removing isolated plants including most of the tap root is effective for small infestations. If fruits have formed, they should be collected and destroyed. Metsulfuron is effective on young plants, otherwise spot spray with Garlon®. Consult product's information sheet on herbicide application.	
Conyza bonariensis (Flaxleaf Fleabane)	An erect annual herb that grows up to 1.5 m high. Has white flowers from Jan to Dec. Variety of soils. Weed of cultivation, waste places & roadsides.	Generally, more difficult to control than other species of Fleabane. Hand remove small and/or isolated infestations prior to seed set. Re- sprouts from basal buds after top removal. Timing of application is key to the efficacy of any herbicide treatment. Most susceptible to glyphosate at the rosette stage and least susceptible at flowering. Consult product's information sheet on herbicide application. At later stages, it is difficult to control with any single herbicide treatment.	
Cucumis myriocarpus (Prickly Paddy Melon)	A prostrate annual herb. Has yellow flowers from Jan to Feb or Apr to May. Grows in disturbed areas.	Hand remove isolated plants before flowering. Has a high tolerance to glyphosate. Metsulfuron applied by backpack is effective, otherwise spot spray with Garlon®. Consult product's information sheet on herbicide application.	




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Species	Description	Suggested Methods of Control	Image
Datura ferox (Fierce Thornapple) <b>Declared Weed</b>	A bushy annual plant, growing to approximately 1m high. Leaves are broadly oval to triangular in shape and bright green, flowers are white trumpet shaped. Fruits are egg shaped and prickly. <b>WARNING:</b> Fierce Thornapple is poisonous to humans and toxic to livestock.	Small plants are susceptible to herbicide; however, this treatment may be ineffective for mature plants. Mechanical removal is best for small infestations. Larger infestations should be removed by ploughing or tilling the soil and followed up with removal of seedlings.	
Datura innoxia (Downy Thornapple) <b>Declared Weed</b>	A stout, bushy, hairy annual herb that grows up to 1 m high. Has white flowers in Dec or Jan to Aug. Found in disturbed areas. <b>WARNING:</b> Thornapple is a poisonous plant and contact may cause headaches, nausea and dermatitis.	Hand remove isolated plants & small populations in early stages of growth ( <b>WARNING:</b> PPE must be worn). Apply glyphosate (e.g. Roundup®) in early stages of plant's growths. Grazon® (triclopyr & picloram) can be applied in later stages of plant's growth to provide some selective control.  Consult product's information sheet on herbicide application.	
Dittrichia graveolens (Stinkwort)	An erect, bushy, viscid, aromatic, annual herb that grows up to 0.5m high. Has yellow / yellow - white flowers from Jan to Nov. Grows in a variety of soils and is a weed of waste grounds, along rivers & roadsides.	Hand remove isolated plants before flowering. Slash close to ground otherwise plants can resprout. Any treatment should be applied twice, early and then late summer. Apply glyphosate (e.g. Roundup®) when plants are small, or up to flowering. Clean equipment, clothing spread of seed. Consult product's information sheet on herbicide application.	




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Species	Description	Suggested Methods of Control	Image
Echium plantagineum (Paterson's Curse) <b>Declared Weed</b>	An erect annual or biennial herb that grows up to 60cm high. Has blue / blue – purple / pink / white flowers mainly from Sep to Dec or Jan. It is a weed of roadsides, vacant lands & disturbed grounds.	Plants are best treated when young. Spot spray in late autumn/winter when most seed has germinated for the year with chlorsulfuron, this will also help prevent further germination. Glyphosate (e.g. Roundup®) applied at early flowering will control existing plants. Consult product's information sheet. Grubbing and cutting are suitable for young plants if 20 to 40 mm of taproot is removed. Slashing or mowing can cause out of season flowering and seed production.	
Ehrharta villosa (Pyp Grass)	A slender rhizomatous, perennial grass-like or herb that grows up to 1.5 m high. Has purple- green flowers from Oct to Dec or Jan. Grows in sand & found in coastal sand dunes & limestone.	Spray with Verdict® or glyphosate (e.g. Roundup®). Several sequential applications will likely be required. Consult product's information sheet on herbicide application.	
Erodium aureum	A spreading, short-lived perennial herb that grows up to 20cm high. Has pink-purple flowers from Jul to Oct. Grows in sand, sandy clay & loam.	Apply glyphosate (e.g. Roundup®) in early stages of plant's growth. Grazon® (triclopyr & picloram) can be applied in later stages of plant's growth to provide some selective control. Consult product's information sheet on herbicide application.	




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Species	Description	Suggested Methods of Control	Image
Erodium cicutarium (Common Storksbill)	A decumbent, ascending, or erect annual or biennial, herb that grows up to 20cm high. Has pink-white flowers from May to Oct. A weed of wasteland, crops & pastures.	Apply glyphosate (e.g. Roundup®) in early stages of plant's growth. Grazon® (triclopyr & picloram) can be applied in later stages of plant's growth to provide some selective control. Consult product's information sheet on herbicide application.	
Erythrostemon gilliesii (Bird of Paradise Flower)	An erect shrub that grows up to 3m high. Has yellow & red flowers from Mar to Apr or Oct. Often cultivated.	Hand remove isolated plants & small populations. Apply glyphosate (e.g. Roundup®) in early stages of plant's growth. Grazon® (triclopyr & picloram) can be applied in later stages of plant's growth to provide some selective control. Consult product's information sheet on herbicide application.	
Galenia pubescens var. pubescens	A prostrate perennial, herb (semi-woody at base) that can grow up to 10cm high & to 2 m wide. Has white-pink flowers in Apr or Nov to Dec. Grows in sandy soils and found in disturbed sites.	Hand remove isolated plants & small populations. Apply glyphosate (e.g. Roundup®) in early stages of plant's growth. Grazon® (triclopyr & picloram) can be applied in later stages of plant's growth to provide some selective control. Consult product's information sheet on herbicide application.	




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Species	Description	Suggested Methods of Control	Image
Gazania linearis	Clump-forming perennial, herb that grows up to 30cm high. Has yellow-orange-red flowers from Jun to Dec. Found in coastal areas & roadsides, wasteland around settlements.	Hand remove isolated plants & small populations. Apply glyphosate (e.g. Roundup®) in early stages of plant's growth. Grazon® (triclopyr & picloram) can be applied in later stages of plant's growth to provide some selective control. Consult product's information sheet on herbicide application.	
Helianthus annuus (Sunflower)	An erect, woody annual, herb that grows up to 3m high. Has yellow flowers from Aug to Dec or Jan to Apr. Weed of habitation, roadsides & waste land in dry places.	Hand remove isolated plants & small populations. Apply glyphosate (e.g. Roundup®) in early stages of plant's growth. Grazon® (triclopyr & picloram) can be applied in later stages of plant's growth to provide some selective control. Consult product's information sheet on herbicide application.	
Hordeum leporinum (Barley Grass)	A tufted annual, grass- like or herb that grows up to 40cm high. Has green-cream flowers in Sep to Oct. Grows in white, grey, or red clayey sand, sandy loam & clay.	Prevent seed set. Hand pull or spray with Fusilade® Fortet 4-6 weeks after opening rains. Consult product's information sheet on herbicide application.	




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Species	Description	Suggested Methods of Control	Image
Lycium ferocissimum (African Boxthorn) <b>WoNS</b>	Intricately branched, spiny shrub, 0.5- 2.5(-4) m high. Fl. white-purple-blue, Apr to May or Aug to Dec. Found in waste grounds.	Hand pull or dig out small seedlings ensuring removal of all roots. For mature plants cut and paint with glyphosate (e.g. Roundup®) and follow up treatment on regrowth. Consult product's information sheet on herbicide application.	
Lysimachia arvensis (Pimpernel)	A hairless spreading annual herb. Has red & blue flowers in spring. It is a weed of horticulture, crops, pastures, granite rocks and gardens.	Hand remove isolated plants & small populations. Apply glyphosate (e.g. Roundup®) in early stages of plant's growth.  Grazon® (triclopyr & picloram) can be applied in later stages of plant's growth to provide some selective control. Consult product's information sheet on herbicide application.	
Malva parviflora (Marshmallow)	An erect or decumbent, annual, or perennial herb, that grows up to 1.2m high. Has blue-purple/pink/white flowers in Mar or Jul to Nov. Grows in sandy & clayey soils. Found in disturbed areas.	Hand remove isolated plants.  Chemical control is only effective at early growth stages, it is naturally tolerant to glyphosate and difficult to control due to substantial taproot.  Able to regrow after cutting or defoliation, although plants may be killed if the tap root is cut below the crown. Weed control measures carried out after flowering are unlikely to prevent viable seeds entering the soil seed bank.	




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Species	Description	Suggested Methods of Control	Image
Medicago laciniata var. laciniata	A prostrate or ascending, annual herb that can grow up to 40cm high. Has yellow flowers from Aug to Oct. Grows in red clay and sand, loam over granite and found in flats & road verges.	Hand remove isolated plants & small populations. Apply glyphosate (e.g. Roundup®) in early stages of plant's growth. Grazon® (triclopyr & picloram) can be applied in later stages of plant's growth to provide some selective control. Consult product's information sheet on herbicide application.	
Medicago minima (Small Burr Medic)	A prostrate annual herb that grows up to 10cm high. Has yellow flowers from Jul to Sep. Grows in grey loamy sand, red- brown clay loam, granite & ironstone. Found in hills, valley slopes, rangelands & roadsides.	Hand remove isolated plants & small populations. Apply glyphosate (e.g. Roundup®) in early stages of plant's growth. Grazon® (triclopyr & picloram) can be applied in later stages of plant's growth to provide some selective control. Consult product's information sheet on herbicide application.	
Medicago polymorpha (Burr Medic)	A prostrate or ascending annual herb that grows up to 20cm high, to 50cm wide. Has yellow flowers from Jan to Feb or May or Jul to Nov. Grows in black, brown, white, yellow, or grey sand, ironstone gravel, orange-brown sandy clay, granite. Found in flood plains, valley slopes, dunes, clay flats & roadsides.	Hand remove isolated plants & small populations. Apply glyphosate (e.g. Roundup®) in early stages of plant's growth. Grazon® (triclopyr & picloram) can be applied in later stages of plant's growth to provide some selective control. Consult product's information sheet on herbicide application.	




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Species	Description	Suggested Methods of Control	Image
Mentha suaveolens (Apple Mint)	An aromatic rhizomatous, perennial herb that grows to 1m high. Has pink/white/blue flowers from Jan to Mar. Grows in damp areas.	Hand remove isolated plants & small populations. Apply glyphosate (e.g. Roundup®) in early stages of plant's growth. Grazon® (triclopyr & picloram) can be applied in later stages of plant's growth to provide some selective control. Consult product's information sheet on herbicide application.	
Monoculus monstrosus	An erect annual herb that grows up to 70cm high. Grows in red- brown loams or sandy clays, yellow-white or grey-brown sandy loam, brown clay loam, limestone & granite. Found in undulating sandplains, hills and slopes, valley slopes, creek beds & saline watercourses.	Hand remove isolated plants & small populations. Apply glyphosate (e.g. Roundup®) in early stages of plant's growth. Grazon® (triclopyr & picloram) can be applied in later stages of plant's growth to provide some selective control. Consult product's information sheet on herbicide application.	
Nicotiana glauca (Tree Tobacco)	An erect, spindly shrub or tree that grows between 1-6m high. Has yellow flowers in Mar or May or Aug to Dec. Grows in sand, clay & clay loam.	Hand remove isolated plants & small populations. Apply Grazon® (triclopyr & picloram) to provide some selective control. Consult product's information sheet on herbicide application.	




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Species	Description	Suggested Methods of Control	Image
Oligocarpus calendulaceus	An open, prostrate to decumbent annual herb that grows 6cm high. Has yellow flowers in Feb or Apr to May or Oct. Grows in calcareous loam, red clay loam, sandy clay, ironstone.  Found in flat marine plains, depressions, disturbed sites & road verges.	Hand remove isolated plants & small populations. Apply glyphosate (e.g. Roundup®) in early stages of plant's growth. Grazon® (triclopyr & picloram) can be applied in later stages of plant's growth to provide some selective control. Consult product's information sheet on herbicide application.	
Oncosiphon suffruticosum [Previously: Pentzia suffruticosa] (Calomba Daisy)	An erect, spreading, aromatic annual herb that grows up to 1m high. Has yellow flowers in Sep to Oct or Dec. Grows in red clay loam, red-brown gravelly clay loam, granite & limestone. Found in seasonally inundated areas, clay pans, paddocks & road verges.	Hand remove isolated plants & small populations. Apply glyphosate (e.g. Roundup®) in early stages of plant's growth. Grazon® (triclopyr & picloram) can be applied in later stages of plant's growth to provide some selective control. Consult product's information sheet on herbicide application.	
Opuntia stricta (Prickly Pear) <b>Declared Pest / WoNS</b>	A spreading to erect shrub that grows up to 2m high. Has yellow flowers.  Grows in sandy soils.	Physical removal and burning of plants are the most effective method of control. All dislodged segments and fruit must be collected and destroyed.	




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Species	Description	Suggested Methods of Control	Image
Orbea variegata (Starfish Cactus)	A prostrate, succulent herb. Grows in calcareous soils. Found in plains above salt lake & highly disturbed site.	Hand remove isolated plants & small populations. Apply glyphosate (e.g. Roundup®) in early stages of plant's growth. Grazon® (triclopyr & picloram) can be applied in later stages of plant's growth to provide some selective control. Consult product's information sheet on herbicide application.	
Oxalis bowiei (Bowie Wood Sorrel)		Hand remove isolated plants & small populations. Apply glyphosate (e.g. Roundup®) in early stages of plant's growth. Grazon® (triclopyr & picloram) can be applied in later stages of plant's growth to provide some selective control. Consult product's information sheet on herbicide application.	
Oxalis pes-caprae (Soursob)	A bulbaceous and rhizomatous, perennial, herb, that grows up to 30cm high. Has yellow flowers from Jun to Oct. It is a common weed.	Hand remove isolated plants & small populations. Apply glyphosate (e.g. Roundup®) in early stages of plant's growth. Grazon® (triclopyr & picloram) can be applied in later stages of plant's growth to provide some selective control. Consult product's information sheet on herbicide application.	




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Species	Description	Suggested Methods of Control	Image
Pennisetum villosum (Feathertop)	A rhizomatous, tufted perennial, grass- like or herb, that grows up to 1m high. Has yellow/purple flowers from Feb to Oct. Grows in sand, loam, sandy clay. Cultivated in gardens but also a weed of disturbed habitats.	Hand remove isolated plants & small populations. Apply glyphosate (e.g. Roundup®) in early stages of plant's growth. Grazon® (triclopyr & picloram) can be applied in later stages of plant's growth to provide some selective control. Consult product's information sheet on herbicide application.	
Phyla canescens (Lippia)	A procumbent or ascending, perennial herb. Has blue-purple-white-pink flowers. Mainly known from moist plains.	Hand remove isolated plants & small populations. Apply glyphosate (e.g. Roundup®) in early stages of plant's growth. Grazon® (triclopyr & picloram) can be applied in later stages of plant's growth to provide some selective control. Consult product's information sheet on herbicide application.	
Polygonum aviculare (Wireweed)	A prostrate, sprawling annual, herb that grows up to 10cm high. Has green-white-pink flowers from Oct to Dec or Jan to May. Grows in sandy clay, clay loam. A weed of cultivation & waste places.	Hand remove isolated plants & small populations. Apply glyphosate (e.g. Roundup®) in early stages of plant's growth. Grazon® (triclopyr & picloram) can be applied in later stages of plant's growth to provide some selective control. Consult product's information sheet on herbicide application.	




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Species	Description	Suggested Methods of Control	Image
Portulacaria afra (Jade Plant)	An erect shrub that grows up to 1.5m high. Grows in sand, clay, loam & found in flats.	Needs to be removed mechanically by hand.	
Rostraria pumila	A tufted annual, grass- like or herb that grows up to 20cm high. Has green flowers from Jul to Oct. Grows in grey, black or red sand, sandy clay, clay & limestone. Found at roadsides, sand dunes & cliff slopes.	Hand remove isolated plants & small populations. Apply glyphosate (e.g. Roundup®) in early stages of plant's growth. Grazon® (triclopyr & picloram) can be applied in later stages of plant's growth to provide some selective control. Consult product's information sheet on herbicide application.	
Rumex hypogaeus [Previously: Emex australis] (Doublegee) <b>Declared Pest</b>	Prostrate annual, herb. Fl. green, Jan to Dec. Sand, loam, or clay. Disturbed areas, weed of cereals, road verges.	Control of doublegees should occur shortly after emergence and should continue for a number of years. Herbicides will give poor results applied to plants with more than 12 leaves at the time of spraying. Spot spray plants with 1% Grazon® or glyphosate at 0.5-0.7% to kill existing plants. Alternatively wipe actively growing plants with 50% glyphosate. Read the manufacturers' labels and material safety data sheets before using herbicides.	




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Species	Description	Suggested Methods of Control	Image
Rumex vesicarius L [Previously: Acetosa vesicaria] (Ruby Dock)	An erect, stout, fleshy, hollow-stemmed, annual herb that grows up to 1m high. Has red- pink flowers in Jul to Sep. Grows in sandy alluvial soils & gravelly ironstone soils. Found along roadsides & in disturbed areas.	Hand remove isolated plants & small populations. Apply glyphosate (e.g. Roundup®) in early stages of plant's growth. Grazon® (triclopyr & picloram) can be applied in later stages of plant's growth to provide some selective control. Consult product's information sheet on herbicide application.	
Salvia reflexa (Mintweed) <b>Declared Pest</b>	A hoary, aromatic annual herb that grows up to 6m high. Has blue flowers from Oct to Dec or Jan to Apr. Found in margins of water-courses.	Hand remove isolated plants & small populations. Apply glyphosate (e.g. Roundup®) when plants are seeding or actively growing. Grazon® (triclopyr & picloram) can be applied in later stages of plant's growth to provide some selective control.  Consult product's information sheet on herbicide application.	
Salvia verbenaca (Wild Sage)	A slightly aromatic, perennial herb that grows up to 1m high. Has blue-pink-purple flowers in Apr or Jul to Oct. Often found along roadsides.	Hand remove isolated plants & small populations. Apply glyphosate (e.g. Roundup®) in early stages of plant's growth.  Grazon® (triclopyr & picloram) can be applied in later stages of plant's growth to provide some selective control. Consult product's information sheet on herbicide application.	




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Species	Description	Suggested Methods of Control	Image
Schinus molle var. areira (Pepper tree)	A tree that grows up to 5m high. Has white- cream flowers. Grows in red, sandy loam, alluvium & granite. Found in old mine sites & rubbish tips, drainage lines & creek banks.	Needs to be removed mechanically by hand.	
Schismus arabicus (Araby Grass)	A tufted ascending annual grass-like or herb that grows up to 25cm high. Has green/purple flowers in Sep. Grows in sand & loam. Found on roadsides & sandplains.	Hand remove isolated plants & small populations. Apply glyphosate (e.g. Roundup®) in early stages of plant's growth. Grazon® (triclopyr & picloram) can be applied in later stages of plant's growth to provide some selective control. Consult product's information sheet on herbicide application.	
Schismus barbatus (Kelch Grass)	A tufted ascending annual grass-like or herb that grows up to 25cm high. Has green/purple flowers in Aug to Nov. Grows in sand, limestone, clay.	Hand remove isolated plants & small populations. Apply glyphosate (e.g. Roundup®) in early stages of plant's growth. Grazon® (triclopyr & picloram) can be applied in later stages of plant's growth to provide some selective control. Consult product's information sheet on herbicide application.	




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Species	Description	Suggested Methods of Control	Image
Sisymbrium irio (London Rocket)	An erect annual or biennial herb that grows up to 60cm high. Has yellow flowers from Jul to Dec. Grows in sandy & clayey soils.	Hand remove isolated plants & small populations. Apply glyphosate (e.g. Roundup®) in early stages of plant's growth. Grazon® (triclopyr & picloram) can be applied in later stages of plant's growth to provide some selective control. Consult product's information sheet on herbicide application.	
Sisymbrium orientale (Indian Hedge Mustard)	An erect annual or biennial herb that grows up to 1m high. Has yellow flowers from Mar to Nov. Found in disturbed areas.	Hand remove isolated plants & small populations. Apply glyphosate (e.g. Roundup®) in early stages of plant's growth. Grazon® (triclopyr & picloram) can be applied in later stages of plant's growth to provide some selective control. Consult product's information sheet on herbicide application.	
Solanum nigrum (Black Berry Nightshade)	An erect, perennial herb or shrub (short-lived) that grows up to 1m high. Has white flowers from Jan to Dec.	Prevent seed set for several years. Hand weed small communities. In bushland situations, manually remove plants before flowering. For large infestations use Starane® when actively growing in summer, will provide reasonably selective control.  Do not use in or near wetlands.  Control infestations within 5 km of the target area to reduce dispersal of seed by birds. Consult product's information sheet on herbicide application.	




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Species	Description	Suggested Methods of Control	Image
Sonchus oleraceus (Common Sowthistle)	An erect annual herb that grows up to 1.5m high. Has yellow flowers from Jan to Dec. Grows in a variety of soils. Is a weed of waste places & disturbed ground.	Remove small and/or isolated populations manually prior to seed set. Slashing is often ineffective as flowers continue to be produced. Spot spray Lontrel® preferably at the rosette stage. Consult product's information sheet on herbicide application.	
Sorghum halepense (Johnson Grass)	A rhizomatous, tufted perennial, grass-like or herb that grows up to 2m high. Has brown flowers from Aug to Dec or Jan to Feb. Grows in loam & sand.	Hand remove isolated plants & small populations. Apply glyphosate (e.g. Roundup®) in early stages of plant's growth. Grazon® (triclopyr & picloram) can be applied in later stages of plant's growth to provide some selective control. Consult product's information sheet on herbicide application.	
Spergularia diandra (Lesser Sand Spurry)	A recumbent to ascending annual or perennial herb that grows to 25cm high. Has pink flowers from Sep to Nov. Grows in sandy & clayey soils. Found on roadsides, railway tracks & cleared land.	Hand remove isolated plants & small populations. Apply glyphosate (e.g. Roundup®) in early stages of plant's growth. Grazon® (triclopyr & picloram) can be applied in later stages of plant's growth to provide some selective control. Consult product's information sheet on herbicide application.	

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Species	Description	Suggested Methods of Control	Image
Tribulus terrestris (Caltrop)	A prostrate annual herb. Has yellow flower from Jan to Dec. Often found on sandy soils and waste places.	Exclude people and close tracks to stop spread. Hand remove small/isolated populations, pulling plants from the root crown. Apply herbicide to prevent seed set.  Glyphosate (e.g. Roundup®) is effective on seedlings.	
Urtica urens (Small Nettle)	A monoecious annual herb (with stinging hairs) that grows up to 60cm high. Has green flowers from Jul to Nov. Grows in sandy soils.	Hand remove isolated plants & small populations. Apply glyphosate (e.g. Roundup®) in early stages of plant's growth. Grazon® (triclopyr & picloram) can be applied in later stages of plant's growth to provide some selective control. Consult product's information sheet on herbicide application.	
Xanthium spinosum (Bathurst Burr) <b>Declared Pest</b>	Coarse annual herb that grows to 1 m high. Has flowers from Jan to Jun. It is a weed of disturbed & cultivated land.	Hand remove isolated plants. Apply glyphosate (e.g. Roundup®) in early stages of plant's growth, before burrs have formed. Grazon® (triclopyr & picloram) can be applied in later stages of plant's growth to provide some selective control. Consult product's information sheet on herbicide application.	

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