10-800-EN-PLA-0020

Mount Gibson Iron

Extension Hill Pty Ltd

Lepidosperma gibsonii

Conservation Action Plan Revision 1.5

2016 -2025

Extension Hill Pty Ltd and Mount Gibson Mining Limited

June 2023

Abbreviations

BGPA	Botanic Gardens and Parks Authority
BIF	Banded Ironstone Formation
CALM	Department of Conservation and Land Management, Western Australia (changed to Department of Environment and Conservation in July 2006 and Department of Parks and Wildlife in July 2013)
DEE	Commonwealth Department of the Environment and Energy (formerly DoE, and DSEWPaC)
DEC	Department of Environment and Conservation, Western Australia (changed to Department of Parks and Wildlife in July 2013)
Parks and Wildlife, DPaW	Department of Parks and Wildlife, Western Australia (formerly CALM and DEC)
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
EHPL	Extension Hill Pty Ltd
GDTFRT	Geraldton District Threatened Flora Recovery Team
GNHwy	Great Northern Highway
IBRA	Interim Biogeographical Regionalisation for Australia
IUCN	International Union for Conservation of Nature
MGIOIP	Mount Gibson Iron Ore Mine and Infrastructure Project
MGM	Mount Gibson Mining Limited
NAN	Nuts About Natives
SCB	Species and Communities Branch, Parks and Wildlife
TPFL	Threatened and Priority Flora Database
UWA	The University of Western Australia
WA	Western Australia

Foreword

This Conservation Action Plan (plan) has been prepared by Extension Hill Pty Ltd and Mount Gibson Mining Limited to meet condition 7-3 of Ministerial Statement 753 (MS753), which authorises the implementation of the Mount Gibson Iron Ore Mine and Infrastructure Project (MGIOIP). Appendices demonstrate how the content of this Plan meets condition 7-3. The Plan is consistent with the "Recovery Plan Guidelines for Nationally Listed Threatened Species and Ecological Communities under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*" (Appendix 10.).

Information in this plan was accurate at December 2016.

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Summary

Species:	*Lepidosperma gibsonii*	**Common name:**	none
Family:	Cyperaceae	**Flowering period:**	August to December (development); April to May (final development-pollen dispersal)
IBRA Regions:	Avon Wheatbelt	**IBRA Subregions:**	Avon Wheatbelt P1
Shire:	Yalgoo, Perenjori	**NRM region:**	Rangelands NRM – Murchison subregion, Northern Agricultural Catchment Council
DEC Region:	Midwest	**DEC District:**	Geraldton

Current status of taxon:

Specially protected under the Western Australia *Wildlife Conservation Act* 1950: Schedule 2 – Likely to become extinct or rare, as endangered flora.

Habitat critical to survival:

Lepidosperma gibsonii appears to be restricted to the mid-west region of Western Australia where it is known to occur in the vicinity of the Mt Gibson Ranges, located approximately 80 kilometres (km) north east of Wubin and 350 km north east of Perth. Within the Mt Gibson Ranges, *L. gibsonii* prefers steep slopes or gullies that may provide increased water availability during rainfall events. The records occurring beyond the influence of the Ranges are associated with low granite outcrops or breakaways and loamy flats in close proximity to the breakaways. In the majority of locations from where *L. gibsonii* has been recorded, the soils range from skeletal on the upper slopes often in association with the margins of larger areas of exposed ironstone, Banded Ironstone Formation (BIF) or granitic outcropping to deeper, sandy loams on the side slopes and gully floor. The geographical extremes of the populations are less than 8 km apart, thus making the species a restricted and narrow endemic.

Threats:

The main threats to the species are:

- Mining (direct removal)
- Drying climate
- Drought
- Grazing
- Inappropriate fire regimes
- Mining (secondary effects)
- Weed proliferation

Plan objective:

The objective of this plan is to "to maintain, and ultimately improve, the conservation status of *Lepidosperma gibsonii* such that its conservation status is more secure…..". This objective is prescribed in Ministerial Statement 753 for the Mount Gibson Iron Ore and Infrastructure Project.

Criteria for success:

This plan will be deemed successful if, over the term of the plan, all of the following are achieved:

1. The number of *in-situ* mature individuals in areas of current occupancy outside of areas approved for disturbance under Ministerial Statements remains stable[1] or increases.

2. The conservation category of the species remains at the current status or improves.

Criteria for failure:

This plan will be deemed unsuccessful if, over the term of the plan, any of the following occur:

1. The total number of *in-situ* mature individuals in areas of known occupancy, outside of areas approved for disturbance under Ministerial Statements, has decreased by more than 15% beyond its natural variability as a result of effects from threats identified in section 1.3;

2. The conservation status meets IUCN criteria for listing at a higher threat category than the current status.

Actions:
1. Coordinate recovery actions and liaise with stakeholders
2. Maintain and use seed/germplasm collections to ensure material with a broad genetic base is available for conservation
3. Promote awareness of *Lepidosperma gibsonii*
4. Implement *Lepidosperma gibsonii* condition monitoring program
5. Implement Fire Management Strategy
6. Manage threatening processes from mining

[1] Stable means the number of mature individuals plus or minus fifteen per cent.

Actions:
7. Protect plants from herbivory
8. Report any new occurrences of *Lepidosperma gibsonii*
9. Develop a restoration program
10. Review conservation status of the species
11. Review this plan

Recovery team:

Recovery teams provide advice and assist in coordinating actions described in recovery plans. They include representatives from organisations with a direct interest in the recovery of the species, including those involved in funding and those participating in actions that support the species recovery, including by those implementing this Conservation Action Plan.

The co-ordination and implementation of any Recovery Plan will be overseen separately by Parks and Wildlife.

1. Background

1. The taxon

This section provides a summary of information pertinent to *Lepidosperma gibsonii* including its description, taxonomy, biology and ecology, habitat and distribution, population history and conservation status. More comprehensive information with respect to the taxon can be found in Appendix 10.

1. Description

Lepidosperma gibsonii is a fine-leaved herb (sedge), 0.7 m high. Its characteristics as described by Barrett (2007) are as follows:

> "Tufted perennial with short rhizomes. Culms and leaves spirodistichous; leaf to culm ratio 0.6–1:1; angle of fan (ramet) spread 5–10°. Leaves somewhat rigid, fully erect, angular, distinctly diamond-shaped in section, scarcely finely striate, deep green when fresh, pale green to glaucous when semi-dormant, with *c.* 30–34 stomatal rows, 35–45(–80) cm tall, 0.43–0.73 mm wide, 0.29–0.58 mm thick; margin pale green, smooth, glabrous, not resinous; sheath pale tan to brown, glabrous, base fibrous to almost entire, not resinous. Culms as for leaves but terete, scarcely finely striate, with c. 44 stomatal rows, 35–70(–140) cm tall, 0.32–0.72 mm wide, 0.32–0.63 mm thick. Inflorescence loose-linear in outline, 32–51 mm long, 2.5–5 mm wide, with few short lateral branches, 1 branch per node; lateral branches small, in line with main axis so as to appear simple, or basal lateral branch somewhat divergent, 10–18 mm long with 4–8 spikelets; involucral bract 10–39 mm long. Spikelets 2.6–3.2 mm long, the upper flower bisexual, the lower flower functionally male. Glumes 4 with opaque pale margins grading to rusty red keel, the surface with a few minute white hairs near the apex, the margins with scattered hairs, the apex acute to acuminate; 2 sterile glumes; fertile glumes 2.0–2.3 mm long, 0.94–1.24 mm wide. Stamens 3; anthers 1.6–2.0 mm long including the apical appendage, 0.25–0.38 mm wide; filaments 2.0–2.4 mm long. Style 3-fid, 1.29–1.33 mm to branches which are 1.30–1.56 mm long; style base continuous with ovary, caducous; stylar cap large. Nut cream, becoming mottled brown with age, smooth, with 3 prominent ribs, obovate in outline, terete in section, 1.25–1.40 mm long, 0.87–0.89 mm wide; epidermal cells ovate to sub-orbicular in outline. Hypogynous scales 6–8, falling with the nut, broadly triangular, white, 0.45–0.47 mm long; apex acuminate, with hairs." (p52)

2. History, nomenclature and taxonomic relationships

The first collection of *Lepidosperma gibsonii* held in the Western Australian Herbarium (1998-) was made from the Mt Gibson Ranges in 2005 by Rachel Meissner and Yvette Caruso of the Department of Environment and Conservation (DEC) during a flora and vegetation survey of banded ironstone ranges in the Mt Gibson area. It was informally named as *Lepidosperma* sp. Mt Gibson (R. Meissner & Y. Caruso 3), and subsequently described and formally named *Lepidosperma gibsonii* by Barrett in 2007.

Lepidosperma gibsonii was initially thought to be taxonomically most closely related to *L. ferricola* (formerly *Lepidosperma* sp. Mt Jackson (L. Mattiske 193-2/572)), which was recorded from Mt Jackson during surveys of the Portman Iron Ore Ltd Kooyanobbing Expansion Project in 2001. The taxonomic status of *L. gibsonii* has been investigated by Botanic Gardens and Parks Authority (BGPA) as part of a research programme funded by Mount Gibson Mining (MGM) and Extension Hill Pty Ltd (EHPL). Results of the molecular analysis indicate that *L. gibsonii* is more closely related to the *L. costale* species complex than to the morphologically similar species, *L. ferricola* (Barrett, 2007; BGPA, 2010). There are clear differences in stem cross-section and seed morphology between *L. costale* and *L. gibsonii*.

3. Biology and ecology

Although the known distribution of *L. gibsonii* appears to be restricted, it demonstrates traits of strong ecological resilience, namely:

1. It is a re-sprouting species and therefore capable of surviving fire and grazing to a greater extent than a seeder species;
2. *Lepidosperma* as a genus is well known to be resistant to the pathogens, *Phytophthora cinnamomi* and *Armillaria luteobubalina* (Barrett, 2013). It would be expected that *L. gibsonii* would have a similar resistance and would therefore be unlikely to be directly impacted by these pathogens;
3. The species demonstrates vigorous subsoil rhizome sprouting indicating that the plant can respond to seasonal moisture and is probably capable of producing a shoot to flower in one year; and
4. Clump size and branching patterns indicate that individual clumps are long lived, likely for multiple decades and potentially longer.

Overall the species is probably long-lived, resilient to fire and grazing, and disease tolerant. Initial research by BGPA suggest that the species is water rather than nutrient limited, with rapid growth rates in standard soil mixes indicating that the substrate may be less important than water harvesting attributes (BGPA, 2010).

Lepidosperma gibsonii flowering to seed production occurs over an 18 month period (BGPA, 2010). Flower development starts in late winter to early spring followed by a period of dormancy over summer until May-June when the flowers mature and release their pollen. *Lepidosperma gibsonii* is wind pollinated and therefore has a high outcrossing rate (i.e. a multilocus outcrossing rate of 91.7%) compared to selfing. Seeds mature in the same year and are released over a two week window around mid-October (BGPA, 2010).

As the rainfall in the region is unreliable, *L. gibsonii* is likely to respond opportunistically (at least with vegetative growth) to rainfall events (i.e. sub-tropical summer rainfall events and southern winter cold fronts).

4. Habitat and distribution

Lepidosperma gibsonii appears to be restricted to the mid-west region of Western Australia where it occurs in the vicinity of the Mt Gibson Ranges, which are located approximately 80 kilometres (km) northeast of Wubin and 350 km north east of Perth. Within the Mt Gibson Ranges, *L. gibsonii* prefers steep slopes or gullies that provide increased water availability during rainfall events. The populations occurring outside of the Ranges are

associated with low granite outcrops or breakaways and loamy flats in close proximity to the breakaways. In the majority of locations from where *L. gibsonii* has been recorded, the soils range from skeletal on the upper slopes often in association with the margins of larger areas of exposed ironstone, Banded Ironstone Formation (BIF) or granitic outcropping to deeper, sandy loams on the side slopes and gully floor. The geographical extremes of the populations are less than 8 km apart, thus making the species a restricted and narrow endemic.

Lepidosperma gibsonii has been recorded from a number of vegetation communities including three thicket and one heath community (Bennett, 2000) on BIF in the Mt Gibson Ranges, and low woodland and thicket communities for the populations associated with granite breakaways. *Lepidosperma gibsonii* is associated with the following vegetation communities on the Mt Gibson Range(Bennett, 2000):

T1 Dense Thicket of mixed species dominated by Acacia species, *Allocasuarina acutivalvis* subsp. *prinsepiana*, *Calycopeplus paucifolius* and *Melaleuca nematophylla* over Low Shrubland in jaspilite rocks and pockets of loam.

T3 Dense Thicket dominated by *Acacia assimilis*, *Allocasuarina acutivalvis* subsp. *prinsepiana* and *Melaleuca nematophylla* over Low Shrubland of *Hemigenia* sp. Paynes Find and *Hibbertia crassifolia* in loam pockets in jaspilite rocks.

T6 Thicket of *Acacia acuaria* and *Acacia stowardii* over Low Shrubland of mixed species with large numbers of *Darwinia masonii* in loam with abundant rocks on the surface.

HS1 Low Heath of *Ptilotus obovatus* with emergent shrubs of *Acacia stowardii* and *Calycopeplus paucifolius* over Herbs in loamy clay large amongst large boulders.

Emu proof fence sub-population Low Woodland of *Eucalyptus kochii* subsp. *plenissima*, *Eucalyptus kochii* subsp. *horistes* over Tall Open Scrub dominated by *Allocasuarina acutivalvis*, *Acacia aneura*, *Micromyrtus clavata* and *Acacia acuminata* on clayey loamy soil.

Sub-populations C and D *Allocasuarina acutivalvis* subsp. *prinsepiana*, *Melaleuca uncinata*, *Acacia assimilis* subsp. *assimilis*, and *Melaleuca nematophylla*.

Sub-population E Low Open Woodland of *Eucalyptus leptopoda* subsp. *arctata* with occasional *Allocasuarina acutivalvis* subsp. *prinsepiana* over a Tall Open Woodland *Melaleuca uncinata* and *Acacia aneura* var. *aneura* over a Tall Scrubland dominated by *Acacia masliniana* over a Low Shrubland dominated by *Micromyrtus clavata* and *Thryptomene cuspidata* over a Very Open Herbland of *Ecdeiocolea monostachya* and *Hyalosperma glutinosum* subsp. *glutinosum*.

Sub-population F *Allocasuarina acutivalvis* subsp. *prinsepiana*, *Melaleuca uncinata*, *Acacia assimilis* subsp. *assimilis*, and *Melaleuca nematophylla*.

5. Population history

Abundance and distribution

Parks and Wildlife have collated the data from numerous surveys and identified sixteen populations of *L. gibsonii* (as listed in Table 1).

The first comprehensive survey was undertaken in 2006 (ATA Environmental, 2006) to determine the population size, distribution and age spectrum of *L. gibsonii* populations at the Mt Gibson Ranges. Eight discrete populations of *L. gibsonii* were recorded from the slopes of the Mt Gibson Ranges, originally with a total population of 17,618 plants (ATA Environmental, 2006). In 2007 and 2008, a further six populations were located increasing the total population to 45,013 plants. Five of the six additional populations occurred on or were associated with granite outcrops and breakaways outside the Mt Gibson Ranges (Coffey Environments, 2008a, b). The sixth population was located within the Mt Gibson Ranges, to the south of Mt Gibson South (Figure 1).

Areas with similar geology (BIF or chert) and vegetation to that at the Mt Gibson Ranges were surveyed by ATA Environmental (2006) but no additional populations of the species were located at the time. Areas surveyed during the targeted survey included banded iron formation and granite hills within a 20 km radius of Mt Gibson including Mt Singleton, Yandhanoo Hill, the old Bonnie Mine and other smaller unnamed BIF hills in the area. In addition, a helicopter based Rapid Habitat Assessment was undertaken of approximately 10,000 km^2 area bounded by Mt Gibson, Windamurra, Yalgoo and Koolanooka. The Rapid Habitat Assessment focused on 30 BIF and granite hills within the area (ATA Environmental, 2006).

MGM and EHPL have approval to take approximately 8,900 plants for the MGIOMIP (Ministerial Statement number 753 and Permit to Take 70b-0809), representing 19.8% of the known population (45,013 plants as at June 2008). To date, as of March 2015, approximately 819 plants have been taken under this permit.

In addition, genetic studies now estimate the current population size of *L. gibsonii* to be 1.25 times greater than the current census due to multiple genetic individuals within some clumps. In order to get accurate estimates of the size of the population, genetic sampling of all clumps would be required to accurately determine the number of individuals.

Taking into account known population size and genetic studies, DPaW (2014e) estimates the *L. gibsonii* population at between approximately 60,000 and 70,000 individuals. Based on this estimate, the approved MGIOMIP development envelope coincides with approximately 9,030 individuals of *L. gibsonii*; equating up to approximately 15% (using the lower limit) of the recorded population. As of March 2015, less than 1.5% of the species abundance has been taken.

Table 1 - Summary of *Lepidosperma gibsonii* population records. Green shading signifies latest records subject to further assessment before any TPFL listing by DPaW

TPFL Pop No.	IRP Pop No.	Date of first database record (database)	Geographic location description	Take status	WA Herbarium Sheet No	Quadrat monitoring site	Date of most accurate monitoring record (method)	Previous Numbers recorded	Comments	Records held by MGM 2015
1A, 1B	6	26/02/2006 (TPFL)	Iron Hill East	Not taken			26/02/2006 (estimate)	675	No herbarium specimen; Census in 2006; Last records in 2008	1,027
5A, 5B, 5C	7	26/02/2006 (TPFL)	Mt Gibson (north end)	Not taken	NONE	L23, L24	26/02/2006 (estimate)	3,617	No herbarium specimen Census in 2006; Last record in 2008	4,084
								4,292		5,111
Following the initial census of the above TPFLs, the extent of the Iron Hill East and Mt Gibson (north end) populations have increased and recorded to the point where it is no longer possible to distinguish separate populations so arbitrary divisors have been assigned as of 2015										
2A	4	26/02/2006 (WA Herb, TPFL)	Iron Hill (Middle)	Not taken	PERTH 07523092	L20, L22	26/02/2006 (estimate)	265	Census in 2006; Last records in 2008	720
2B	5	26/02/2006 (TPFL)	Iron Hill South	Not taken	NONE	L18, L19	26/02/2006 (estimate)	118	Census in 2006; and limited census in 2013	143
2C	not listed		Iron Hill North	Not taken	NONE			Nil	Not known from census in 2006; Last record in 2009	286
3A[2]	2	15/09/2005 (WA Herb)	Extension Hill	Part will be taken – mining activities	PERTH 07745974 PERTH 07543867 PERTH 07245343 PERTH 07245351	L16, L17	26/02/2006 (estimate)	7,424	Census in 2006; Last record in 2008	7,449 69 taken
3B, 3C	3	26/02/2006 (TPFL)	Extension Hill South and East	Not taken		L26	26/02/2006 (estimate)	4,307	No herbarium specimen Census in 2006; Last record in 2008	4,478 (3B) 27 (3C- new)

TPFL Pop No.	IRP Pop No.	Date of first database record (database)	Geographic location description	Take status	WA Herbarium Sheet No	Quadrat monitoring site	Date of most accurate monitoring record (method)	Previous Numbers recorded	Comments	Records held by MGM 2015
4A[2]	1	26/02/2006 (TPFL)	Extension Hill North	Part will be taken – mining activities	NONE		26/02/2006 (estimate)	777	No herbarium specimen Census in 2006; Last record in 2008	636 (4A.1) 94 (4A.2 - new)
4B	Not listed	12/02/2008 (TPFL)	Extension Hill North	Partly taken - mining activities	NONE		12/02/2008 (broad estimate) 14/08/2013 (partial)	1,000 91	No herbarium specimen Low quality census in 2008, and limited census in 2013	202, 798 taken
6	8	24/02/2006 (WA Herb)	Mt Gibson (south end; also known as 'central')	Not taken	PERTH 07523084 PERTH 07523068		26/02/2006 (estimate)	435	Census in 2006; Last record in 2008	658
7	9	13/02/2008 (TPFL)	Mt Gibson South	Not taken	NONE		13/02/2008 (estimate)	4,384	No herbarium specimen Last census in 2008	5,082
8A, 8B	10	13/02/2008 (TPFL)	Emu Proof Fence North and South	Not taken	NONE	L25	13/02/2008 (estimate)	160	No herbarium specimen Last census in 2008	9 (N) 1 (S)
9[1]	Not listed	12/02/2008 (TPFL)	Northern Junction old and new GNHwy	Partially taken for GNHwy realignment	NONE		12/02/2008 (broad estimate)	1,000-10,000	No herbarium specimen DPAW 2014	1,000-10,000
10	12	02/01/2008 (WA Herb, TPFL)	Population D (Coffey Environments, 2008a; 2008b)	Not taken	PERTH 07887116		02/01/2008 (estimate)	3,244	Last census in 2008	3,244
11	14	12/02/2008 (TPFL)	Population F (Coffey Environments, 2008b)	Not taken	PERTH 07887310		12/02/2008 (estimate)	10,352	Last census in 2008	10,352
12A	11	02/01/2008 (WA Herb, TPFL)	Population C (Coffey Environments, 2008a; 2008b)	Not taken	PERTH 07887108 PERTH 07887388		02/01/2008 (estimate)	5,225	Last census in 2008	5,225

TPFL Pop No.	IRP Pop No.	Date of first database record (database)	Geographic location description	Take status	WA Herbarium Sheet No	Quadrat monitoring site	Date of most accurate monitoring record (method)	Previous Numbers recorded	Comments	Records held by MGM 2015
12B[1]	13	02/01/2008 (WA Herb, TPFL)	Population E (Coffey Environments, 2008a; 2008b); Southern Junction old and new GNHwy	Partially taken for GNHwy realignment	PERTH 07887353 PERTH 07887361		02/01/2008 (estimate)	4,030	Last census in 2008, and limited census in 2013	3509 (520 taken)
NEW subpop.	Not listed	24/09/2013 (WA Herb, TPFL)	E of old GNHwy, ~200m south of turnoff to MGM Accommodation Village	Not taken	PERTH 08503524		24/09/2013 (Partial survey, low quality)	362	Low quality partial census in 2013	362#
NEW subpop	Not listed	24/09/2013 (WA Herb, TPFL)	W of old GNHwy, ~200m south of turnoff to MGM Accommodation Village	Not taken	PERTH 08503532		24/09/2013 (Partial survey, low quality)	11,550	Low quality partial census in 2013	11,550#
13	Not listed	02/01/2008 (WA Herb)	Populations A and B (Coffey Environments, 2008a)	Not taken	PERTH 07887124 PERTH 07887345		02/01/2008	Pop A - 390 Pop B - 451	This is a new TPFL population. Last census in 2008	841
15	Not listed		Populations G (Coffey Environments, 2008a)	Not taken						1
NEW 2	Not listed	TBA[4]	~700m NNE of Breakaway Well on CDR	Not taken	TBA[4]		17/07/2014 (edge survey, estimate)	140	Further survey to determine size of population is necessary	140#
NEW 3	Not listed	TBA[4]	~ 70m west of GNHwy and 700m along GNHwy south of junction GNHwy and MGM village road	Not taken	TBA[4]		24/11/2014 (edge survey, estimate)	TBA[4]	Further survey to determine size of population is necessary	TBA

TPFL Pop No.	IRP Pop No.	Date of first database record (database)	Geographic location description	Take status	WA Herbarium Sheet No	Quadrat monitoring site	Date of most accurate monitoring record (method)	Previous Numbers recorded	Comments	Records held by MGM 2015
NEW 4	Not listed	TBA[4]	~ 420m west of GNHwy and 1160m along GNHwy south of junction GNHwy and MGM village road	Not taken	TBA[4]		25/11/2014 (edge survey, estimate)	TBA[4]	Further survey to determine size of population is necessary	TBA
NEW 5	Not listed	TBA[4]	~ 470m west of GNHwy and 250m along GNHwy north of junction GNHwy and MGM village road	Not taken	TBA[4]		25/11/2014 (edge survey, estimate)	TBA[4]	Further survey to determine size of population is necessary	TBA

these data are sourced directly from DPaW as the records are not held by MGM; ^ validation of the total records is required as MGM holds 10 point records with unknown numbers at each point

[1] These populations have been partially taken. Approximately 520 plants have been removed for the GN Hwy realignment, which infers that the combined number of plants remaining at these populations may range between 4,510 and 13,510. The cross-section of GNH as built over previous plant records matches 520 removed from TPFL12B.

[2] These populations have been partially taken. Approximately 299 plants have been removed for the hematite mine, which infers that the combined number of plants remaining at these populations may be 7,902. [3] Plants related to past translocation trials are not recorded in the above table. These may account for in the order of 200 plants.

[4] Pending advice from Parks and Wildlife following completion of surveys and compilation of data.

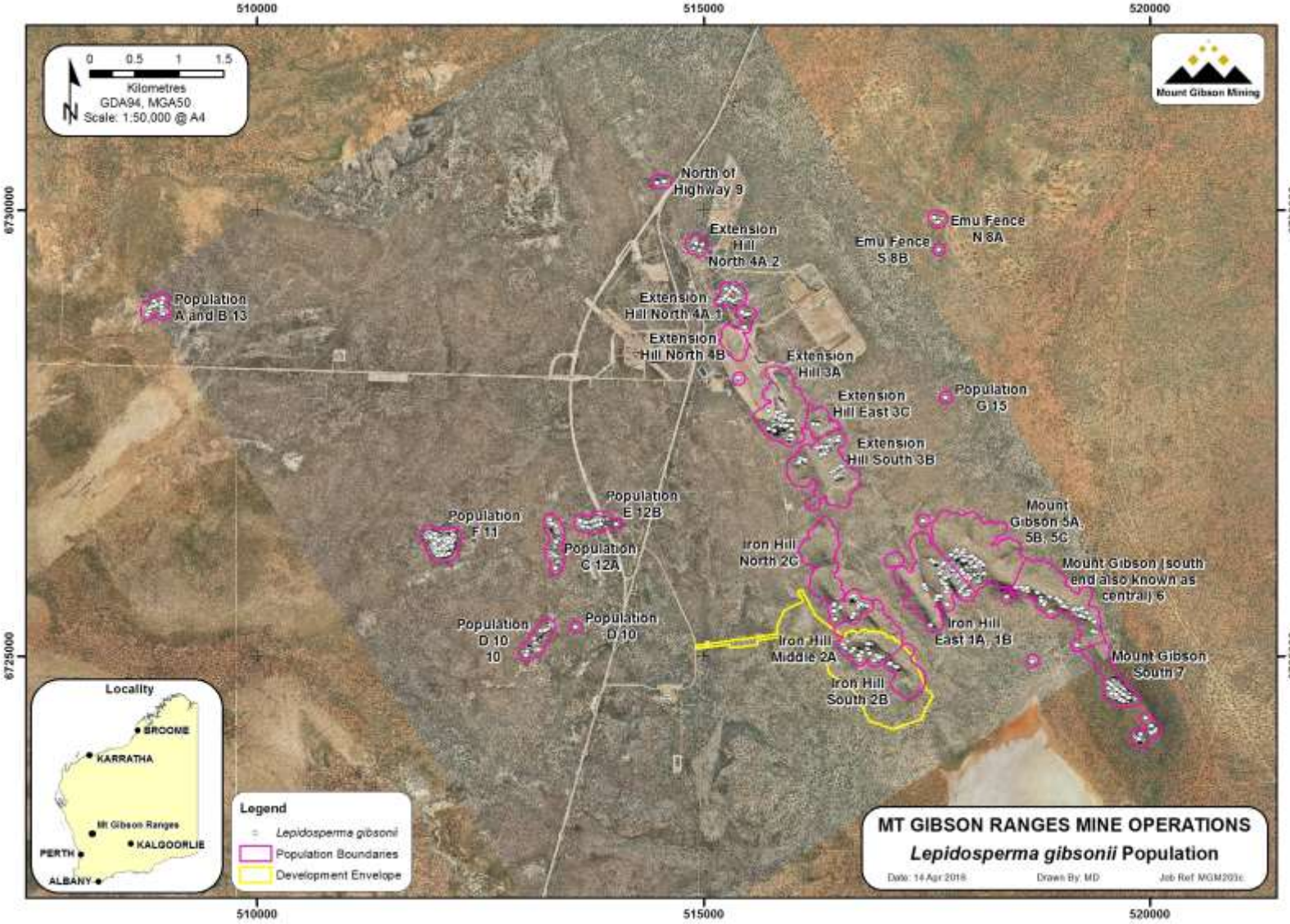

Figure 1a Distribution of *Lepidosperma gibsonii* records (white dots) around the Mt Gibson Ranges within actual and mapped potential habitat

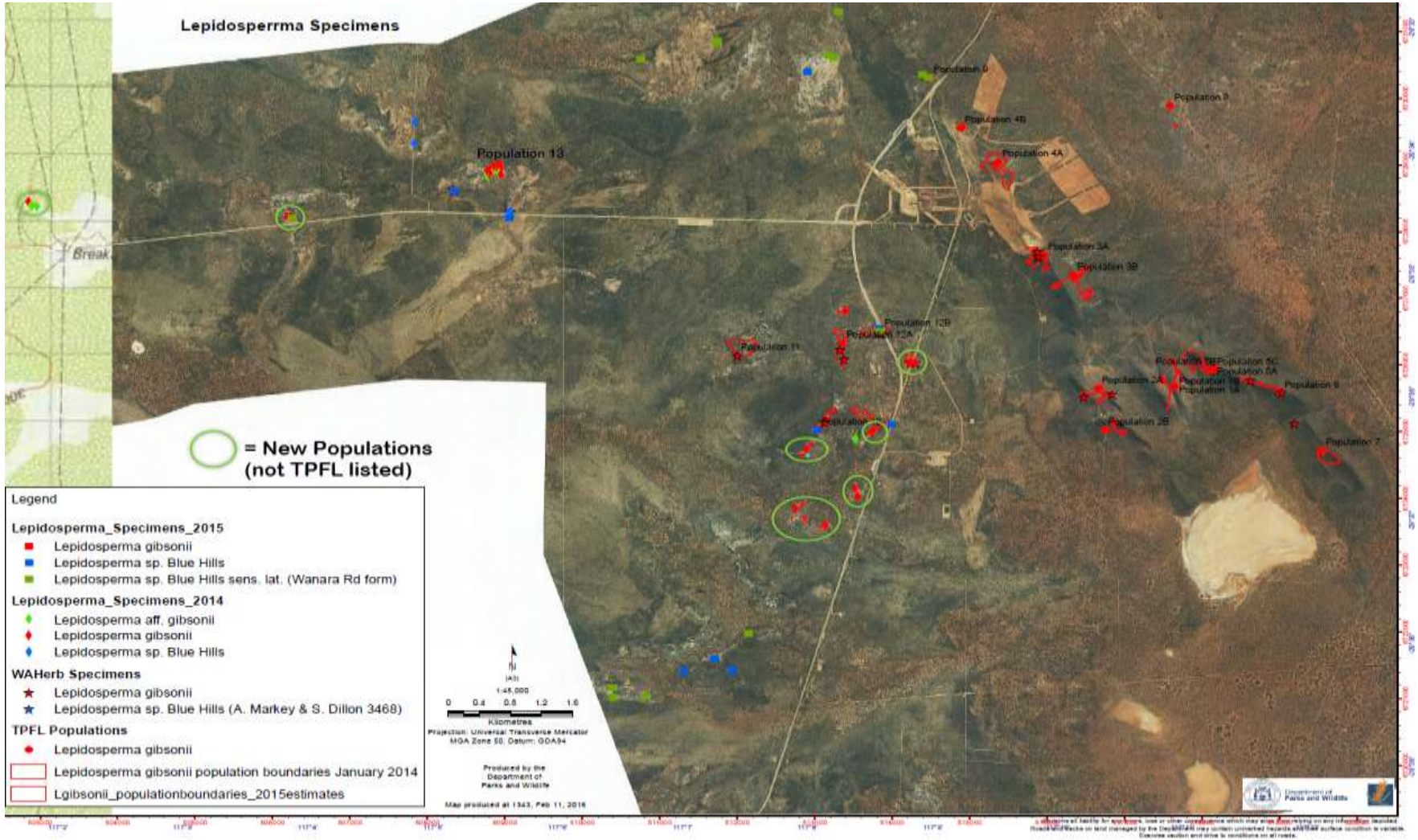

Figure 2 b) Distribution of *L.gibsonii* and other Lepidosperma taxa at and around the Mt Gibson Ranges (source DPaW 2016). Green circles show new Populations listed in Table 1. Where a TPFL number exists, it is shown on the figure.

Population size

Using data from the most recent and accurate records (Table 1), the size of the known *L. gibsonii* population is conservatively estimated to comprise **60,000 to 70,000** plants. This takes into consideration that approximately 819 whole plants have been removed by applying Statement 753. The most comprehensive data for many populations range in accuracy, and most of it is at least eight years old, so the present size of the population may differ. Note that the size of the population when the Interim Recovery Plan was prepared in 2008 comprised **45,013** mature plants (DEC, 2008), which means that the current data available indicates that the known population size has, because of new records, increased by **over 30%** since 2008.

Approximately 39% of the estimated population are from slopes and gullies within the Mt Gibson Ranges. Of the balance of the population, the majority of records are associated with breakaways and granite outcrops within 4 km of the Ranges, and currently recorded to occur in about six discrete groups.

Initial information on population genetics

A preliminary study undertaken by BGPA (2006) focused on genetic variations of *L. gibsonii* using standard population genetic statistics. The study found high genetic variation within the eight discrete *L. gibsonii* populations located within the Mt Gibson Ranges. The observed microsatellite variation was uniformly distributed over the range of the species, therefore the populations in the Mt Gibson Ranges were considered as a single provenance unit for *L. gibsonii* (BGPA, 2006).

Further genetic studies have since confirmed that there is low genetic structuring between populations of *L. gibsonii* with 96% of variation within populations and 4% between populations. Pairwise tests, however, showed that there are some barriers to complete gene flow across the Mt Gibson Ranges (BGPA, p6, 2010). The sub-population on "Mt Gibson Saddle" was measured as genetically isolated from nearly all remaining populations. Possible explanations include inbreeding in small populations, physical isolation, or a strong selection at one or more linked loci (BGPA, 2010).

A study to determine genetic diversity in *L. gibsonii* involved comparisons with populations belonging to the *L. costale* complex (BGPA, 2010). Measures of heterozygosity and fixation index of the two species showed comparable genetic diversity, which, given the low sample size, was in contrast to expected evidence of population bottlenecks and inbreeding. BGPA (2010) suggest gene flow is high over the scale of these populations or that the current small populations are relicts of past populations.

Population areas of occupancy and extent of occurrence

The area of occupancy of *L. gibsonii* is illustrated in Figure 1. BGPA (2010) modelled outputs showing probabilities of presence (blue = low, red = high) for *L. gibsonii* as shown in Figure 2. BGPA's modelling of the distribution of *L. gibsonii* against spatially mapped data identified localities for possible *L. gibsonii* translocation sites (see Figure 2). The modelling predicted *L. gibsonii* to occur with a greater than 90% likelihood of presence in many small areas and a detailed pattern of presence probabilities outside of these areas of greatest likelihood (BGPA, 2010). *Lepidosperma gibsonii* is already known to occupy many of the areas that it is most strongly predicted to occupy, and the environmental variables used were considered to be good predictors of suitable abiotic habitat.

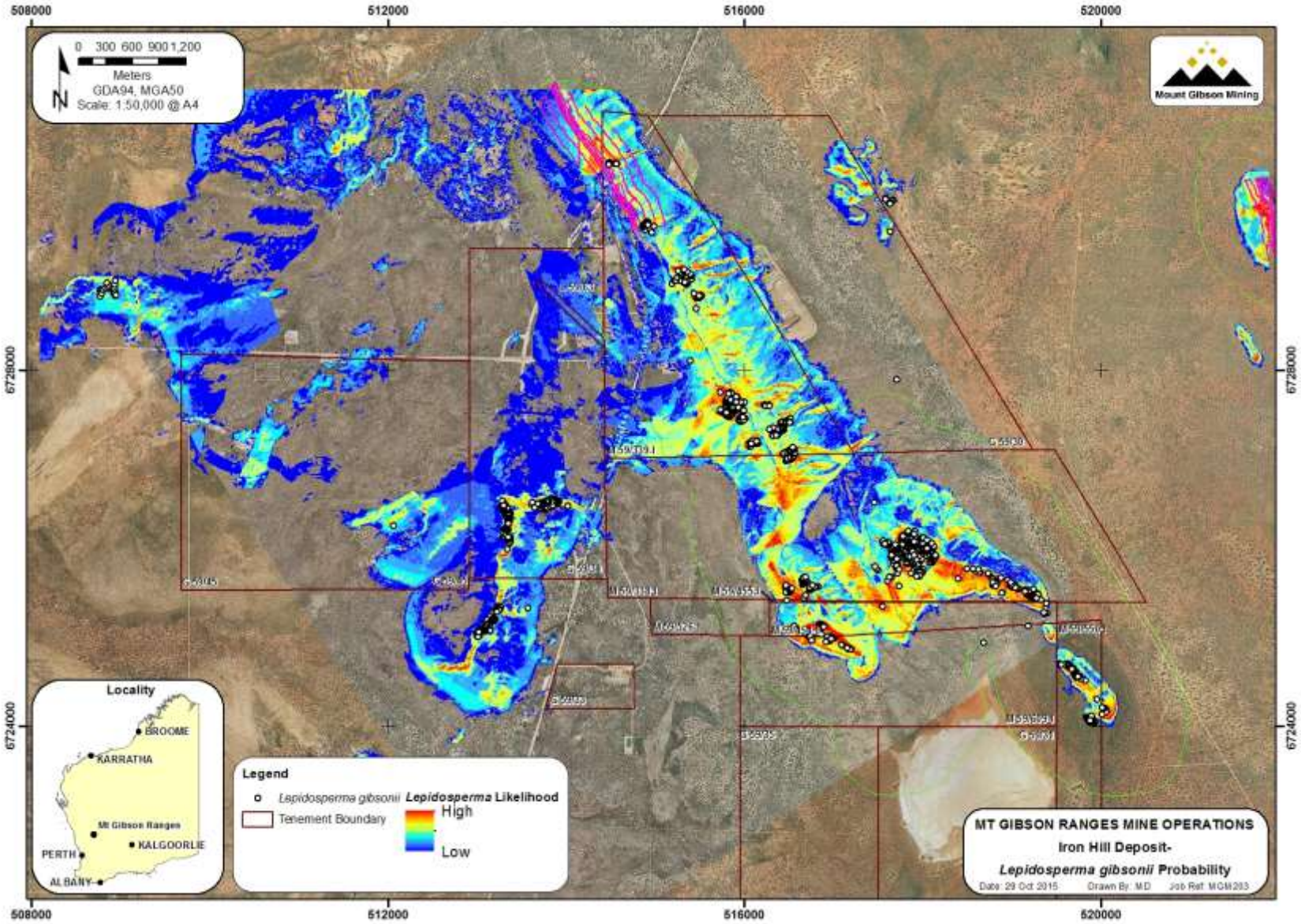

Figure 3 Mapped probabilities of plant presence for *L. gibsonii* (from BGPA, 2010) vs actual records of *L. gibsonii* locations

6. Conservation status

Lepidosperma gibsonii is specially protected under the Western Australian *Wildlife Conservation Act 1950*. It was listed as a Declared Rare Flora under the Western Australian *Wildlife Conservation Act 1950* [as *Lepidosperma* sp. Mt Gibson (R. Meissner & Y. Caruso 3)] on 12 December 2006, and on 22nd January 2008 it was listed under its current name, *L.gibsonii*. At the time of ranking, it was ranked as Vulnerable D2 under the International Union for Conservation of Nature (IUCN) criteria due to it being known from one location (14 populations, one genetic population) with a plausible future threat that could change its ranking. As of January 2017, the species was listed on Schedule 2 – Likely to become extinct or rare as endangered flora.

The species is not listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

2. Habitat critical to survival of the species and important populations

This taxon was originally listed as Vulnerable D2 consistent with the World Conservation Union (IUCN 2001). As a result of its status, emphasis was placed on the known habitat, which is critical to the survival of the plant species, as well as, any successfully rehabilitated populations.

Within the Mt Gibson Ranges, *L. gibsonii* appears to prefer steep slopes or gullies that provide increased water availability after rainfall events. The populations occurring outside of the Ranges are associated with low granite outcrops or breakaways and loamy flats in close proximity to the breakaways. In the majority of locations from where *L. gibsonii* has been recorded, the soils range from skeletal on the upper slopes often in association with the margins of larger areas of exposed ironstone, Banded Ironstone Formation (BIF) or granitic outcropping to deeper, sandy loams on the side slopes and gully floor. *L. gibsonii* has been recorded from a number of vegetation communities including three thicket and one heath community (Bennett, 2000; Section 1.2.4).

Research conducted by BGPA (2010) further refined and characterised suitable habitat. BGPA (2010) broadly defined the habitat requirements and predicted suitable habitat that could be critical to the long term health and survival of *L. gibsonii* was more extensive than the currently known areas of occupancy. At that time, the model considered geology from the Mt Gibson Iron Deposit Geological Plan, fire history using satellite and air photo imagery (1969 to 2007), and solar radiation receipt, aspect, slope, curvature and elevation using a 1 m interval contour map (BGPA 2010). Winter 2 pm solar radiation (< 0.4 w.m-2.hr-1) contributed 40% of the models prediction with slope (> 15°) and elevation (380 – 440 m) making up the remainder of the contribution to the distribution of known records prior to 2010. These factors have been found to model some of the areas in which *L. gibsonii* is known to occur. These areas are shown in Figure 2.

These qualities and characteristics of habitats may need continuing assessment to determine spatial locations within the landscape and relationships to other flora species to better define those elements that define critical habitat for the recovery of *L. gibsonii*. Substrate types on which the plant species is predicted and known to occur is well characterised (BGPA, 2010). For instance, other nearby lands on which *L. gibsonii* is not currently present - for reasons such as overgrazing - might have supported the species in the past and may be suitable for future actions such as translocations. Translocation trials may assist in determining whether or not additional areas of similar habitat are considered suitable for recovery of the species.

Note that Parks and Wildlife's Policy Statement 29 (CALM, 1995) refers to the translocation of threatened flora.

Habitat critical to the survival of *L. gibsonii* includes the area of occupancy of populations, areas of similar habitat surrounding and linking populations (these providing potential habitat for population expansion), and additional areas of similar habitat that may contain undiscovered populations of the species or otherwise be suitable for future translocations.

Furthermore, in relation to Figure 2, BGPA (2010) reported that:

- *L. gibsonii* is already known to occupy many of the areas that it is most strongly predicted to occupy; and,
- most of the remaining highly predicted areas will also contain populations if they were to be surveyed.

In relation to critical habitat, BGPA (2010) concluded that:

- factors limiting the distribution of *L. gibsonii* are described by the environmental variables modelled;
- potential restoration and translocation areas for *L. gibsonii* need to be in areas of low solar radiation (with overstorey) and/or areas able to maintain higher soil moisture than the landscape average; and,
- restoration trials should include treatments addressing uncertainties – i.e. shade and moisture for *L. gibsonii*.

Habitat critical to the survival of *L. gibsonii* is subject to enduring regulatory protection through a robust environmental approval process through which potential impacts are assessed under the *Environmental Protection Act* (Part IV – Environmental Impact Assessment). Approvals processes have specific mechanisms that can disallow (or suitably condition development) in instances where the environmental impact is assessed as significant.

3. Threatening processes

Under the EPBC Act a threatening process is defined as a factor that threatens or may threaten the survival, abundance or evolutionary development of a native species or ecological community. The threatening processes listed below were identified by the Department of Parks and Wildlife as being of most significant concern to the survival of remaining *L. gibsonii:*

- Mining (direct removal);
- Mining (threatening processes);
- Weeds;
- Fire;
- Drought;
- Grazing; and
- Climate Change.

1. Risk assessment

Each of the identified threatening processes was the subject of a risk assessment based on the Australian and international standard for risk management AS/NZS ISO 31000 (2009). The output of the risk assessment (Table 2) is used to identify management priorities and guide the allocation of resources towards recovery actions.

Risk assessment is also the basis of management and mitigation measures applied through the approved "Extension Hill & Extension Hill North Environmental Management Plan", prepared to meet the conditions of Ministerial Statement No. 753 (in particular conditions 6 to 12 and 14 of Ministerial Statement No. 753).

The main elements of the risk assessment process involved:

- Identification of the potential threats, the cause of the threat, the potential impact on *L.gibsonii* and likelihood of occurrence in the absence of any controls resulting in a raw risk rating; and
- Estimating the likelihood of each threat occurring, the potential environmental consequences if it did occur and the subsequent determination of a controlled risk rating in context of the current controls;
- Consideration of recovery actions to further mitigate risk; and
- Re-estimating the likelihood of each risk event occurring and the potential environmental consequences if it did occur, and the subsequent determination of a final residual risk rating.

Further details of the risk assessment criteria are included in Appendix 10.4.

Table 1 *Lepidosperma gibsonii* – risk assessment based on AS/NZS ISO 31000 framework

This risk assessment uses a consequence **(C)** and likelihood **(L)** matrix (Appendix 10.4) to determine Inherent Risk **(IR)** which considers risk if there are no controls in place; Controlled Risk **(CR)** which considers the risk after application of existing controls and Residual Risk **(RR)** which considers the final residual risk level after the application of additional controls proposed in this plan.

Risk Event (Threats)	**Cause**	**Impacts**	**Existing Controls**	**C**	**L**	**IR**	**Additional Risk Mitigation (Actions)**	**C**	**L**	**RR**
Direct removal of *Lepidosperma gibsonii* from areas outside the currently approved development envelope.	Approval of additional mining projects outside the currently approved footprint that cause extensive clearing of native vegetation impacting a significant number of *L. gibsonii*.	Worst case scenario if the entire known habitat on or adjacent ironstone was approved for mining is direct removal of up to 39% (as assessed by DPaW) of the known *L. gibsonii* population. Current, proposed and possible development targets within a five year timeframe result in less than 20% of direct removal of the known *L. gibsonii* population.	1. Government regulation through a robust approvals process in which impacts are assessed including: - Environmental Protection Act (Part IV - Environmental Impact Assessment) Approvals processes have specific mechanisms that can disallow or condition development in instances where the environmental impact is deemed to be unacceptable. 2. Conditional environmental approval process including Ministerial Statements and offset programmes to manage the environmental impact of projects should they be approved. MS753 authorises a	3	D	**17**	1. Maintain and use seed/germplasm collections of material with a broad genetic base for translocation and ongoing ex-situ conservation activities. 2. Survey for additional plant records 3. Consider developing and implementing a restoration program for groups taken through direct removal. *4.* Promote awareness of *L. gibsonii*	3	E	**20**

Risk Event (Threats)	Cause	Impacts	Existing Controls	C	L	IR	Additional Risk Mitigation (Actions)	C	L	RR
			development envelope with 15% of the L. *gibsonii* population. The proposed Iron Hill development envelope contains less than 2% of the *L. gibsonii* population.							
Dust emissions and inadvertent disturbances such as cracking of rock faces (sometimes referred to as "Secondary Impacts of Mining")	Mining operations	Potential impact on plant health or reproductive biology that may lead to a decline in recruitment rate.	1. Implementation of approved Environmental Management Plan and site procedures to monitor and minimise dust emissions. 2. Vegetation health monitoring adjacent to operational mining areas to examine potential effects.	4	D	**21**	1. Additional controls not required at this time. Continue to manage threatening processes from mining as per existing controls.	4	D	**21**
Weed invasion throughout *L. gibsonii* habitat	Increased movement of vehicles coupled with poor control over vehicle hygiene. Increased activity of feral animals spreading weed species.	Potential to outcompete *L. gibsonii* resulting in poor recruitment.	1. Vehicle hygiene controls are in place for all vehicles and mobile equipment involved with mining operations. 2. The presence and distribution of weeds is surveyed annually in spring. 3. Weed eradication controls are applied in accordance with approved procedures within the mining areas	4	D	**21**	1. Additional controls not required at this time. Continue to manage weed invasions as a threatening process from mining as per existing controls.	4	D	**21**

Risk Event (Threats)	Cause	Impacts	Existing Controls	C	L	IR	Additional Risk Mitigation (Actions)	C	L	RR
			and follow up inspections undertaken.							
Grazing by introduced species (goats and rabbits)	Potential for increased size of populations.	Grazing can have a significant impact on growth and reproduction of *L. gibsonii*. Repeated herbivory has an impact on reproductive output.	1. Coordination meetings with land managers in areas surrounding Mt Gibson on introduced species management undertaken. 2. Reporting of feral animal sightings in mining areas to inform the implementation of controls. 3. Implementation of approved Environmental Management Plan. 4. Water dams are securely fenced to prevent fauna access.	4	C	**18**	1. Protect plants from herbivory through the development and implementation of an adaptive management program to respond to increased herbivory from introduced species as necessary.	4	D	**21**
Inappropriate fire regimes	Fire frequency increased as a result of mine site activities or lightning events.	Loss of large-scale adult population resulting in increased susceptibility of fire induced recruits.	1. Fire is managed within the operational mining area and response capabilities exist to provide assistance in surrounding areas to prevent large-scale fire events.	4	C	**18**	1. Additional controls not required at this time. Continue to implement fire management strategy as per existing controls.	4	C	**18**
Drying climate	Natural phenomena	*L. gibsonii* requires sufficient soil moisture over two consecutive growing seasons in order to complete one reproductive cycle. Extended drought periods may negatively	1. Implement *L. gibsonii* condition monitoring program.	4	C	**18**	1. Maintain seed and germplasm collections. 2. Develop restoration program as a contingency measure.	4	C	**18**

Risk Event (Threats)	Cause	Impacts	Existing Controls	C	L	IR	Additional Risk Mitigation (Actions)	C	L	RR
		impact upon recruitment, however, there are some knowledge gaps on species response under this scenario.								
Drought	Natural phenomena	The reproductive cycle occurs over 2 consecutive growing seasons. Drought conditions have the potential to impact the reproductive ability of this species.	1. Research to aid understanding of recruitment has been undertaken by BGPA (2010) and funded by Extension Hill Pty Ltd and Mount Gibson Mining. 2. Implement *L. gibsonii* condition monitoring program.	4	C	**18**	1. Maintain seed and germplasm collections. 2. Develop restoration program as a contingency measure.	4	D	**21**

2. Mining (direct removal)

Approximately 39% of the known *L. gibsonii* population records are estimated to be on ironstone formations which are also prospective for iron ore. The current MGIOIP approval will result in approximately 9,030 adult plants of *L. gibsonii* being taken, which represents approximately 15 % of the known population to-date.

To date, the approved mine operations at Mt Gibson Ranges have removed approximately 820 individuals of *L. gibsonii* (MGM & EHPL 2014b); equating to less than 2% of the *L. gibsonii* population.

The Iron Hill development (determined by Statement 1045) coincides with records of approximately 867 *L. gibsonii*; equating to approximately 1.5% of the total *L. gibsonii* abundance.

If future mining and exploration proposals that require ground disturbance have the potential to impact upon *L. gibsonii*, any such impacts will be assessed and approved through the State's regulatory approvals process. This process provides the opportunity to manage impacts through refusals or conditioned approvals. Ground disturbance may be offset by restoration activities; surveys to increase the knowledge about species abundance, area of occupancy and/or extent of occurrence; land rehabilitation; and, translocation programs. Critically, in the event that a proposal has a potential impact that is deemed to be unacceptable then regulatory approvals may be denied and the proposal disallowed. The regulatory approvals process ensures the future protection of *L. gibsonii* population and habitat.

3. Mining (threatening processes)

It is possible that populations at Extension Hill South, Emu Proof Fence and Iron Hill North may be at some risk from secondary effects of mining (DEC, 2008) because they are most adjacent to the existing and approved mining operations. Possible secondary threats include dust and other potential effects on reproductive biology that may be shown to lead to a decline in plant recruitment rates.

To address this potential threat, plant health and dust deposition monitoring is used to indicate effects and further adaptive management actions may be applied as needed.

Table 2 *Lepidosperma gibsonii* – Potential Risk and Indirect Impacts

Threatening Processs	**Sources of risk**	**Potential Duration**	**Potential impacts**	**Controls**
Dust	Pit blasts; ground clearing; crusher circuit operations; truck movements on unsealed roads	Infrequent; Temporary	Emitted or fugitive dust may settle on plant leaf surfaces and limit primary production or clog stomata.	Haul road speed control; civil methods; watering; plant health monitoring for feedback controls
Changed hydrology; changed microclimate; erosion	Slope truncations and re-directions; altered drainage by interception or redirection in flows	Constant; Permanent	Shadowing: run-on / run-off volume changes which alter the way in the future that plants may germinate or grow.	Construct-on-grade sympathetic with terrain; drainage structures and erosion control where needed.

Threatening Processs	Sources of risk	Potential Duration	Potential impacts	Controls
Pollinators and reproductive success	Mine activity may dissuade animal (eg. bird and insect) pollinators	Infrequent; Temporary	Mine activity (presence; vibration; lighting) reduces rate at which pollinators visit flowers.	Seeds held in existing seedbank outside of project area.
Reduction of Genetic diversity	Ground clearing	One-off; Permanent	Reducing the abundance of populations may eliminate rare genes.	Apply species Conservation Action Plan; restore in situ populations with re-established stock
Fragmentation	Ground clearing	One-off; temporary	Removing ridgetop or creating elevated WRLs 'blocks' connectivity in space and/or time	Rehab and revegetation of domains at closure; retention of linkage corridors of natural terrain.
Introduced weeds	Mine activity vehicles may introduce or spread seeds	Infrequent; permanent	Weeds infest significant areas of native vegetation.	Weed monitoring and treatments; quarantine protocols and vehicle inspections
Grazing pressure	Mine activity attracts non-native grazers	Infrequent; temporary	Grazers reduce the foliage and health of vegetation including rare plants.	Monitoring (no significant impacts on foliage of rare plants); eradication programs for ferals
Seed disperal	Mine infrastructure	Constant; temporary	Infrastructure may create barriers to dispersal by insects, wind and water	Decommissioing and rehabilitation of land at closure.
Fire	Man made ignition sources – hot work tools; cigarettes	Infrequent; temporary - permanent	Uncontrolled extensive blaze that permanently destroys native vegetation and rare flora	Fire management systems and procedures
Vibration	Blasting and road haulage	Infrequent; temporary	Rocks may dislodge and trample native vegetation	Civil works management (rock placement); blast operational procedures.

4. Weed invasion

No significant weed populations had been observed at the time of the publication of the IRP (Parks and Wildlife, 2008). Weeds, should they proliferate in the future, may be a potential threat to habitats that support *L. gibsonii*.

5. Fire

Lepidosperma gibsonii recruitment from long-lived soil seedbanks occurs following a fire (BGPA, 2010). No evidence for inter-fire recruitment has been observed. Approximately 50% of adult *L. gibsonii* survive and regenerate following a fire (BGPA, 2010). The threat of fire alone is unlikely to result in negative impacts to the species because some adults will survive (i.e. they are re-sprouters) and there will likely be a proliferation of seedling recruitment. However, a period of drought following a fire and during the seedling establishment phase may result in a significant reduction in abundance of new recruits.

Fire will help the species to proliferate as long as there is sufficient rainfall in the following years to ensure seedlings grow and establish as adults.

6. Drought

Seed production in *L. gibsonii* is very much dependent on sufficient rainfall in consecutive years given that flower development occurs in one year and fruit and seed development occur in the following year. BGPA (2010) estimates a rainfall requirement of 65 - 110% of the average. Historical periods of low rainfall resulting in no seed production by this species are estimated to vary from two to 49 years. Therefore, *L. gibsonii* requires suitable conditions over two consecutive growing seasons (i.e. sufficient soil moisture) in order to complete one reproductive cycle (BGPA, 2010). This makes it more vulnerable to the impacts of drought compared to most other plant species which complete their reproductive cycles within one year. Drought conditions may therefore impact the reproductive ability of *L. gibsonii* in the short term.

Comparative studies by BGPA (2010) on *L. gibsonii* and related species demonstrate that the target taxa do not possess unique capacity to function or use water at lower levels of water availability. *L. gibsonii* was shown to respond to declining soil moisture levels by increasing root growth at the expense of an energy investment in leaves and shoots, and appear to persist over the arid summer period by closing down plant function and maintaining a dormant state through to the winter period.

7. Grazing

L. gibsonii is susceptible to herbivory by rabbits or goats, although plants often show significant recovery (BGPA 2010). The impact of herbivory on survival rates is unknown. The greatest impact to the plants' is likely to be a reduction in reproductive output, which can be reduced to zero seed production as a result of grazing.

A scale insect (Hemiptera: Coocoidea), yet to be identified, has been observed on *L. gibsonii* culms. The insect is likely a parasite that feeds on the plants sap. This may affect the plant by reducing its growth rate and photosynthesis.

In addition, a rust fungus (yet to be identified) has been observed growing on *L. gibsonii*, although no significant impact to the plants has been observed (BGPA, 2010). The effects may be evident when the plants are under stress by other vectors (e.g. drought, grazing).

8. Climate Change

Climate change can result in increased drying or a greater frequency of dry years in the region (BGPA, 2010). Given the increased effect of drought conditions on this species, there may be implications for seed production and ultimately seed bank size, recruitment capacity and long term viability of populations of the taxon.

4. Broader biodiversity benefits

Actions implemented to address identified risks and to ensure the long-term conservation of *L. gibsonii* will also maintain or improve the status of the associated native vegetation and habitat.

Two rare and four priority flora taxa occur within 500 metres of *L. gibsonii* populations (Table 3).

Table 3 Conservation–listed flora species occurring within 500m of *Lepidosperma gibsonii*

Species name	Conservation status (WA)	Conservation status (EPBC Act)
Eucalyptus synandra	Threatened (VU)	VU
Darwinia masonii	Threatened (VU)	VU
Acacia cerastes	Priority 1	-
Allocasuarina tessellata	Priority 1	-
Micromyrtus trudgenii	Priority 3	-
Persoonia pentasticha	Priority 3	-

Five fauna listed under the *Wildlife Conservation Act 1950* (WA), and five priority fauna have previously been recorded to occur within the range of *L. gibsonii* populations (Table 4).

Table 4 Conservation–listed fauna species occurring within *Lepidosperma gibsonii* habitat

Species name	Conservation status (***Wildlife Conservation Act 1950***)	Conservation status (***Environment Protection and Biodiversity Conservation Act 1999***)
Idiosoma nigrum (Shield-backed Trapdoor Spider)	T - Threatened (VU)	VU
Leipoa ocellata (Malleefowl)	T - Threatened (VU)	VU
Merops ornatus (Rainbow Bee-eater)	IA – Migratory birds protected under an international agreement*	Listed Marine Listed Migratory (JAMBA)*
Cacatua leadbeateri (Major Mitchell's Cockatoo)	S – Other specially protected fauna	-
Falco peregrinus (Peregrine Falcon)	S – Other specially protected fauna	-
Aganippe castellum (Tree-stem Trapdoor Spider)	Priority 4	-
Hylacola cauta subsp. whitlocki (Shy Heathwren (western))	Priority 4	-
Oreoica gutturalis subsp. *gutturalis* (Crested Bellbird (southern))	Priority 4	-
Pomatostomus superciliosus subsp. *ashbyi*	Priority 4	-
Pomatostomus superciliosus	-	Near Threatened

Species name	Conservation status (*Wildlife Conservation Act 1950*)	Conservation status (*Environment Protection and Biodiversity Conservation Act 1999*)
(White-browed Babbler (western wheatbelt))		

Migratory birds are protected under China-Australia Migratory Bird Agreement, Japan-Australia Migratory Bird Agreement (JAMBA), Republic of Korea-Australia Migratory Bird Agreement, and Bonn Convention.

L. gibsonii occurs within the Priority 1 listed ecological community 'Mt Gibson Range vegetation complexes (banded ironstone formation)' (5 occurrences, 3,216 hectares total). For a description of Priority Ecological Community (PEC) categories, refer to the DEC (2010) reference.

No negative effects of the actions on other conservation significant taxa and the priority ecological community for *L. gibsonii* have been identified during the period when the IRP was implemented.

2. Plan objective and criteria

1. Plan objective

The objective of this plan is to "to maintain, and ultimately improve, the conservation status of *L. gibsonii* such that its conservation status is more secure in the Mt Gibson area". This objective is prescribed in Ministerial Statement 753 for the Mount Gibson Iron Ore and Infrastructure Project.

2. Species conservation criteria

Criteria for Plan success:

This plan will be deemed successful if, over the term of the plan, all of the following are achieved:

1. The number of *in-situ* mature individuals in areas of current occupancy outside of areas approved for disturbance under Ministerial Statements remains stable[2] or increases.

2. The conservation category of the species remains at the current status or improves.

Criteria for Plan failure:

This plan will be deemed unsuccessful if, over the term of the plan, any of the following occur:

1. The total number of *in-situ* mature individuals in areas of known occupancy, outside of areas approved for disturbance under Ministerial Statements, has decreased by more than 15% beyond its natural variability* as a result of effects from threats identified in section 1.3;

2. The conservation status meets IUCN criteria for listing at a higher threat category than the current status.

* Natural variability will be assessed through regular monitoring as described in Section 4.4

[2] Stable means number of mature individuals plus or minus fifteen per cent.

3. Past and existing recovery actions

Parks and Wildlife has reviewed the relevance and effectiveness of the *Lepidosperma gibsonii* Interim Recovery Plan 2008-2012 (IRP No 283; DEC, 2008) in the *Lepidosperma gibsonii* Review Paper (Parks and Wildlife, 2014). The IRP identified eleven recovery actions associated with the taxon, listed below:

1. Coordinate recovery actions and liaise with stakeholders.
2. Continue implementation of the *Lepidosperma gibsonii* research programme.
3. Report any additional populations of *Lepidosperma gibsonii*.
4. Implement *Lepidosperma gibsonii* condition monitoring programme.
5. Implement a fire management strategy.
6. Manage secondary impacts of mining on *Lepidosperma gibsonii*.
7. Manage inappropriate grazing pressure on *Lepidosperma gibsonii*.
8. Undertake translocation trials as part of the *Lepidosperma gibsonii* Research Programme.
9. Maintain adequate seed/germplasm collections to ensure material with a broad genetic base is available for translocation and on-going *ex situ* conservation.
10. Promote awareness of *Lepidosperma gibsonii Recovery Plan* initiatives.
11. Review ranking of the species and prepare a full Recovery Plan if the review of the Interim Recovery Plan indicates this is necessary.

Further detail relating to these actions, an evaluation of their implementation and recommendations in relation to them is provided in Table 5.

Table 5 Summary of the *L. gibsonii* Interim Recovery Plan review (Parks & Wildlife, 2014; updated)

Part of recovery action	Timing	Responsibility	Evaluation of recovery action implementation	Recommendation
1. Coordinate recovery actions and liaise with stakeholders				
Continue to coordinate the implementation of recovery actions for *Lepidosperma gibsonii*.	Ongoing until 2012	GDTFRT	• GDTFRT have not coordinated the implementation of recovery actions for *L. gibsonii*.	This action is carried over in this Plan (Section 1). Responsibilities for some aspects have been re-allocated.
Ensure implementation of research, management and recovery actions for *L. gibsonii* in consultation with Parks and Wildlife, DoE, BGPA, Geraldton District Threatened Flora Recovery Team, relevant land managers and indigenous groups.		MGM & EHPL	• Research as outlined in recovery action 2 has been implemented and completed. • Implementation of the majority of management and recovery actions for *L. gibsonii* has been undertaken. • Consultation has been undertaken with a number of the stakeholders. This has been enhanced through employment of a Conservation Officer at Parks and Wildlife in August 2013.	
Annual progress report will be produced by 30 June each year.		Parks and Wildlife, GDTFRT, MGM & EHPL	• An annual progress report has not been produced. MGM & EHPL have produced Annual Environmental Reports that are distributed to Parks & Wildlife and Department of the Environment annually.	

Part of recovery action	Timing	Responsibility	Evaluation of recovery action implementation	Recommendation
2. Continue implementation of the *Lepidosperma gibsonii* research programme				
A comprehensive programme of research into: • conservation genetics; • population demography; • breeding biology; • population viability analysis; • environmental interactions and plant health; • restoration and translocation; and, • ex situ conservation of *L. gibsonii* is currently being implemented and is ongoing. The initial research programme will extend to December 2010, at which time the direction of future research will be reviewed. The nature of some of the research is longer term (5 years minimum).	2007 – 2010 (initially)	MGM, EHPL, BGPA & Parks and Wildlife (*ex situ* conservation only)	• An initial research programme was completed and was submitted by BGPA to MGM and EHPL in October 2010 in the form of a report entitled "*Darwinia masonii* and *Lepidosperma gibsonii* Conservation and Restoration Research. An integrated research program into the ex situ and in situ conservation, restoration and translocation requirements of *Darwinia masonii* and *Lepidosperma gibsonii* May 2007 – June 2010". • Recommendations on the direction of research were provided by BGPA (2010).	Further research of the species of *Lepidosperma gibsonii* is included in this plan (Section 5). This draws on recommendations of BGPA's (2010) initial research.

Part of recovery action	Timing	Responsibility	Evaluation of recovery action implementation	Recommendation
3. Report any new populations of *Lepidosperma gibsonii*				
Report any new populations of *L. gibsonii* to Parks and Wildlife.	On-going until 2012	MGM, EHPL, BGPA, GDTFRT, Parks and Wildlife	• In September 2013 and September 2014, Parks and Wildlife and MGM collected specimens and reported new (sub) populations of *L. gibsonii*. In total 2 new populations and 4 new subpopulations were recorded. Parks and Wildlife will provide an update on total population estimates in these areas to EHPL & MGM.	This action is carried over in this Plan (Sections 4.8).
Areas of potential habitat will be surveyed for the presence of *Lepidosperma gibsonii* during the flowering period. All surveyed areas will be recorded and the presence or absence documented to increase survey efficiency and reduce duplicate surveys. Where possible the GDTFRT and volunteers from the local community should be involved in surveys, supervised by Parks and Wildlife staff.		Parks and Wildlife	• Parks and Wildlife has not conducted or coordinated surveys of areas of potential habitat for *L. gibsonii*. This is currently planned for late 2015.	

4. Establish and implement *Lepidosperma gibsonii* condition monitoring programme

Monitoring of factors such as weed invasion, grazing, habitat degradation, population stability (expansion of decline), pollinator activity, seed production, recruitment, and longevity is essential. Rare Flora Report Forms will be prepared for monitoring undertaken.	2008 – 2012	GDTFRT, Parks and Wildlife	• Populations have not been monitored by GDTFRT or Parks and Wildlife regularly: o A single brief inspection of TPFL populations 3A was undertaken in May 2007 by Parks and Wildlife, and a Rare Flora Report Form was submitted, o No further monitoring was conducted until September 2013 when TPFL populations 3B and 12B were inspected by Parks and Wildlife, and a partial count of numbers undertaken for the latter. o In July 2014, Parks and Wildlife undertook a reconnaissance inspection of the new population corresponding to populations A and B referred to by Coffey Environments (2008a) in their letter dated 15 January 2008. They also commenced survey of a new subpopulation which was recorded on 24 September 2013 along the old alignment of the Great Northern Highway, approximately 200m south of the turnoff to the MGM accommodation village. This was completed in October 2014. o In October and November 2014, Parks and Wildlife surveyed TPFL populations 12B, 12A, 11, 10 and 8.	This action is carried over in this Plan (Sections 4.4).
The condition of the populations not directly impacted by mining will be monitored for any indirect impacts from mining that include risks such as excessive dust deposition, and possible weed invasions, and other potential threats such as grazing by introduced or native animals that may impact plant condition. A representative subset of 715 individual plants (2.5% of total pre-mining adult population) will be monitored in detail annually.		MGM & EHPL	• Annual monitoring of a subset of *L. gibsonii* has been conducted every year since 2007. The 2014 monitoring survey was conducted between 20 and 28th of October. A total of 948 plants were included in the recent annual monitoring program (MBS, 2015). Monitoring results showed that the percentage of plants alive, seedling recruitment and plant health were comparable to previous monitoring in November 2013. Plant health was higher or comparable. In 2014, plant health, reproductive status, height, and basal diameter were recorded. • Health scores were lower than when monitoring began in 2007, however this was attributed to a change in those surveyors doing the monitoring and consequently different interpretations of the qualitative health score (MBS, 2015)	

Ambient dust monitoring will be undertaken on a monthly basis in permanent quadrats to assess dust deposition on *L. gibsonii*. Populations closest to the mine (e.g. Extension Hill South) will be monitored monthly to assess any changes in condition prior to evidence of acute stress or mortality. Visual inspections of the populations closest to the mine (e.g. Extension Hill South) will be undertaken weekly. Populations located further away from the mine will be inspected quarterly. The results of the monitoring program will be used to guide subsequent management of the species.		MGM & EHPL	• Monthly monitoring has been conducted as outlined in this part of the recovery action (AER, 2014). • Dust monitoring is reported to regulators via the Annual Environmental Report.	
The results of the monitoring program will be used to guide subsequent management of the species in relation to mining activities.		MGM, EHPL, Parks and Wildlife, and GDTFRT	• It is expected that these results will be used to guide management and recovery actions included in the Recovery Plan for *L. gibsonii*.	
The research programme will investigate and develop suitable measures to assess plant health and will collect detailed demographic data from approximately 2% of the population in long term monitoring plots as part of the research program.		MGM, EHPL, Parks and Wildlife, & GDTFRT	• BGPA collected detailed data in order to complete the initial research programme as outlined in recovery action 2. BGPA (2010) recommended ongoing annual monitoring of all plants in permanently marked plots where individual plants should be tagged and measured. Additional variables recommended for collection were: survival, recruitment (new plants tagged and recorded as found), health, herbivory, infructescence production, seed production, and growth of seedlings and smaller plants. • Annual monitoring has continued since the initial research programme was completed. The data collected is in very raw form, and it will be necessary to determine the consistency of the data collected, and the extent to which it corresponds to the variables recommended by BGPA.	

5. Implement a fire management strategy				
An Environmental Management Plan and fire management procedures are being developed that detail the frequency and intensity of fires and control measures necessary to prevent inappropriate fires which may impact on the species directly, or its habitat.	Ongoing for life of mine	MGM & EHPL	• An Environmental Management Plan and Fire Management Procedures have been developed and adopted. • Mt Gibson Ranges and the habitat of *Lepidosperma gibsonii* are currently under a no burn fire management regime. Any fires which would occur on the ranges are wildfires or unplanned fires. • An experimental fire within *Lepidosperma gibsonii* TPFL population 3A was conducted by BGPA on 12 May 2009, and monitoring of recruitment in plots within the fire boundary was subsequently undertaken (BGPA, 2010). This experiment confirmed that *Lepidosperma gibsonii* germinates strongly after fire.	This action is carried over in this Plan (Section 4.5).
6. Manage secondary impacts of mining				
Implement Environmental Management Plan and associated procedures.	Ongoing for life of mine	MGM & EHPL	• This action is being implemented	This action is carried over in this Plan (Section 4.6).
7. Manage inappropriate grazing pressure on *Lepidosperma gibsonii*				
Undertake condition monitoring	Ongoing for life of mine	MGM & EHPL	• Condition has been monitored as described in the comments against recovery action 4.	This action is carried over in this Plan (Section 4.7).
Implement Environmental Management Plan and associated feral or other introduced animal procedures.		MGM & EHPL	• This part of the recovery action is being implemented.	
Restrict native animal access as required following consultation with Parks and Wildlife, as required.		MGM & EHPL	• Implementation of this part of the recovery action has not been considered necessary to date.	
8. Translocation trials				
Describe biotic and abiotic environments and habitat requirements. Trial *in-situ* planting methods.	2007 – 2010 (initially)	MGM, EHPL & BGPA	• BGPA (2010) described biotic and abiotic environments and habitat requirements for *L. gibsonii*. *In situ* planting methods using cuttings have been trialled at Mt Gibson on four differing field soil substrates. Further studies were recommended by BGPA to investigate further variation of rocky and gravelly substrate and variation of these substrates at different depths. BGPA also recommended treatments of varying shade and moisture.	Elements of this action are carried over in this plan (Section 4.2).

Identify critical parameters for the long-term viability of re-established populations of *L. gibsonii* and related species.		MGM, EHPL & BGPA	• It appears from the research by BGPA (2010) that critical parameters for the long-term viability of re-established populations of *L. gibsonii* may include areas of lower radiation receipt, and a rocky or gravelly substrate. Other parameters, which may not have been able to be gauged because for the relatively short length of time over which the BGPA research took place, may be critical for the long-term viability of re-established populations.	
Derive quantitative completion criteria which demonstrate maintenance of viable population dynamics and resilience in *L. gibsonii*.		MGM, EHPL & BGPA	• Quantitative completion criteria which demonstrate maintenance of viable population dynamics and resilience in *L. gibsonii* have not been derived to date.	

9. Maintain adequate seed/germplasm collections for material with a broad genetic base is available for translocation and on-going *ex situ* conservation				
Maintain adequate seed/germplasm collections	Ongoing until 2012	MGM & EHPL through BGPA	• Collections of seed and germplasm have been reported by BGPA (2010). • A stock of 168 genotypes of *L. gibsonii*, out of the original 187 which were successfully initiated from cuttings collected from plants within the MGIOIP footprint, is maintained at Nuts about Natives (B. Croxford 2015, pers. comm., 8 April). • Nuts about Natives was visited by Kiera Foster (Parks and Wildlife) and Ben McLernon (EHPL) on 2 October 2013. The clones of *L. gibsonii* genotypes are maintained as tube stock in 2 collections, with 3 clones of each genotype in each collection. These are kept on unshaded external benches, regularly monitored, and watered at moderate intervals. The genotypes are subcultured annually, by dividing the healthiest clones. Flowers from the clones are manually removed and disposed of before maturation. At present, clones in excess of those required for maintenance of the genotypes are disposed. The clones of the genotypes of *L. gibsonii* grow vigorously and are successfully conserved using the methods described.	Elements of this action are carried over in this Plan (Section 4.2).
10. Promote awareness of *Lepidosperma gibsonii*				
Promote need for protection through poster displays and local print and electronic media	Ongoing	Parks and Wildlife, GDTFRT	• This action has not yet been implemented	This action is carried over in this Plan (Section 4.3).
Continue environmental inductions and Environmental Handbook dissemination	Ongoing	MGM & EHPL	• This action is being implemented	
11. Review ranking of the species and the need for a full Recovery Plan				
In accordance with Condition 6.3 of Ministerial Statement 753, the relevance and effectiveness of the plan (DEC, 2008) will be reviewed within 4 years of the commencement of ground disturbing activities and the plan updated as necessary. The ranking of the species will be reviewed as part of the review of the IRP.	February 2011	MGM, EHPL, Parks and Wildlife, GDTFRT, in association with BGPA	• This action has commenced, and the outcome is expected to be a full Recovery Plan. A review of the ranking of the species will be undertaken during preparation of the Recovery Plan.	(Section 4.10 and Section 4.10).

4. Plan actions

There is a requirement that the actions identified in the plan manage and support the recovery of *L. gibsonii*, for its long term survival in nature.

The proposed actions have been developed in response to the threatening processes outlined in Section 3. They have been formulated to achieve the objective of this plan, and are based on the outcomes of the research and the implementation of the *L. gibsonii* IRP to date, as well as aspects of the conditions of MS753 pertinent to *L. gibsonii*. They are:

1. Coordinate recovery actions and liaise with stakeholders
2. Maintain and use seed/germplasm collections so a broad base of genetic material is available for conservation
3. Promote awareness of *L. gibsonii*
4. Implement *L. gibsonii* condition monitoring program
5. Implement fire management strategy
6. Manage threatening processes of mining
7. Protect plants from herbivory
8. Report any new occurrences of *L. gibsonii*
9. Develop a restoration program to implement, if required
10. Review the conservation status of the species
11. Review this plan

The effectiveness of actions in managing threatening processes using the Open *Standards of the Practice of Conservation* guidelines (CMP, 2013), as well as an environmental risk assessment based on the methodology of the international standard for risk management ISO 31000 (2009), was conducted as outlined in Section 3.1 and Appendix 10.4.

A summary of the risks to the survival of *L. gibsonii* before and after the application of corresponding conservation actions shown in Table 6. These ratings relate to the magnitude of the threat to the species and its reversibility over the 10 year timeframe of this Plan.

Key actions have been developed to mitigate potential threats as part of the IRP and will be continued in this Plan.

Actions that are not directly related to threatening processes, but which are important for efficient and effective implementation of the Plan are:

- Coordinate recovery actions and liaise with stakeholders;
- Monitor populations;
- Report and protect existing and any new occurrences of *Lepidosperma gibsonii*;
- Review assigned conservation status of the species; and,

- Review this plan and assess the need for an updated Plan.

Budget allocations relating to proposed actions are listed in Appendix 10.5.

Table 6 Summary of Inherent and residual risks to the survival of *Lepidosperma gibsonii*

Risk Event (Threats)	Inherent Risk	Actions	Residual Risk
Direct removal of *Lepidosperma gibsonii* from areas outside the currently approved development envelope.	**Medium**	1. Maintain and use seed/germplasm collections of material with a broad genetic base for translocation* and ongoing ex-situ conservation activities. 2. Survey for additional plant records 3. Consider developing and implementing a restoration program for groups taken through direct removal. 4. Promote awareness of *L. gibsonii*	**Low**
Dust emissions and inadvertent disturbances such as cracking of rock faces (sometimes referred to as "Secondary Impacts of Mining")	**Low**	1. Additional controls not required at this time. Continue to manage threatening processes from mining as per existing controls.	**Low**
Weed invasion throughout *L. gibsonii* habitat	**Low**	1. Additional controls not required at this time. Continue to manage weed invasions as a threatening process from mining as per existing controls.	**Low**
Grazing by introduced species (goats and rabbits)	**Medium**	1. Protect plants from herbivory through the development and implementation of an adaptive management program to respond to any sudden fluctuations in the number of introduced species as necessary.	**Low**
Inappropriate fire regimes	**Medium**	1. Additional controls not required at this time. Continue to implement fire management strategy as per existing controls.	**Medium**
Drying climate	**Medium**	1. Continue to implement *L. gibsonii* condition monitoring program. 2. Maintain seed and germplasm collections. 3. Develop restoration program as a contingency measure.	**Medium**
Drought	**Medium**	1. Continue to implement *L. gibsonii* condition monitoring program. 2. Maintain seed and germplasm collections. 3. Develop restoration program as a contingency measure.	**Low**

*The time frame to develop and implement translocations is within the term of the Plan (10 years) however the time frame to meet completion criteria for a translocation is much longer and requires establishment of a viable self-sustaining population (usually of at least 200 mature plants) and natural recruitment of second and subsequent generations.

1. Coordinate species recovery actions and liaise with stakeholders

Parks and Wildlife will coordinate the management of threatening processes (recovery actions) in relation to *L. gibsonii*.

MGM and EHPL will consult with and seek advice from Parks and Wildlife during implementation of proponent's actions in this Plan for *L. gibsonii* or until such time that the proponents no longer implement Statement 753 at the Mt Gibson Range.

As part of their broader conservation objectives, Parks and Wildlife may include information on the implementation of this Plan in annual reports to Parks and Wildlife's Corporate Executive and funding bodies.

Actions:

- Coordinate relevant recovery actions and liaise with stakeholders.
- Implement relevant actions of the Plan.
- Provide an annual report on the Plan's progress (by Parks and Wildlife) to Parks and Wildlife's Corporate Executive and funding bodies.

Responsibility: Parks and Wildlife

Timing: ongoing, annually for the report

Commencement date:	On adoption of the Plan
Completion date:	Life of Plan

2. Maintain and use seed/germplasm/tissue collections to ensure material with a broad genetic base is available for conservation

Seed/germplasm collections, if these show viability, may be available for on-going *ex situ* conservation and for future use in restoration programs. Seed banking and germplasm strategies may provide long-term security for identified genotypes and back-up collection. Any such seed will also be provided to the Parks and Wildlife Threatened Flora Seed Centre. *In vitro* culture and cryostorage are also options for long-term storage of key clonal germplasm if required (BGPA, 2010). *In vitro* culture has successfully been achieved for this species (BGPA, 2010).

However, in the short-medium term, propagation of live *L. gibsonii* plant material from wild collections and nursery stock may pose the most cost-effective approach for storage and recovery, as well as production of new plants for restoration purposes. Maintenance of the *L. gibsonii* green tissue collection, particularly from

those plants which have been cleared from approved footprints, should continue until such a time as viable plants are re-established from these collections. Multiple (>100) genotypes of live plants should be maintained, monitored and supplemented to represent each of the groups directly cleared during mining activities.

A review of the seed held in storage, its quality, and the groups from which it originates, is necessary to determine the viability of seed. Collection of seed from groups which do not have representations of tissue, or seed of good quality, will be necessary with the aim of maintaining an adequate supply for storage of *L. gibsonii* tissue.

Tasks may include:

- Maintain records of retained seed stock in storage.
- Test viability of retained seed stock in storage (2015-17).
- If feasible, seasonal collection of seeds from targeted Mt Gibson Ranges groups (mid-November) which do not have tissue representation (late Spring 2016-2020).
- Ex situ propagation of live *L. gibsonii* plants from wild collection seed stock and cuttings (2017-2018).
- Provision of nominated seed samples to Threatened Flora Seed Centre (2016-2017).
- Review adequacy of ex situ collection and seed viability to inform future actions (2017).
- Supplementation of seed in storage (if inadequate stock levels and/or benefits are identified; 2018).

Action: Maintain adequate seed/ germplasm / tissue collections

Responsibility: EHPL and MGM

Timing: 2015 – 2018 initially

Commencement date:	2015
Completion date:	Life of mine

3. Promote awareness of *Lepidosperma gibsonii*

The significance of this species will continue to be communicated to personnel working at and around the mine site (i.e. environmental induction). Note that Parks and Wildlife may promote species awareness to the wider community as part of its species recovery action.

Actions:

1. Promote awareness to the wider community; and
2. Promote awareness of *L. gibsonii* to mine site personnel through environmental inductions.

Responsibility: MGM and EHPL at the tenements; Parks & Wildlife in the wider community

Timing: Ongoing for life of MGIOIP

Commencement date:	2016
Completion date:	Life of mine

4. Implement *Lepidosperma gibsonii* condition monitoring program

MGM and EHPL will continue to implement a program for *L. gibsonii* condition monitoring.

The survival and condition of *L. gibsonii* will be monitored including for potential effects from drought, dust and possible weed invasions, and other threats such as grazing. A representative subset of the records on the Mt Gibson range will be monitored in detail at least annually between September and November. These results will also be used to assess natural variability of population abundances.

Inspections of plants in established quadrats will be continued routinely through the year, with plants assessed according to a plant health scale developed by BGPA and/or other equivalent parameters. The monitoring results will be used to identify impacts, not characteristic of natural seasonal variation, in a timely manner. Monitoring will continue for the life of mining ore from pits on the range.

Adaptive management, if required, will draw on mitigations of this Plan to reduce indirect effects on plant health.

Tasks would include:

- On-going monitoring of tagged plants in established quadrats in detail on an annual basis.

Action: Undertake plant specimen health and condition monitoring

Responsibility: MGM and EHPL at the established quadrats on mining tenements

Timing: Annually, as described above

Commencement date:	Ongoing
Completion date:	Life of mine

Note that since the advent of MS753 Condition 6, Mount Gibson Mining will apply, for the duration of Ministerial Statement 1045, an approved *Flora & Vegetation Monitoring and Management Plan* across the Mt Gibson Range to conduct regular monitoring of native vegetation including *L.gibsonii*. The plan methods generate results against a number of plant health and habitat condition indicators aimed to detect temporal and seasonal changes in plant condition and identify indirect effects from mining. Overall, because of MGM's commitment to a meso-scale survey across the range, plant survival and leaf chlorophyll content (pigment fluorescence) is repeatedly recorded in tagged *L.gibsonii* (and over four hundred other native plants) on at least eight consecutive occasions during 2017 at sites from Extension Hill South to Mount Gibson South.

5. Implement Fire Management Strategy

Lepidosperma gibsonii is a re-sprouting species and therefore capable of surviving fire and grazing to a greater extent than a seeder species. Frequent fires (combined with drought conditions) represent the greatest threat to the medium to long term survival of the species.

MGM and EPHL are required to manage secondary threats from mining and threats of fire to *L. gibsonii* through the conditions that apply to Ministerial approvals. The management actions below will be undertaken alongside those obligations that already apply under MS753.

Actions:

- Implement actions required to manage the risk of bush fires resulting from mining activities (MGM and EHPL).
- Prevent fire occurring in the habitat of the populations, except where it is being used in regeneration trials (Parks and Wildlife).

Responsibility: MGM and EHPL; Parks and Wildlife

Timing: Ongoing for life of mining

Commencement date:	Ongoing
Completion date:	Life of mine related actions, and otherwise for the life of the Plan

6. Manage threatening processes from mining

The size and condition of the *L. gibsonii* population may potentially be affected by secondary threats including excessive dust deposition, introduction or spread of weeds, unauthorized access causing ground disturbance and altered hydrology.

MGM and EPHL are required to manage secondary threats from mining and threats of fire to the species through Ministerial conditions that apply.

The management actions below will be undertaken alongside those obligations that apply.

Action:

- Continue to implement the approved Environmental Management Plan (MGM & EHPL, 2008), and any subsequent approved revisions.

Responsibility: MGM and EHPL

Timing: Ongoing for life of mine operations

Commencement date:	Ongoing
Completion date:	Life of mine

7. Manage the risk of herbivory

Grazing effects by introduced animals (goats and rabbits) will continue to be assessed as part of monitoring the condition of *L. gibsonii* (see Section 5.2.2).

Generally, to date, minor gazing pressure has been observed although, in some areas, this has been significant. In the event that grazing pressure significantly affects the health of many plants or sub-populations, introduced animals may need to be controlled through trapping, baiting, poisoning, shooting, exclusion fencing or other means.

Access to additional water in dry seasons is restricted through the fencing of permanent water storage facilities.

Management of grazing pressure may also benefit the broader ecological communities of the Mt Gibson Range.

Tasks would include:

- Monitor effects of grazing on the condition of *L. gibsonii*;
- In the event that grazing pressure significantly impacts *L. gibsonii*, either directly or through damage to associated habitat, the feral animal population will be controlled on the mining tenements through consideration of:
    - Fencing (financial provision and logistic capability required); and
    - Feral animal eradication (permits and pastoral consent required).

Action:

- Continue to monitor grazing effects in annual *L. gibsonii* condition monitoring data (see Section 4.4); and
- If grazing is having significant adverse effects on populations of *L. gibsonii* or its habitat, MGM and EHPL will facilitate an appropriate feral animal control program in consultation with relevant stakeholders.

Responsibility: MGM and EHPL; Parks and Wildlife

Timing: Annually

Commencement date:	Ongoing
Completion date:	Life of mine

8. Report any new occurrences of *Lepidosperma gibsonii*

Future census work should use a reliable reproducible methodology that aims to update the total of known plants, their boundary and population structure (proportions of mature, juvenile, seedling and dead individuals.

If a decline in the population size occurs on mining tenements during the life of mine then the lead responsibility for completing a census would be MGM and EHPL, in accordance with Plan criteria (Section 2.2).

Any new *L. gibsonii* specimens or groups that may be located opportunistically will be reported in accordance with the Threatened and Priority Flora Report Form to Parks and Wildlife.

Actions:

- Report any new occurrences of *L. gibsonii* opportunistically discovered to Parks and Wildlife (MGM/EHPL) (2015 onwards).
- *Lepidosperma gibsonii* does not have representative specimens held by the WA Herbarium from across its range. Parks and Wildlife will consider that specimens of these sub-populations are to be collected and lodged with the WA Herbarium (Parks & Wildlife).
- There are plans by Parks and Wildlife to survey areas of potential habitat for the presence of *L. gibsonii* during future seasonal flowering periods. Any surveyed areas will be recorded and the presence or absence of the species will be documented to increase survey efficiency and reduce the chance of duplicate surveys. Where possible, the GDTFRT and volunteers from the local community shall be involved in surveys, supervised by Parks and Wildlife staff.

Responsibility: MGM and EHPL; Parks & Wildlife

Timing: Ongoing

Commencement date:	2015
Completion date:	Life of mine for tasks specific to MGM and EHPL, otherwise life of Plan

9. Develop a restoration program

The critical habitat for the survival of *L. gibsonii* may also include additional nearby occurrences of similar habitat that do not currently support the species but may have done so in the past and may be suitable in the future. The modelled habitat (Figure 2) and recorded groups of plants has increased the known areas of occurrence and abundance of the population. Because of this, direct or extensive plant translocations may not be necessary in the short to medium term, while the known abundance and mapped area of occurrence is at current levels. In preparation, should the plant population show trends of decline, translocations may then be required to conserve the species. The seed/ germplasm and/or green tissue stock (Section 4.2) should be used.

Restoration planning may consider the scaled production of *L. gibsonii* seedlings via germination of seed using methods such as:

- fresh or stored seed involving physical manipulation of small seeds for seed coat nicking or removal;
- heat shock treatment (100°C for five minutes);
- seed burial which resulted in physical degradation of the seed coat, as well as, environmental (seasonal temperature and moisture) cuing; and
- smoke treatments.

All of these treatments have been shown to improve germination rates, however, the best results were obtained from removing the seed coat and then subjecting the seeds to a heat shock treatment, which resulted in 60% germination (BGPA, 2010). Further research would be required to specifically identify the right combination of dormancy breaking treatments for the seed of this species. Should *L. gibsonii* seed become a more viable restoration source, as a result of further investigations into its germination requirements, allowance must be made for the likely ultimate rate of seed germination, difficulty of collection and the potential rate (in time and money) of developing seedlings from seed.

Of much higher success is clone development from existing live plants by collecting (under permit) tissue clumps (roots and leaves) from plants, growing these in nursery and then relocating to the field under an approved translocation proposal.

The effort and budget invested in work above and such tasks as below would only be triggered by a reduction against the criteria in Section 2 describing key metrics of the plant populations.

Tasks may include:

- Collect seed and/or use *ex situ* materials (2017 – 2019).
- Waste landform and drill pad/track rehabilitation trials: assessment of rock and gravel substrates with varying composition, degrees of soil depth and rockiness and other growing media to support growth of *L. gibsonii* will determine the suitability of this species for more extensive waste landform rehabilitation programs.

Actions:

- The currently proposed management actions are comprised of tasks above; restoration activities will be implemented in the event of a significant decline in total population abundance.
- Review the use and application for future use if required.

Responsibility: EHPL and MGM

Timing: As required.

Commencement date:	November 2014
Completion date:	As required.

10. Review conservation status of the species

For the purposes of species conservation, changes to conservation status include changes and trends in the:

- number of individuals;
- number of populations;
- number of locations;
- habitat quality and extent;
- extent of occurrence;
- area of occurrence; and,
- apparent threats.

For example, a successful translocation trial or future regional discovery of additional records and areas of occurrence that has natural recruitment would improve the conservation status by increasing the areas and abundance, and may or may not change the IUCN category.

The species is geographically restricted and listed on Schedule 2 (EN), despite there being significantly more known individuals due to further population census and research, and additional sub population discoveries.

Actions:

- Review the conservation status of the species every five years; or more frequently when there are indications of significant change to the conservation status of the species.
- Liaison by Parks & Wildlife with EHPL & MGM

Responsibility: Parks and Wildlife

Timing: 2018

Commencement date:	2016
Completion date:	Life of Plan

11. Improve Taxonomic Resolution within the Genus

Lepidosperma species can be challenging to identify due to a lack of informative morphological characteristics. Molecular methods can be useful tools for identifying ambiguous specimens and studies of species diversity and taxonomic relationships.

Recent questions (DPaW 2016) have arisen in relation to morphological identifications of groups of *L. gibsonii* based on specimen records without genetic assessment. Further, recent survey work (November 2015) has found specimens of both *L. gibsonii* and a potentially new form at the same locations, indicating that admixed specimens from different taxa may co-exist. This effect currently limits the reliability of current population estimates in the known western parts of the species' area of occurrence, such that they may not be

representative of the abundance of *L. gibsonii* occurring in the wild. The areas where Lepidosperma taxa may co-habit is shown in Figure 1(a) – these are all west of the Great Northern Highway.

Actions:

- Phase 1: *To use DNA identification of Lepidosperma gibsonii, including potentially admixed individuals, to characterize the existence of discrete or admixed populations;* and
- Phase 2: *To further resolve the species' status across select population west of Great Northern Highway for 'ambiguous' (potentially admixed) Lepidosperma specimens.* The requirement for this phase will be updated following completion of Phase 1 based on further detailed information.

Responsibility: MGM with support from and pending agreement with Parks and Wildlife for the utilisation of Biodiversity Offset Funds to contribute to certain costs of the stated actions.

Timing: Phase 1, FY2017-18; Phase 2, FY2018-19

12. Review this plan

The proponents shall review and revise this Plan as and when directed by the CEO, OEPA (Condition 7-7 of MS753), or every five years, whichever comes first.

Actions:

- Review performance annually (Appendix 10.5) and report on the implementation of this Plan;
- Review and revise this Plan.

Responsibility: MGM and EHPL

Timing: As directed by the CEO, OEPA, or every five years, whichever is first.

Commencement date:	Commencement of the Plan
Completion date:	Life of mine

5.Further research of the species

MGM and EHPL are required under conditions 6-1 and 6-4 of MS753, respectively, to prepare and implement a *Lepidosperma gibsonii* Research Plan. They are required to review and revise the Research Plan as and when directed by the CEO, OEPA (condition 6-7 of MS753), and to implement revisions of the *Lepidosperma gibsonii* Research Plan (condition 6-8).

BGPA (2010) identified the need for further research. These recommendations were considered by MGM, EHPL and Parks and Wildlife and the following list identifies the items which are agreed to be the key research priorities:

- Perform manipulative experiments of substrates using mine waste components or other available and appropriate materials.
- Report into the use of seed as preferred restoration source.
- Determine if *L. gibsonii* seed would germinate from 2007 collected samples.
- Translocation trial methodologies will assist in:
    - determining whether or not additional areas of similar habitat are suitable for growing *L. gibsonii*, and
    - rehabilitation of areas disturbed by mining. The survival and management of the plants remaining from the past planting trials of *L. gibsonii* on the four differing field soil substrates should continue to be observed.

Actions:

- Implement the above tasks according to resourcing and budget considerations.
- Review and revise the *L. gibsonii* Research Plan.

Responsibility: MGM and EHPL

Timing: 2016 - 2025

Commencement date:	Commencement of Plan
Completion date:	2025

6. Legislative and decision making controls and obligations

1. International obligations

This plan is intended to be consistent with the aims and recommendations of the Convention on Biological Diversity, ratified by Australia in June 1993, and assist in implementing Australia's responsibilities under that Convention. The species is not listed:

- under Appendix II in the United Nations Environment Program World Conservation Monitoring Centre (UNEP-WCMC) Convention on International Trade in Endangered Species (CITES), nor
- under the International Union on Conservation of Nature (2012) Red List.

This plan is not known to adversely affect Australia's obligations under any other international agreements.

2. Guide for decision makers

Preceding sections of this Plan provide details of current and possible future threats to the species. Any further development in the vicinity of existing or potential habitat would require further assessment under established referral and/or environmental assessment mechanisms of State and Commonwealth governments.

The *L. gibsonii* population is known to occur across a variety of land tenures including pastoral leases, Crown Reserve (Reserve 17367), unallocated Crown land, mining leases and native title areas. Based on the current records and known area of occurrence (Figure 1), interests potentially affected by, or involved in the implementation of this plan include:

- MGM, EHPL, Pindiddy Aboriginal Corporation (Ninghan Station), Australian Wildlife Conservancy (Mt Gibson Station) and the Badimia People.

Interests of others may be potentially affected by this plan. Further details are provided in Section 7. In most cases, no undue impediment or restriction on current land use is apparent or likely to arise because of this plan. Landholders and land management agencies may be affected through statutory planning and approval processes outside this plan when seeking to alter the landscape or undertake actions that may cause certain detrimental effects on *L. gibsonii*.

Permission has been, or will be, sought from the managers and those with entitlements to lands where *L. gibsonii* occurs or may occur before actions are undertaken on any such land.

Actions implemented to maintain the quality and occurrence of the habitat of *L. gibsonii* will also support vegetation and habitat in which it is located and supports the Declared Rare Flora (DRF) taxon *Darwinia masonii* and other priority flora. Fauna species may also benefit where actions improve their habitat. No negative effects of the actions for the species have been identified, however, should they be, they should be allied with those of extant taxa.

7. Interest groups, social and economic impacts and benefits

1. Role and interest of Aboriginal groups

The Badimia people were the registered native title claimants in the area (Badimia People WC96/98), however, the Badimia claim was dismissed by the Federal Court of Australia in March 2015 and in May 2015 the Court made a determination that no native title exists in the area.

There are registered ethnographic and / or archaeological sites within the habitat of *L. gibsonii* which are of cultural significance.

MGM and EHPL has undertaken regular consultation through stakeholder meetings, including in the period of the Interim Recovery Plan and during the preparation of this Plan. The proponents will continue to consult with Aboriginal groups in the region identified in this plan and consider their role and interests in its implementation. Input and involvement will be welcome from Aboriginal groups of standing that have an active interest in areas that *L. gibsonii* occurs, and their involvement in recovery team representation may be sought.

The works of Tehnas (2010) should be referenced to obtain information of the existence and status of aboriginal heritage sites and regional ethnography.

The Aboriginal Heritage Sites Register, maintained by the Department of Aboriginal Affairs, will be used to identify significant sites near recorded and any new plant population. However, not all potential heritage sites are listed on the Register, and on-going liaison will be maintained with local Aboriginal community representatives.

2. Affected interests

The known populations of *L. gibsonii* occur across a variety of land tenures including pastoral leases, Crown Reserve (Reserve 17367), Unallocated Crown Land and mining leases. Based on the current records and known area of occurrence of *L. gibsonii*, interests potentially affected by, or involved in the implementation of this plan include:

- MGM, EHPL, Pindiddy Aboriginal Corporation (Ninghan Station), Australian Wildlife Conservancy (Mt Gibson Station), Bush Heritage Australia (Charles Darwin Reserve) and the Badimia People.

Interests of others may be potentially affected by this Plan. In most cases, no undue impediment or restriction on current land use is likely to arise because of this plan. Landholders and land management agencies may be affected through statutory planning and approval processes outside this Plan when seeking to alter the landscape or undertake actions that may impact on *L. gibsonii*.

Permission has been, or will be sought from the managers and those with entitlements to lands where *L. gibsonii* occurs or may occur before actions are undertaken on any such land.

3. Social and economic impacts and benefits

The presence of MGM and EHPL in the region and their proactive approach to supporting the implementation of this plan will benefit the conservation of *L. gibsonii*, as well as the economic and social advantages from mining activities on Mt Gibson Ranges.

The known habitat for 39% of the population of *L. gibsonii* comprises ironstone formations and slopes in some areas that are also partly prospective for iron ore and under live mining leases. This Plan provides guidance for decisions on assessments under established referral and/or environmental assessment mechanisms of State government with respect to further development in the vicinity of existing or potential habitat for *L. gibsonii*.

8. Implementation and evaluation

This plan has been prepared to the requirements of the Minister for the Environment (WA) by Environmental Protection Authority and Parks and Wildlife.

MGM and EHPL will implement the Plan as required by condition 7-6 of MS753.

The Parks and Wildlife officer position funded through Offset 4 under condition 16 of MS753 may "assist with the implementation of the Plan".

Actions associated with evaluation and review of this Plan are provided in Section 4 and include:

- Conduct an annual internal audit (Appendix 10.6) to assess effectiveness of the implementation of this Plan;
- Provide an annual report on the Plan's progress to Parks and Wildlife's Corporate Executive and funding bodies (Section 1).
- MGM, EHPL, and Parks and Wildlife shall review and revise this Plan as and when directed by the CEO, OEPA (Condition 7-7 of MS753), or after five years, whichever comes first (Section 11).

This plan will continue to apply from the date of adoption for a minimum of 10 years, or until replaced by a revised Plan.

The estimated cost of implementing this Plan is outlined in Table 7. However, this estimated figure does not include site operational costs associated with implementing actions or associated restoration of post-mining landforms, the budgets of other government agencies and private land owners. Nor does it include costs associated with mitigating any loss of habitat due to development proposals that may be approved and undertaken at any point in the next five years.

Table 7 Summary of actions over five years and indicative costs

Section	Action	Responsibility	2016/17 ($)	2017/18 ($)	2018/19 ($)	2019/20 ($)	2020/21 ($)
4.1 Coordinate actions and liaise with stakeholders							
4.1	Coordinate relevant actions, and liaise with stakeholders.	MGM & EHPL	Site operation budgets	Site operation budgets	Site operation budgets	Site operation budgets	Site operation budgets
4.1	Coordinate relevant actions, and liaise with stakeholders.	Parks & Wildlife					
4.1	Implement the relevant actions in the Plan.*	MGM & EHPL	Site operation budgets	Site operation budgets	Site operation budgets	Site operation budgets	Site operation budgets

Section	Action	Responsibility	2016/17 ($)	2017/18 ($)	2018/19 ($)	2019/20 ($)	2020/21 ($)
4.1	Implement the relevant actions in the Plan.*	Parks & Wildlife					
4.1	Provide an annual report on the Plan's progress to Parks and Wildlife's Corporate Executive and funding bodies.*	Parks & Wildlife					
4.2 Maintain and use seed/germplasm collections to ensure material with a broad genetic base is available for conservation							
4.2	Maintain records of retained seed stock in storage.	MGM & EHPL	-	-	-	-	-
4.2	One-off viability test of retained seed stock in storage.	MGM & EHPL	-	$1,000	-	-	-
4.2	Targeted seasonal collection of seeds from key Mt Gibson Ranges populations (late October to early November) including those which do not have seed representation (late spring).	MGM & EHPL	-	5,000	5,000	10,000	15,000
4.2	Propagation of live *L. gibsonii* plants from wild collection seed stock and cuttings.	MGM & EHPL	-	10,000	10,000	-	-
4.2	Provision of nominated seed samples to the Threatened Flora Seed Centre.	MGM & EHPL	-	-	-	-	-
4.2	Review adequacy of *ex situ* collection to inform future actions.	MGM & EHPL	-	-	-	1,000	-
4.2	Supplementation of seed in storage (upon identification of inadequate stock levels).	MGM & EHPL	-	-	-	-	5,000 (if req'd)
4.3 Promote awareness of *Lepidosperma gibsonii*							
4.3	Promote awareness to the wider community.	Parks & Wildlife					
4.3	Promote awareness of *L. gibsonii* to mine site personnel through environmental inductions.	MGM & EHPL	Site operation budgets	Site operation budgets	Site operation budgets	Site operation budgets	Site operation budgets
4.4 Implement *Lepidosperma gibsonii* condition monitoring program							

Section	Action	Responsibility	2016/17 ($)	2017/18 ($)	2018/19 ($)	2019/20 ($)	2020/21 ($)
4.4	Implement the *L. gibsonii* condition monitoring program.	MGM & EHPL	$40,000	$40,000	$40,000	$45,000	$45,000
4.5 Implement Fire Management Strategy							
4.5	Implement actions required to manage fire as a threatening process through the conditions that apply to the MGIOIP under MS753.	MGM & EHPL	Site operation budgets	Site operation budgets	Site operation budgets	Site operation budgets	Site operation budgets
4.5	Prevent fire occurring in the habitat of the populations, except where it is being used in regeneration trials.	Parks & Wildlife					
4.6 Manage threatening processes from mining							
4.6	Implement management actions required to manage threatening processes from mining through the conditions that apply to the MGIOIP under MS753.	MGM & EHPL	Site operation budgets	Site operation budgets	Site operation budgets	Site operation budgets	Site operation budgets
4.7 Protect plants from herbivory							
4.7	Review grazing impacts in monthly and annual *L. gibsonii* condition monitoring data (see Section 1.1);	MGM & EHPL	Site operation budgets	Site operation budgets	Site operation budgets	Site operation budgets	Site operation budgets
4.7	If grazing is having an adverse impact on populations of *L. gibsonii* or its habitat, facilitate an appropriate feral animal control program in consultation with stakeholders' of the Mt Gibson area.	MGM & EHPL	-	Nominal $10,000	Nominal $10,000	Nominal $10,000	Nominal $10,000
4.8 Report any new occurrences of *Lepidosperma gibsonii*							
4.8	Report opportunistic observation of any 'new' plant or population occurrence to Parks and Wildlife.	MGM & EHPL	Site operation budgets	Site operation budgets	Site operation budgets	Site operation budgets	Site operation budgets
4.9 Develop and implement restoration program							
4.9	Prepare species restoration strategy and program	MGM & EHPL	-	5,000	-	-	-
4.9	Collect seed and/or use ex situ materials for translocation programs.[#]	MGM & EHPL	-	20,000, if required	25,000, if required	25,000, if required	-

Section	Action	Responsibility	2016/17 ($)	2017/18 ($)	2018/19 ($)	2019/20 ($)	2020/21 ($)
4.9	Monitor the survival and establishment of plants remaining from preliminary translocation trials.	MGM & EHPL	-	15,000	-	-	-
4.9	Waste landform rehabilitation trials: Assessment of rock and gravel substrates with varying composition, degrees of soil depth and rockiness and other growing media to support growth of *L. gibsonii* will determine the suitability of this species for more extensive waste landform rehabilitation.	MGM & EHPL	-	40,000	10,000	10,000	-
4.10 Review conservation status of the species							
4.10	Review the conservation status of the species every five years; or more frequently when there are indications of significant change to the conservation status of the species.	Parks & Wildlife					
4.11 Review this plan							
4.11	Review and revise this Plan.	MGM & EHPL	10,000	-	-	-	10,000
5.0 Further research to benefit the species							
5.0	Prioritise the listed tasks and implement according to resourcing and budget considerations over a three year period.	MGM & EHPL	-	25,000	25,000	25,000	-
5.0	Review and revise the *L. gibsonii* Research Plan.	MGM & EHPL	-	2,000	-	-	-

* A Parks and Wildlife officer position is funded through offset 4 of condition 16 of MS753 by the proponents. The funding value is $110,000 p.a. Two of this officer's four environmental objectives pertain to the *L. gibsonii* Plan and are: assist with the development and implementation of the Recovery Plan for *L. gibsonii*; and, coordinate the management of the threatening processes (recovery actions) in relation to *L. gibsonii*.

Depending on evidence of a decline in the total population abundance.

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10. Appendices

Appendix 10.1 Consideration of Ministerial Statement 753

Ministerial Statement 753 (MS753) authorises the implementation of the Mount Gibson Iron Ore Mine and Infrastructure Project (MGIOIP), being the proposal to mine and produce iron ore from Extension Hill and Extension Hill North, within the Mount Gibson Ranges, construct a pipeline to transport the magnetite slurry to Geraldton Port, and construct infrastructure at the port to strip the ore from the slurry for export.

MGM and EPHL are both proponents for the purposes of MS753.

This Plan on *Lepidosperma gibsonii* Plan has been prepared to meet condition 7-3 of MS753 (Table 8). The primary objective of this plan as specified in Ministerial Statement 753 is "*to maintain, and ultimately improve, the conservation status of* Lepidosperma gibsonii *such that its conservation status is more secure in the Mt Gibson area*".

Table 8 Sections of this Plan that are aligned with Condition 7-3 of Ministerial Statement 753

MS753 Condition	**Key Plan Elements**	**Section of the Plan**
7-3(1)	*Habitats which are critical to the survival of the species* *Actions needed to protect those habitats*	Section 1.2 Section 4
7-3(2)	*Threats to the species and areas and populations under threat*	Section 1.1 and 1.3
7-3(3)	*Objectives to be achieved*	Section 2
7-3(4)	*Criteria against which achievement of the objectives is to be measured*	Section 2
7-3(5)	*Management actions based on the outcomes of the implementation of the Research Plan and Interim Recovery Plan that will remediate the impacts of the project and provide for a net improvement on the pre-mining status of the species*	Section 4
7-3(6)	*Further research required into the management or recovery of the species*	Section 5

The development and preparation of this plan and the management actions within has been guided by the outcomes to-date of the *Lepidosperma gibsonii* Research Plan and *Lepidosperma gibsonii* Interim Recovery Plan.

The *Lepidosperma gibsonii* Research Plan and the *Lepidosperma gibsonii* Interim Recovery Plan were developed and implemented pursuant to conditions 7-1, 7-2, 7-4 and 7-5 of MS753. A summary of the outcomes of the Research and Interim Recovery Plan is provided by way of background in sections 1.2, 2 and 5.1 of this plan.

MS753 includes several conditions which regulate the implementation of the MGIOIP in a manner that will manage the effects of the MGIOIP on *Lepidosperma gibsonii*. For example, condition 8 (conservation of significant flora and communities), condition 9 (weeds) and condition 10 (bushfires). This plan does not repeat those obligations, but is intended to work alongside those obligations (and particularly the management plans that operate under those conditions) to meet the objectives of this plan.

Appendix 10.2 Legislative Requirements

This Plan has been developed using the structure and addresses the matters outlined in the "Recovery Plan Guidelines for Nationally Listed Threatened Species and Ecological Communities" under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.

The following Table 9 is a condensed version of the Department of the Environment's compliance checklist:

Table 9 Compliance checklist

	Requirements of the Guidelines	**Section of this Plan**
1.	Consultation with relevant departments	Consultation with relevant government departments and Decision Making Authorities has been on-going since MGIOIP was Referred under the EPBC and EP Acts. Since that time, on-going consultation has occurred in the development and implementation of the IRP, through the funding of a Parks and Wildlife officer positions, and through the development of this Plan.
2.	Consultation with other stakeholders	Consultation with scientists and specialists has also occurred during the MGIOMIP development, approvals and operations with regard to *L.gibsonii*.
3.	Public consultation	The Public Environmental Review document was made available for public comment and the IRP is publically available. This Plan will also be available to the public.
4.	Objects of the Act	Objects a-c: The *L. gibsonii* Plan Object d: Consultation (as above) Object e: International responsibilities (Section 5.1) Objects f & g: The role and interests of indigenous people (Section 6.1)
5.	International agreements	Section 6.1
6.	Indigenous People	Section 7.1
7.	Social and economic impacts	Section 7.3
8.	Efficient and effective use of resources	Section 8
9.	Species listed as threatened (EPBC Act)	*L. gibsonii* is not listed under the EPBC Act.
10.	Taxonomic or common names used	The taxonomic name, *Lepidosperma gibsonii (L.gibsonii)* is used throughout the document.
11.	Distribution of the species	Section 1.1.4
12.	Population(s)	Section 1.1.5

	Requirements of the Guidelines	Section of this Plan
13.	Define habitat critical to survival	Section 1.1.4
14.	Description of habitat - spatial	Section1.1.4
15.	Threats	Section 1.3
16.	Areas affected by threats	Section 1.3
17.	Population(s) under pressure of survival	Section 1.1.6
18.	Plan objectives	Section 2.1
19.	Measurable criteria	Section 2.2
20.	Evaluation of performance	Section 4.11
21.	On-ground actions	Section 4
22.	Cost	Section 8
23.	Management practices	Section 4
24.	Biodiversity benefits/impacts	Section 1.4
25.	Affected interests	Section 7
26.	Social and economic benefits/impacts	Section 7

Appendix 10.3 Comprehensive Information on the Taxon

History, nomenclature and taxonomic relationships

Lepidosperma gibsonii is a species that was recognised as such in January 2006 (Barrett, 2007). The species was not represented by any specimen in the Western Australian Herbarium, and was recognised after Russell Barrett from Botanic Gardens and Parks Authority (BGPA) carried out a preliminary study of unsorted *Lepidosperma* specimens and found that there are many more taxa of *Lepidosperma* than have previously been recognised. Consequently, funding was made available to BGPA from MGM and EHPL to examine patterns of genetic variation within *L. gibsonii* (formerly *Lepidosperma* sp. Mt Gibson (R. Meissner & Y. Caruso 3)) as part of a preliminary study to provide some fundamental information on which the effects of removal of plants could be evaluated.

Lepidosperma gibsonii is most closely related to nearby populations of *L. costale* (BGPA, p5, 2010).

Illustrations and/or further information

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Further details on species biology and ecology

Population demography

Lepidosperma gibsonii individuals recruit from long-lived soil-stored seedbanks in a single post-fire cohort. There is no particular evidence for inter-fire recruitment. Plants are long-lived (perhaps to ca. 100 years) and about half of plants exposed to fire appear to survive and resprout (BGPA, 2010)

Growth

Plant size data and known population ages suggest that *L. gibsonii* basal diameter growth averages 2 – 2.5 mm per year for seedlings and adults. Surveys of tagged plants identified mean negative growth rates between 2007 and 2010, possibly reflecting growth conditions in these years (BGPA, 2010).

Fecundity

Reproduction commences in *L. gibsonii* seedlings as young as six years, but increases in terms of proportion of plants flowering, and flowers per plant as plant size increases (BGPA, 2010).

Recruitment

Post-fire *L. gibsonii* recruitment averaged 4.2 seedlings produced per pre-fire adult, but approximately 75% did not survive to two years of age. Mortality among 4-6 year old seedlings averaged 3% per year (BGPA, 2010).

Seed production and seed biology

Lepidosperma gibsonii reproduction takes place over multiple years, with inflorescence production occurring in one year and flowering and fruit ripening occurring in the next (BGPA, 2010). *Lepidosperma gibsonii* seed production is limited by a requirement for sufficient rainfall in consecutive years (BGPA, p70, 2010). The amount of this rainfall is unknown but appears to lie in the range of 65 - 110% of the average. Applying these thresholds to the Ninghan rainfall record suggests that the frequency of *L. gibsonii* reproduction may vary between 60% and 22% of years, with likely historic runs of no seed production varying from 2 to 49 years.

Pollination is via wind. If seed is produced, the period for which ripe seed can be collected from *L. gibsonii* plants is brief (one to two weeks in mid-October) as good seeds fall soon after ripening (BGPA, 2010).

Seed of *L. gibsonii* is thought to be abiotically dispersed by gravity or flowing water (BGPA, 2010). It has no apparent external dispersal adaptations, and a small experiment offering fruits to captive seed dispersing ants from Extension Hill did not result in fruits being removed. Comprehensive seed dispersal studies were not possible as insufficient seed was available for them.

Tracking seed dispersal was difficult because of these abiotic dispersal vectors, small seed size and poor seed production. BGPA (2010) conducted an experiment which mapped the actual dispersal distance by assignment of the genotypes of 200 seedlings within the boundary of the May 2009 experimental fire to their source plants.

Seed germination and dormancy

Lepidosperma gibsonii recruits in a single cohort post fire from the soil-stored seedbank as discussed previously in this section, but preliminary results from BGPA's (2010) seed bank trial indicated that *L. gibsonii* has complex germination and dormancy strategies. These results indicated requirements for physical degradation of the seed coat, environmental (seasonal temperature and moisture) cuing, with smoke acting as an additional cue. Smoke alone does not break the dormancy of *L. gibsonii*. The seed bank trial was designed to run for up to five years and was established in 2009, so BGPA were only able to report on the results from the first six months of the trial. After six months burial, only those *L. gibsonii* seed which were treated with heat (100^{o}C for 10 minutes) germinated, and the rate was low i.e. 8 % for seeds treated with smoke water and 4.8 % for seeds treated with water. The germination rate appeared to show signs that it would continue to steadily increase with the length of time of seed burial as there was no germination of seeds which hadn't been buried, and a small percentage germinated (with the same treatments) at three months.

The preliminary results of the seed bank trial were corroborated by data from experiments where the seed coat of *L. gibsonii* was manually removed and heat treated. Tissue culture of embryos extracted and treated to 100°C for 10 minutes had the highest germination rate (60 %; BGPA, 2010).

Environmental adaptations

Lepidosperma gibsonii shares with co-occurring species the drought avoiding strategy of closing down transpiration and photosynthetic function to enter a period of physiological dormancy through summer drought with the capacity to restore tissues when rainfall occurs and the soils become wet (BGPA, 2010).

Roots of *L. gibsonii* have a capacity to enter large cracks, pores and fissures in regolith and may achieve considerable root depths (perhaps to >10m), but the species did not show root growth adaptations that were significantly different from close relatives from non-Banded Iron Formation habitats (BGPA, 2010).

Biotic interactions

Grazing by goats and rabbits was recorded repeatedly at localised sites (BGPA, 2010) which were all on lower slopes or not on slopes. At least half of the leaves or scapes were grazed on 16% of all *L. gibsonii* plants surveyed, and over 20% were recorded having been grazed. BGPA reported that the evidence for an impact of herbivory on survival rates is unclear as significant recovery was recorded for plants experiencing herbivory. However, repeated herbivory which was recorded has an impact on reproductive output. Plants which are 100% grazed had no reproductive output.

A scale insect (unidentified Hemiptera: Coocoidea) has been recorded on the culms of *L. gibsonii* (BGPA, 2010). The parasitic, sap-sucking nature of this insect may significantly affect growth rate and reproductive capacity in populations where it was prevalent (e.g. Emu Proof Fence TPFL 8).

An unidentified rust fungus was recorded in small numbers (1-5 culms per clump) on *L. gibsonii* plants of most populations (BGPA, 2010). It is considered a minor parasite of *L. gibsonii*, but its significance may be more marked in poor seasons or if infection rates increase.

Five species of smut fungi (four *Moreaua*, one *Heterotolyposporium*) which have been observed in populations of *L. costale sens. lat*. in the Midwest have not yet been observed on *L. gibsonii*. *Lepidosperma* smuts are systemic and destroy all florets within an inflorescence when they are abundant.

Abiotic associations

BGPA (2010) used two approaches to determine the environmental associations of *L. gibsonii*: An analysis of site factors at demographic and physiological monitoring plots; and, modelling of species distributions against spatially mapped environmental data. The environmental parameters interrogated by the modelling were geology, short term fire history (since 1968), solar radiation receipt, aspect, slope, curvature and elevation. They concluded that of the environmental parameters interrogated by distribution modelling for *L. gibsonii*, winter 2 pm solar radiation (below), elevation and slope were the principal environmental parameters predicting the distribution of *L. gibsonii*. These were followed by geology, aspect and fire history since 1969. When considered

alone, areas with less than 0.4 w/m^2/hr winter 2pm solar radiation receipt had an 80% probability of presence of *L. gibsonii*.

The modelling predicted *L. gibsonii* to occur with a >90% likelihood of presence in many small areas and a detailed pattern of presence probabilities outside of these areas of greatest likelihood (BGPA, 2010). *Lepidosperma gibsonii* is already known to occupy many of the areas that it is most strongly predicted to occupy, and BGPA postulated that most of the remaining highly predicted areas will also contain populations if they were to be surveyed. It is interesting to note that the modelling also predicted suitable habitat for *L. gibsonii* on Yandanhoo Hill to the east of the Mt Gibson Ranges. BGPA (2010) concluded the environmental variables used are the factors limiting suitability of the abiotic habitat. Also discussed in the context of the abiotic associations was soil moisture, although this was not a variable which was modelled. Low solar radiation receipt is one factor which contributes to increased soil moisture. Soil type and depth to rock also affect soil moisture, and these may also be important abiotic factors affecting the distribution of *L. gibsonii*.

In situ planting methods using separated clumps of *L. gibsonii* were trialled by BGPA (2010) at Mt Gibson on four differing field soil substrates. These were on the deep red loam/clay plains east of Extension Hill (clay), white-yellow sands of sandplains west of Extension Hill (sand), and gravelly and rocky loams of the north Extension Hill slope and ridge (BIF gravel and BIF rock respectively). *Lepidosperma gibsonii* survival after nine months of planting was successful in sites with BIF rock and BIF gravel substrate, and less than 10% of the plants persisted with limited vigour at the sand and clay sites. In contrast, there was approximately 70% survival on the BIF gravelly loam and 50% survival on the BIF rocky loam. Both sites had significantly higher Organic Carbon (%) and Total Nitrogen (%) than the clay and sand sites. The BIF rock and BIF gravel sites had slower soil drying curves than the sand and clay sites. *L. gibsonii* is not currently known from sandy or clayey sites like those selected for the restoration trial, and perhaps the factors contributing to the lack of success of the clumps planted provides some explanation for this. BGPA (2010) concluded that sites with BIF rock and BIF gravel are suitable for translocations, and texture, gravel/rock content, patterns of moisture content and Total Nitrogen may be the most critical soil properties to consider in site selection.

Fire

BGPA research (2010) indicates that *L. gibsonii* is a long-lived re-sprouting species, and approximately 50% of adult *L. gibsonii* plants are killed in a fire. Recruitment occurs after fire in a single cohort from long-lived soil-stored seedbanks and seedlings take at least six years to reach reproductive maturity. This research also found no evidence of inter-fire recruitment. Fire management, particularly management of fire frequency, is essential in optimising the ongoing conservation of *L. gibsonii*.

BGPA (2010) reported that the best model of fire history since the mid 1960's (Figure 3) describes just four major fires on the Mt Gibson range and several others nearby. Scars for the two recent fires are clearly visible on images dating from 2004 and 2005, and these can be accurately dated from Sentinel to 7-10th February 2003 and from personal communications to December 2005. The two previous fires are attributed to 1972 and 1969 are visible on high resolution images up to the present, and dating back to 1972. Evidence supporting the dates of these fires include their absence from the 1968 photo, presence in 1972 and relative freshness apparent in the two fire scars in the 1972 and 1974 images (Figure 3). While it is recognised that this dating

may be imprecise, variation of a year or two is relatively insignificant relative to the subsequent 40 years of growth of plants subsequently. In fact only one of these fires appears to have burnt surveyed populations of *L. gibsonii*, although the 1972 fire may have burnt populations of *L. gibsonii* to the west of the Mt Gibson range.

BGPA (2010) also reported that population structure of *L. gibsonii* indicates that individuals recruit in a single cohort post-fire, with no evidence for inter-fire recruitment observed. That older populations were evenly structured may suggest infrequent inter-fire recruitment, but are more likely to indicate varying growth rate and the coalescence and splitting of clumps through time. Furthermore, the studies found:

- Evidence from population structure suggesting a mean basal diameter growth rate of 2 – 2.5 mm per year for seedlings and adults.
- Extrapolating growth rates from population structure suggests that the oldest populations studied ("Emu Fence") may have last burnt early in the 20th century, perhaps around 1910.
- Post-fire recruitment was higher, with an average of 4.2 seedlings produced per pre-fire adult.

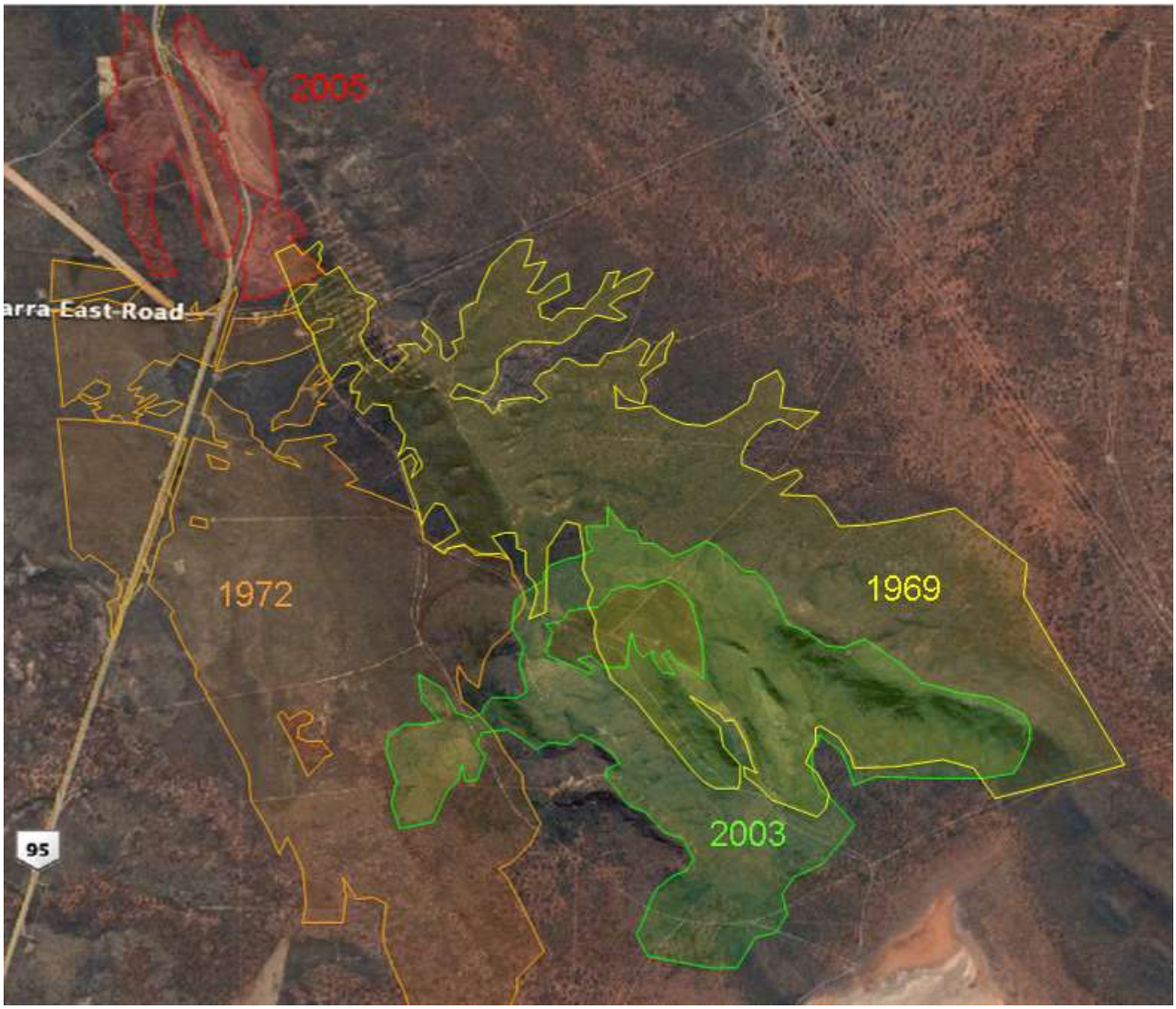

Figure 4 Mt Gibson Ranges fire history; 1968-2010 (sourced from BGPA, 2010)

***Ex situ* Plant Tissue**

Techniques for the successful propagation of *L. gibsonii* have been proven at both BGPA and an independent specialist nursery and involve greenstock production from cuttings (BGPA, 2010). Propagation of live *L. gibsonii* plant material from wild collections and nursery stock is likely pose the most cost-effective approach for the short-medium term storage and production of plants for restoration purposes, but the drawbacks of the use of greenstock should be taken into consideration and managed. The number of genotypes remaining from TPFL population 4A is low at 24, while 150 remain from TPFL 3A. Both of these populations will be taken as they are within the approved disturbance area under Ministerial Statement 753, however, desktop data review indicates that the proportion of plants taken to date from both of these populations is low. Multiple (>100) genotypes of live plants (BGPA, 2010) should be maintained, monitored and supplemented to represent each of the populations (TPFL 4A and 3A) cleared during mining activities under Ministerial Statement 753. Maintenance of the germplasm collection, particularly of the populations of *L. gibsonii* which have been cleared for the MGIOIP footprint, should continue until (Table 10) such a time as viable populations are re-established from these collections.

Table 10 Genotypes of *Lepidosperma gibsonii* maintained at Nuts About Natives nursery

TPFL population number	Number of genotypes collected (October 2008)	Number of genotypes remaining (June 2014)	Current status of natural population	Future status of natural population
TPFL 4A (Extension Hill North)	33	24	Aerial photography and historical survey records indicate proportion of plants taken is low	Within approved disturbance area under Ministerial Statement 753. Will be taken.
TPFL 3A (Extension Hill)	217	150	Aerial photography and historical survey records indicate proportion of plants taken is low	Within approved disturbance area under Ministerial Statement 753. Will be taken.

While propagation of live plant material from wild collections and nursery stock are likely the most cost effective approach for the short-medium term storage and production of plants for restoration purposes, BPGA (2010) recommended continuing investigation into the use of seed as a restoration source because of drawbacks of greenstock. Drawbacks to the use of clones for population restoration were outlined by BGPA, and include:

- Infrastructure, resource and time demands (pots, potting media, glasshouse bench space, irrigation, pest management, time and expertise to establish cuttings, plant out etc.);
- Selection in propagation can lead to a loss of genetic diversity and capacity;
- Increasing the numbers of genotypes collected and established (beyond the low hundreds) may be possible, but with diminishing returns in terms of required effort; and

- Translocation of large and/or unbalanced numbers of genetic clones means that some genotypes may become grossly over-represented in restoration, which should aim to replicate source levels of genetic diversity.

Should *L. gibsonii* seed become a more viable restoration source as a result of further investigations into its germinability, allowance must be made for the likely ultimate rate of seed germination, difficulty of collection and the potential rate (in time and money) of developing seedlings from seed.

Lepidosperma gibsonii reproduction takes place over multiple years, with inflorescence production occurring in one year and flowering and fruit ripening occurring in the next. If *L. gibsonii* seed is produced, the optimal time for which ripe seed can be collected from *L. gibsonii* plants is brief (one to two weeks in mid-October) as good seeds fall soon after ripening (BGPA, 2010).

Seed was collected from the southern slopes of Extension Hill in rock fissures on banded ironstone by Russell Barrett on 19 May 2006 (L Sweedman 2014, pers. comm., 6 June). Details of the quantities and viability of the seed, which is stored at the WA Seed Technology Centre at Kings Park and the Millenium Seed Bank, are provided in Table 11. The seed at the MSB remains WA property and is stored as a duplicate only. No *Lepidosperma gibsonii* seed is currently stored at Parks and Wildlife's Threatened Flora Seed Centre (A Crawford 2013, pers. comm., 30 October).

Table 11 Details of *Lepidosperma gibsonii* seed held at seed storage facilities

Location	Accession	Collection date	Location	TPFL Pop	Seeds/fruit in storage	Viability (%)
WA Seed Technology Centre	20110360	19/06/2006	Extension Hill South	3A	1204 seed	60%
Millenium Seed Bank	?20110360	19/06/2006	Extension Hill South	3A	1678 seed	60%

Landcare Services (2007) carried out seed collection over 5 days within the MGIOIP footprint in December 2007 as part of a salvage operation to collect the maximum amount of seed material prior to clearing of vegetation for mining activities and determine the most efficient way to salvage seed from *Lepidosperma gibsonii*. Little seed was available on the plants at the time of collection. The seeds were collected from plants and vacuumed from within plant clumps. Cut tests were performed on a portion of the collected seeds, which appeared to be non-viable. Organic material was also collected, localised "organic dams", as well as soil from under and around the plants. It was recommended that a pot trial of this material be conducted to determine if *L. gibsonii* seed would germinate from collected samples, and the use of the remainder of the seed collected from the plants be tested for viability using non-destructive x-ray screening.

The seed and topsoil of *L. gibsonii* collected by Landcare in December 2007 is stored along with *Darwinia masonii* seed and topsoil, collected at the same time, in four 55 L containers (Landcare Services, 2009). The seed and material is stored at a constant temperature controlled (19ºC) seed storage facility in Bassendean.

Table 12 Details of *Lepidosperma gibsonii* salvaged seed held by Landcare Services

Code	Collection date	Location*	Material <2mm (g)	Nature of material	Collection method
Group 1, Bag 1	Dec-07	unknown	2,928	Leaf litter	Collected manually with trowels and brushes.
Group 1, Bag 2	Dec-07	unknown	456	Leaf litter	Collected manually with trowels and brushes.
Group 1, Bag 3	Dec-07	unknown	122	Leaf litter	Collected manually with trowels and brushes.
Group 1, Bag 4	Dec-07	unknown	1,434	Leaf litter	Collected manually with trowels and brushes.
Group 2, Bag 1	Dec-07	unknown	5,132	Surface material, contains leaf litter	Collected by hand with trowels.
Group 2, Bag 2	Dec-07	unknown	11,375	Surface material, contains leaf litter	Collected by hand with trowels.
Group 2, Bag 3	Dec-07	unknown	2,314	Surface material, contains leaf litter	Collected by hand with trowels.
Group 2, Bag 4	Dec-07	unknown	1,320	Surface material, contains leaf litter	Collected by hand with trowels.
Group 2, Bag 5	Dec-07	unknown	3,280	Surface material, contains leaf litter	Collected by hand with trowels.
Group 3, Bag 1	Dec-07	unknown	2,188	Surface material to 2 cm	Collected by hand with trowels.
Group 3, Bag 1	Dec-07	unknown	5,432	Surface material to 2 cm	Collected by hand with trowels.
Group 4, Bag 1	Dec-07	unknown	1,676	Topsoil, detritus and surface organic material	12V vacuum
Group 4, Bag 2	Dec-07	unknown	410	Topsoil, detritus and surface organic material	12V vacuum
Group 4, Bag 3	Dec-07	unknown	464	Topsoil, detritus and surface organic material	12V vacuum
Group 4, Bag 4	Dec-07	unknown	492	Topsoil, detritus and surface organic material	12V vacuum
Group 4, Bag 5	Dec-07	unknown	196	Topsoil, detritus and surface organic material	12V vacuum
Group 4, Bag 6	Dec-07	unknown	64	Topsoil, detritus and surface organic material	12V vacuum
Group 4, Bag 7	Dec-07	unknown	114	Topsoil, detritus and surface organic material	12V vacuum
Group 4, Bag 8	Dec-07	unknown	62	Topsoil, detritus and surface organic material	12V vacuum

Code	Collection date	Location*	Material <2mm (g)	Nature of material	Collection method
Group 4, Bag 9	Dec-07	unknown	3,176	Topsoil, detritus and surface organic material	12V vacuum
Group 4, Bag 10	Dec-07	unknown	2,072	Topsoil, detritus and surface organic material	12V vacuum

Table 13 Details of *Lepidosperma gibsonii* seed collections held by Landcare Services

Code	Collection date	Location	TPFL Pop	Amount of seed (g)	Collection notes
L1	Dec-07	Northern	4A	4.6	Hand collected from plant
L2	Dec-07	Northern	4A	2.7	Hand collected from plant
L3	Dec-07	Southern	3A	4.9	Hand collected from plant
L4	Dec-07	Southern	3A	0.6	Hand collected from plant
L5	Dec-07	Southern	3A	0.2	Hand collected from plant
L6	Dec-07	Southern	3A	Approximately 100 seeds	Hand collected from plant
L7	Dec-07	Southern	3A	3.1	Hand collected from plant
*L8	Dec-07	Southern	3A	1	12V vacuum from plant
*L9	Dec-07	Northern	4A	2	Hand collected from plant
*L10	Dec-07	Northern	4A	2.5	12V vacuum from plant
*L11	Dec-07	Northern	4A	44.5	12V vacuum from plant
*L12	Dec-07	Northern	4A	2.7	12V vacuum from plant
*L13	Dec-07	Northern	4A	1,262	Stihl 27 CC vacuum from plant
L14	Dec-07	Mt Gibson	?5/6	0.1	Hand collected from plant

* No seed in sieved material

Appendix 10.4 Risk Assessment Criteria

The *Lepidosperma gibsonii* risk assessment was based on the framework of the Australian and international standard for risk management AS/NZS ISO 31000 (2009).

Risk assessment is the basis of management and mitigation measures applied through the approved "Extension Hill & Extension Hill North Environmental Management Plan", prepared to meet the conditions of Ministerial Statement No. 753 (in particular conditions 6 to 12 and 14 of Ministerial Statement No. 753).

The main elements of the risk assessment process required:

- identification of the potential threats, cause of the threat and potential impact on the species (Table 2; termed 'Inherent Risk'); and
- estimating the likelihood of each threat occurring, the potential environmental consequences if it did occur and the subsequent determination of an inherent risk rating in context of the current controls (Table 2; termed 'Controlled Risk');
- consideration of actions to further mitigate risk; and
- re-estimating the likelihood of each risk event occurring and the potential environmental consequences if it did occur, and the subsequent determination of a residual risk rating (Table 2; termed 'Residual Risk').

Risk Assessment Matrix

RISK MATRIX		Likelihood				
		A Certain	B Probable	C Possible	D Remote	E Improbable
Rating	Consequence	(Common) *It is expected to occur in most circumstances.* *Guide (> 90%)*	(Likely) *Will probably occur in most circumstances.* *Guide (51-90%)*	(Could Happen) *Should occur at some time.* *Guide (21-50%)*	(Not Likely) *Could occur at some time.* *Guide (10-20%)*	(Rare) *May occur only in exceptional circumstances.* *Guide (<10%)*
1 Catastrophic	Severe reduction in population between 71-100% of known records. Intergenerational timeframe for restoration if at all. High cost, long term involvement.	1	2	5	7	11
2 Major	Reduction of 31-70% of known records Long term restoration, high cost and involvement 21 – 100 years.	3	4	8	12	16
3 Moderate	Reduction of between 11-30% of known records Medium reversibility estimate 6 - 20 year recovery timeframe.	6	9	13	17	20
4 Minor	Reduction of 1-10 % of known records Should be reversible within 6 year timeframe.	10	14	18	21	23
5 Insignificant	No discernable effect	15	19	22	24	25

* Environment descriptors have been modified to align with description of severity from WWF 2007

Appendix 10.5 Annual Review Checklist

All parties responsible for implementing actions in this plan shall review the implementation and effectiveness of assigned actions to inform future revisions of this Plan. An audit checklist (Table 14) clearly identifies the specific future actions (as listed in the Plan) required to address the recovery of *Lepidosperma gibsonii* on the Mt Gibson Range, the party responsible for implementation, the timing for implementation and a suitable review mechanism by which the action may be assessed (although further evidence may be requested should an audit be undertaken).

Table 14 Review checklist

Section	Action	Responsibility	Timing	Review mechanism
4.1 Coordinate recovery actions and liaise with stakeholders				
4.1	Coordinate relevant actions, and liaise with stakeholders.	Parks & Wildlife	On-going	Annual progress report
4.1	Implement the relevant actions in the Plan.	MGM & EHPL	On-going	Annual Compliance Report
4.1	Implement the relevant actions in the Plan.	Parks & Wildlife	On-going	Annual progress report
4.1	Provide an annual report on the Plan's progress to Parks and Wildlife's Corporate Executive and funding bodies.	Parks & Wildlife	Annually	Annual progress report
4.2 Maintain and use seed/germplasm collections to ensure material with a broad genetic base is available for conservation				
4.2	Maintain records of retained seed stock in storage.	MGM & EHPL	Annually	Spreadsheet of seed stock records
4.2	One-off viability test of retained seed stock in storage.	MGM & EHPL	2015	Viability test results
4.2	Targeted seasonal collection of seeds from key Mt Gibson Ranges populations (late October to early November) including those which do not have seed representation (late spring).	MGM & EHPL	2015 - 2016	Seed collection records
4.2	Propagation of live *L. gibsonii* plants from wild collection seed stock and cuttings.	MGM & EHPL	2015 - 2017	Nursery report

Section	Action	Responsibility	Timing	Review mechanism
4.2	Provision of nominated seed samples to the Threatened Flora Seed Centre.	MGM & EHPL	2014 - 2017	Annual Compliance Report
4.2	Review adequacy of *ex situ* collection to inform future actions.	MGM & EHPL	2017	Annual Compliance Report
4.2	Supplementation of seed in storage (upon identification of inadequate stock levels).	MGM & EHPL	2018 - 2019	Annual Compliance Report
4.3 Promote awareness of *Lepidosperma gibsonii*				
4.3	Promote awareness to the wider community.	Parks & Wildlife	On-going	Annual progress report
4.3	Promote awareness of *L. gibsonii* to mine site personnel through environmental inductions.	MGM & EHPL	On-going	Induction materials
4.4 Implement *Lepidosperma gibsonii* condition monitoring program				
4.4	Implement the *L. gibsonii* condition monitoring program.	MGM & EHPL	2015	Annual report
4.5 Implement Fire Management Strategy				
4.5	Implement actions required to manage fire as a threatening process through the conditions that apply to the MGIOIP under MS753.	MGM & EHPL	On-going	Annual Compliance Report
4.5	Prevent fire occurring in the habitat of the populations, except where it is being used in regeneration trials.	Parks & Wildlife	On-going	
4.6 Manage threatening processes from mining				
4.6	Implement management actions required to manage threatening processes from mining through the conditions that apply to the MGIOIP under MS753.	MGM & EHPL	On-going	Annual Compliance Report
4.7 Protect plants from herbivory				
4.7	Review grazing impacts in *L. gibsonii* condition monitoring data (see Section 4.4);	MGM & EHPL	Monthly; Annually	Annual Compliance Report
4.7	If grazing is having an adverse impact on populations of *L. gibsonii* or its habitat, facilitate an appropriate feral animal	MGM & EHPL	As required	Annual Compliance Report

Section	Action	Responsibility	Timing	Review mechanism
	control program in consultation with stakeholders' of the Mt Gibson area.			
4.8 Report any new occurrences of *Lepidosperma gibsonii*				
4.8	Report opportunistic observation of any 'new' plant or population occurrence to Parks and Wildlife.	MGM & EHPL	On-going	Threatened and Priority Flora Report Form
4.9 Develop and implement restoration program (if required)				
4.9	Prepare species restoration strategy and program	MGM & EHPL	2014	Annual compliance report
4.9	Collect seed and use ex situ materials.	MGM & EHPL	-	Annual compliance report
4.9	Monitor the survival and establishment of plants remaining from preliminary translocation trials.	MGM & EHPL	-	Annual compliance report
4.9	Waste landform rehabilitation trials : Assessment rock and gravel substrates with varying composition, degrees of soil depth and rockiness and other growing media to support growth of *L. gibsonii* will determine the suitability of this species for more extensive waste landform rehabilitation programs	MGM & EHPL	2015 - 2017	Annual compliance report
4.10 Review conservation status of the species				
4.10	Review the conservation status of the species every five years; or more frequently when there are indications of significant change to the conservation status of the species.	Parks & Wildlife	2015	Annual progress report
4.11 Review this plan				
4.11	Review and revise this Plan.	MGM & EHPL	2020 or as required	Revision number and date of this Recovery Plan
5.0 Further research to benefit the species				
5.0	Prioritise the listed tasks and implement according to resourcing and budget considerations over a three year period.	MGM & EHPL	2015	Research status report

Section	Action	Responsibility	Timing	Review mechanism
5.0	Review and revise the *L. gibsonii* Research Plan.	MGM & EHPL	2015	Research status report