Wanjarri Nature Reserve

Draft Management Plan

1995

Department of Conservation and Land Management

National Parks and Nature Conservation Authority

SUBMISSIONS ON THE DRAFT PLAN

This is an opportunity to provide information, express your opinion, suggest alternatives and have a say on how we are proposing to manage this Nature Reserve over the next 10 years.

If you prefer not to write your own submission you could make a joint submission with others. To ensure your submission is as effective as possible:

- make it concise and clear.
- list your points according to the subject sections (and page numbers) in the Plan.
- describe briefly each subject or issue you wish to discuss.
- say whether you agree or disagree with any or all of the objectives or strategies within each subject or just those of specific interest to you; clearly state your reasons (particularly if you disagree) and give sources of information where possible.
- suggest alternatives to deal with any issue with which you may disagree.

It is important to indicate those strategies and recommendations you agree with as well as those with which you disagree.

Each submission is important, but those that give reasons for concerns, give support where appropriate and offer information and constructive suggestions are most useful.

All submissions will be summarised according to the topics discussed. The Draft Management Plan will then be reviewed in the light of submissions, according to established criteria (see below). A summary of the submissions will be published along with the Final Management Plan, including an indication of how the plan was amended or not in response to the submissions.

1. The Draft Management Plan *will* be amended if a submission:
   (a) provides additional resource information of direct relevance to management;
   (b) provides additional information on affected user groups of direct relevance to management;
   (c) indicates a change in (or clarifies) Government legislation, management commitment or management policy;
   (d) proposes strategies that would better achieve management goals and objectives; or
   (e) indicates omissions, inaccuracies or a lack of clarity.
2. The Draft Management Plan *will not* be amended if a submission:
   (a) clearly supports the draft proposals;
   (b) offers a neutral statement or no change is sought;
   (c) addresses issues beyond the scope of the plan;
   (d) makes points which are already in the plan or were considered during plan preparation;
   (e) is one amongst several widely divergent viewpoints received on the topic and the recommendation of the draft plan is still considered the best option;
   (f) contributes options which are not possible (generally due to some aspect of existing legislation, or Government policy).

Submissions are welcome for two months after the date of release. Written submissions should be sent to:

Attention: Tony Brandis
Wanjarri Nature Reserve Draft Management Plan
Executive Director
Department of Conservation and Land Management
P.O. Box 104
COMO WA 6152

PREFACE

In Western Australia, nature reserves are vested in the National Parks and Nature Conservation Authority (NPNCA) and managed by the Department of Conservation and Land Management (CALM). This Department, established in 1985, is committed to the effective management of public land and natural resources and conserving indigenous wildlife on behalf of the public of Western Australia. The conservation objectives of the Department are set within the context of the State, National and World conservation strategies. Specifically, the conservation objective is to conserve the indigenous plant and animal species and environmental processes in natural habitats throughout the State. (CALM Strategic Plan).

The purpose of nature reserves is to achieve this conservation objective. They `are established in areas that maximise the representation of genetic diversity as far as possible, though often other constraints on the availability of land may limit the extent to which this can be achieved. It is important, therefore to consider land management practices over other types of land within a regional setting, rather than the 'island' setting of the reserve itself. In this way other species, other land types, migration corridors and habitat protection on lands not reserved for nature conservation, can provide for a much broader mix of habitats and increase the opportunities to ensure the persistence of species in their natural state.

Therefore the concept of sustainable land management practices upon lands adjoining reserves is important. Such practices enhance the conservation values of a broad area around a reserve and it has been demonstrated that improved returns to land holders can be achieved at the same time.

Wanjarri Nature Reserve is a small reserve surrounded by pastoral and mining activities. CALM will pursue opportunities for the joint management of pastoral leases surrounding the reserve. The management plan for Wanjarri Nature Reserve addresses the issues of a regional approach to conservation and the potential for joint management.

The preparation of this management plan is an important stage in the overall management of the area. The planning process provides the opportunity for input by individuals or groups with an interest in conservation management or those who may be directly affected by management proposals, such as feral animal control. The plan is prepared within the context of the Regional Management Plan for the Goldfields Region.

ACKNOWLEDGEMENTS

This management plan was prepared for the NPNCA under the direction and guidelines of CALM's Planning Branch. We would like to acknowledge CALM's Specialist Branches for their comments on early drafts of this plan and individuals and groups who contributed submissions during the draft plan's preparation.

The preparation of the plan has been funded by Goldfields Gas Transmission Pty Ltd.

CONTENTS

INTRODUCTION

1. OVERVIEW

Wanjarri Nature Reserve is located in the northern part of the eastern goldfields. It is the only reserve in this area and has significant conservation, educational and research values.

The Reserve is dominated by extensive undulating sand plains with localised reticulate or parallel sand dunes. The key vegetation components on this landform are the spinifex grasses, which are perennial, evergreen plants growing as rounded hummocks. Other landforms occurring within the Reserve include broad valley surfaces, granites, drainage lines and breakaways. On these landforms, mulga is an important component of the plant communities, often occurring as the dominant species.

The Reserve was a small pastoral lease (53,000ha) until 1971 when it was destocked and became an A Class Nature Reserve. As a pastoral lease only parts were utilised for grazing due to the limited areas of suitable stock feed within the Mulga communities. Although grazing impacts are still recognisable, the recovery of the vegetation provides useful baseline information for the rehabilitation management of similar vegetation types that have been degraded.

As an arid zone conservation reserve it is small in area and is not fully representative of the land types of the area. Its value for nature conservation is limited by the pastoral and mining activities on land surrounding the Reserve. The much broader biological diversity represented on the adjoining pastoral lands offers opportunities for a regional approach to ecologically sustainable land management. Land managed on this basis involving stable and low stocking rates has direct benefits to pastoralists in that land degradation is minimised, and nature conservation objectives are enhanced. The role of pastoralism in nature conservation is an important and topical issue with managers now becoming aware of the broader community's expectation that they will act as responsible stewards of the land (Morrisey, 1984). The contribution to regional nature conservation that can be made by pastoralists and mining interests is significant. The provision of land and resources for conservation activities such as feral animal control, is of great value to CALM which must apply its limited resources over vast areas.

Management of the Reserve is for the conservation of wildlife and landscape, for scientific study and for preservation of features of archaeological, historic or scientific interest. Recreational activities, including camping, have occurred historically on the Reserve with some noticeable impacts, particularly the collection of deadwood for camp fires. These activities are contrary to the purposes of a nature reserve (indeed they are illegal without written permission of the Executive Director) and it is recommended that the classification of the land be changed to that of Conservation Park. This change will avoid the illegality of people camping in the area. By confining camping to a relatively small area zoned for recreation around the shearing shed, it will enable the conservation values of the remainder of the area to be protected. In addition to recreational camping, it is important to cater for camping associated with education and eco-tourism to allow appreciation of the important conservation values of the area.

Wanjarri Nature Reserve is listed by the Australian Heritage Commission on the Register of the National Estate. The statement of significance for this listing describes the Reserve as having "diverse flora and fauna; many varieties of birds (122 species), largely because of its location where ranges of species with predominantly southern, eastern or northern distribution overlap. It includes areas of ungrazed mulga" (Australian Heritage Commission).

All of the strategies within this management plan have been prepared to ensure the conservation of the values listed.

2. VALUES

Conservation Values

- Arid land and desert landscape supporting a variety of habitats.
- The spinifex grasslands that characterise what most people perceive to be the deserts of the Australian inland.
- The development of plant communities since grazing ceased that provide useful baseline data about the recovery of the range-lands.
- The utilisation of particular habitats by threatened wildlife.

Educational Values

- Information and interpretation opportunities at the old shearing shed.
- Use of the area by tertiary institutions for educational purposes such as biological and ecological studies.

Recreational Values

- Passive recreation within the Reserve by local, regional, national and international visitors concentrated mainly in the old shearing shed area.
- Mulga woodland that provides opportunities for bird watching, walking, plant identification and appreciation of the natural environment.

Research and Scientific Values

- The recovery of the vegetation since pastoral activities ceased that provides an important benchmark to monitor the recovery of the rangelands.
- The Reserve being a relatively undisturbed ecological system is particularly important because of the impact of grazing on much of the adjoining pastoral land.

- The diversity of vertebrate fauna making the area ideal for habitat research.

- The occurrence of threatened wildlife such as the mulgara provides an opportunity for studies into habitat requirements and life cycles.

Historical and Cultural Values

- The old shearing shed and yards are a fine example of traditional structures utilising local materials.

- The brush yards occurring on the Reserve which were used to 'work' sheep. This type of construction is not usually seen as part of the modern day pastoral practise.

- Carved tree at Coondie Soak.

- The remains of the presumed extinct lesser stick-nest rat nests within the Reserve, including one nest which is particularly well preserved.

- Places of significance to Aboriginal people.

3. COMMUNITY INVOLVEMENT IN THE DRAFT PLAN

Community Input

- State and local papers invited submissions during the preparation of the draft plan.

- Invitations were distributed to a range of interested people and groups calling for their input into the identification of issues important to the management of the Reserve.

- Discussions were held with interested individuals and groups.

- Local and State Government officers were consulted.

- Written submissions were received prior to the preparation of the Draft Plan.

- Contributions from individuals and groups were used in the preparation of the Draft Plan.

Important issues identified

Several issues have been emphasised during the community involvement process including feral animal control, fire suppression, impacts of visitors to the Reserve, impact of mining and mining infrastructure and Aboriginal heritage. These have been carefully considered and are addressed in the management plan.

PRINCIPAL MANAGEMENT DIRECTIONS

4. POLICIES AND GOALS

The Wanjarri Nature Reserve Draft Management Plan is consistent with relevant sections of the Conservation and Land Management Act 1984, the Wildlife Conservation Act 1950, associated Regulations, and relevant State Government, Departmental and NPNCA policies.

The management goals for Wanjarri Nature Reserve cover the major management issues and form the basis for the structure of this management plan. Each section of the plan contains objectives, background information and strategies. These strategies have been prioritised high (H), medium (M), low (L) and tabled accordingly in the Priorities section.
The following management goals for the Reserve cover the key management issues and provide the structure of the Draft Management Plan:

(i) Conservation

Conserve biological, physical, cultural and landscape resources.

(ii) Recreation

Facilitate recreation in a manner compatible with conservation and other goals.

(iii) Community Relations

Promote informed appreciation of natural and cultural values.

Promote co-operation in the management of land for conservation of the natural and cultural resources.

(iv) Research and Monitoring

Seek a better understanding of the natural and cultural environment and the impact of management activities and visitor use.

Plan Structure

Goals represent the long term desirable situation while more specific objectives are designed to achieve these goals. Objectives, background and strategies are set for each of the sections of the Management Plan.

5. LAND TENURE AND BOUNDARIES

The objective is to ensure that the values of the Reserve are adequately protected by the gazetted purpose, vesting and tenure of the Reserve.

Wanjarri Nature Reserve (53,248ha, 27° 10'S, 121° 00'E) is situated in the north eastern goldfields approximately 60km north of Leinster and 90km south east of Wiluna. It lies within the Shires of Leonora and Wiluna and is surrounded by pastoral leases (Yandal, Yakabindie, Mount Keith and Barwidgee).

The Reserve is an A Class Nature Reserve (No. 30897) for the conservation of flora and fauna and is vested in the NPNCA. It is a compact rectangular shape, 26.7km long on the east-west axis and 22km on the north-south axis. The location and area relationship to other reserves and National Parks in the goldfields region are shown on Map 1.

The boundaries of the Reserve are demarcated in the field by fences for the control of grazing stock on pastoral leases. These fences are generally not constructed on surveyed boundaries and are not stock proof. At this stage, to have the Reserve surveyed and to have stock proof fences erected and maintained is beyond the resources of CALM. However, at the same time it is important that stock on adjoining pastoral leases are not allowed to graze within the Reserve. Consultation with adjoining lease holders is necessary to ensure fences are maintained in a stock proof condition and upgraded where necessary. Development activities adjacent to the Reserve such as the construction of grid lines for exploratory drilling, require that the correct cadastral boundaries are clearly identified in the field. Some boundary surveys will be necessary to ensure encroachment onto the Reserve does not occur.

A recent proposal by Dominion Resources Pty Ltd to establish a waste rock dump on the Reserve in relation to the Yackabindie nickel project, has been supported by the NPNCA. The waste rock dump will be situated in the south-west of the Reserve as shown on Map 2. Use of the area will be temporary and at the completion of mining operations the area of land, which includes a buffer zone, would be rehabilitated and become part of the Reserve. By way of compensation, an area of land of equal proportion (approximately 560 ha.) will be added to the Reserve and managed for conservation purposes.

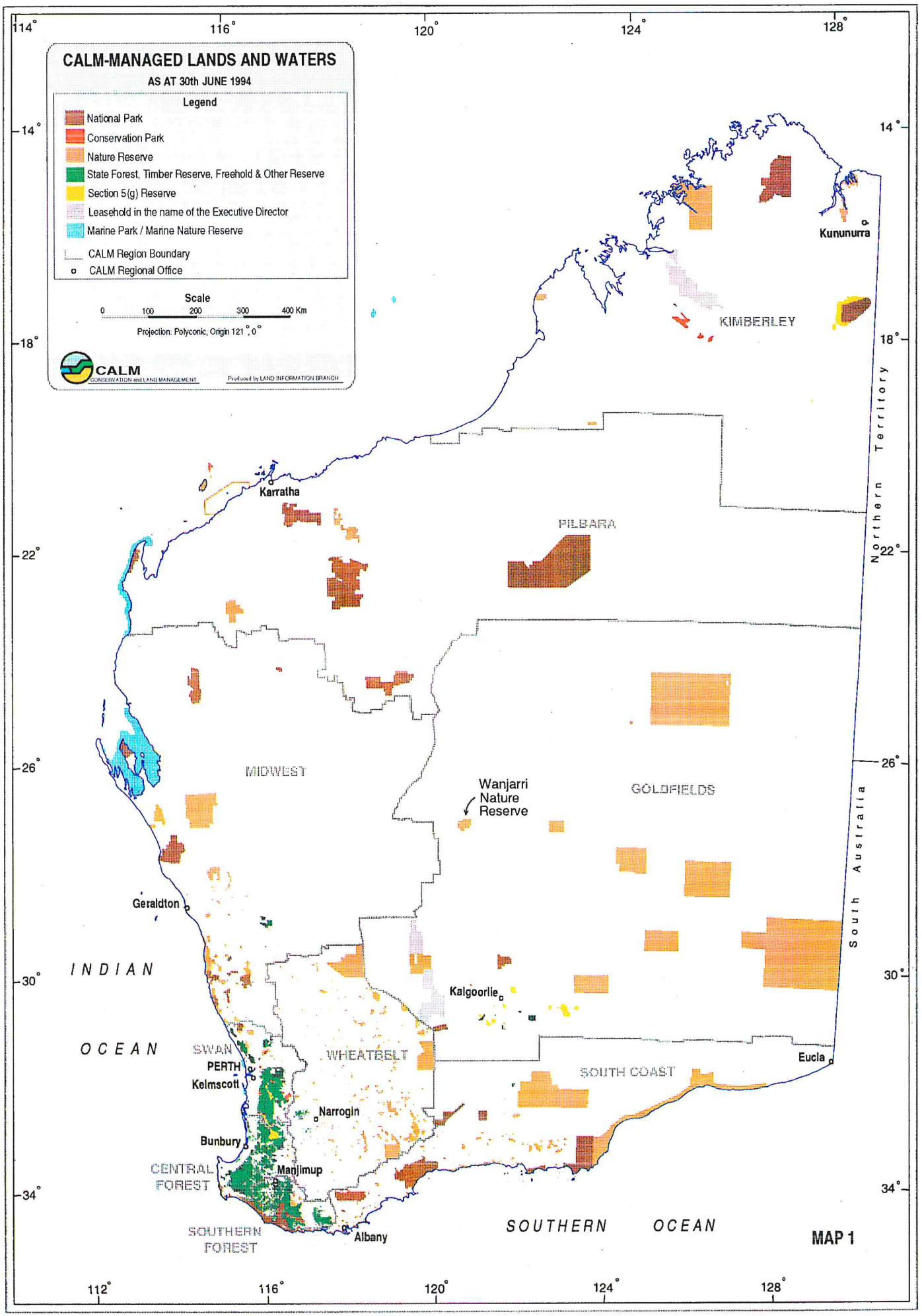
There has been considerable use of the area around the shearing shed for recreation and camping. Camping on a Nature Reserve is illegal without written permission of the Executive Director. It is recommended that the classification of the land be changed from Nature Reserve to Conservation Park. This will make camping legal, and, by confining it to an area zoned for recreation around the shearing shed, the conservation values of the remainder of the Reserve will not be compromised.

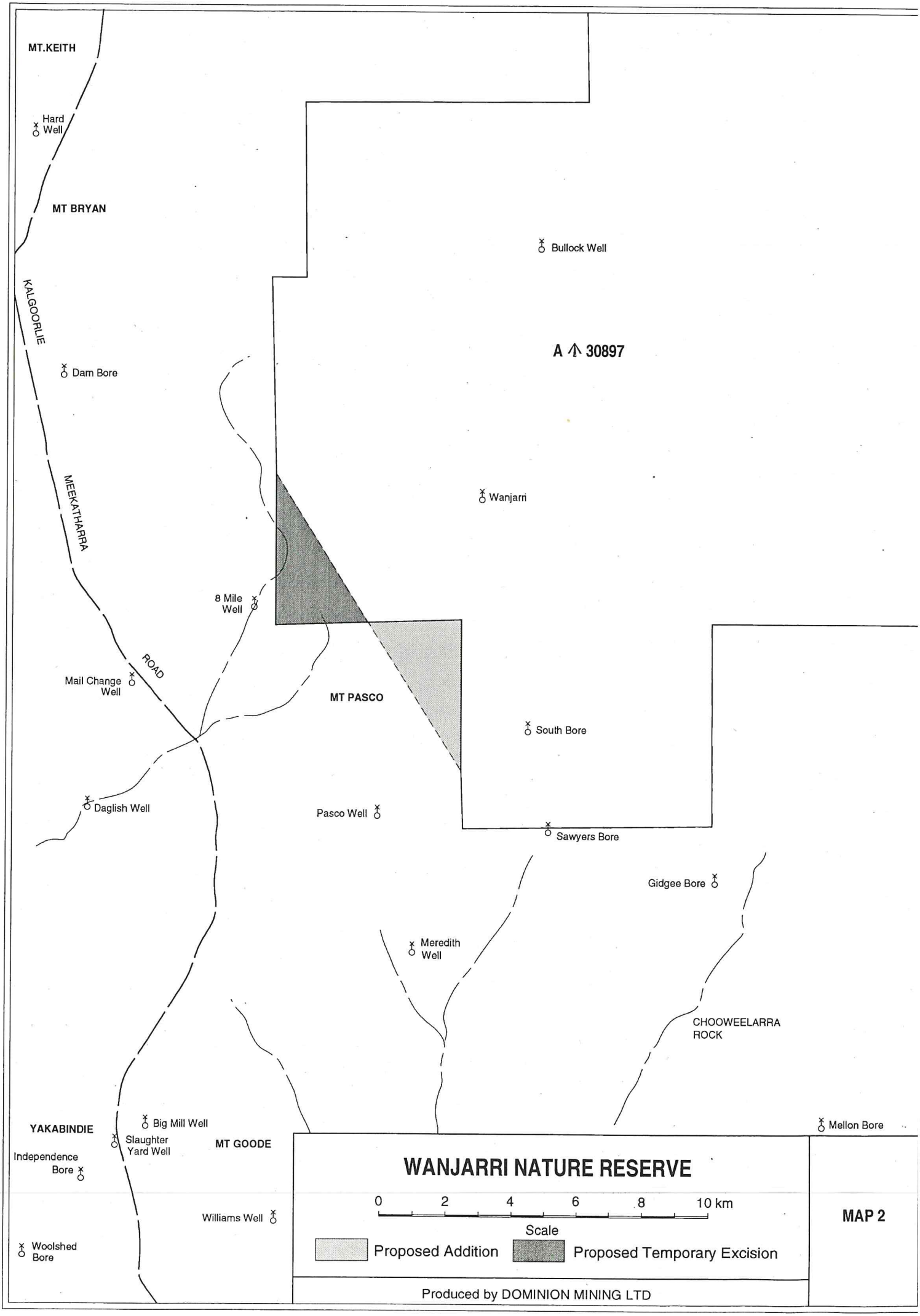
RECOMMENDED STRATEGIES

1. **Ensure Reserve boundaries are clearly demarcated in the field where development activities occur adjacent to the Reserve. (H)**

2. **Ensure fences are maintained in a stock proof condition where necessary and reconstruct only on cadastral boundaries. (M)**

3. **Reclassify the Nature Reserve to Conservation Park. (H)**


CALM-MANAGED LANDS AND WATERS
AS AT 30th JUNE 1994
Legend
National Park
Conservation Park
Nature Reserve
State Forest, Timber Reserve, Freehold & Other Reserve
Section 5(g) Reserve
Leasehold in the name of the Executive Director
Marine Park / Marine Nature Reserve
CALM Region Boundary
CALM Regional Office
Scale
0 100 200 300 400 Km
Projection: Polyconic, Origin 121°, 0°
CALM
CONSERVATION and LAND MANAGEMENT
Produced by LAND INFORMATION BRANCH
114°
116°
120°
124°
128°
14°
18°
22°
26°
30°
34°
112°
Kununurra
KIMBERLEY
Karratha
PILBARA
Northern Territory
MIDWEST
Wanjarri Nature Reserve
GOLDFIELDS
South Australia
Geraldton
INDIAN
OCEAN
Kalgoorlie
SWAN
PERTH
Kelmscott
WHEATBELT
SOUTH COAST
Eucla
Narrogin
Bunbury
CENTRAL FOREST
Manjimup
SOUTHERN FOREST
Albany
SOUTHERN OCEAN
MAP 1


MT.KEITH
Hard Well
MT BRYAN
Bullock Well
KALGOORLIE
A 30897
Dam Bore
MEEKATHARRA
Wanjarri
8 Mile Well
ROAD
Mail Change Well
MT PASCO
South Bore
Daglish Well
Pasco Well
Sawyers Bore
Gidgee Bore
Meredith Well
CHOOWEELARRA ROCK
YAKABINDIE
Big Mill Well
Slaughter Yard Well
MT GOODE
Mellon Bore
Independence Bore
Williams Well
Woolshed Bore
WANJARRI NATURE RESERVE
0 2 4 6 8 10 km
Scale
Proposed Addition
Proposed Temporary Excision
MAP 2
Produced by DOMINION MINING LTD

MANAGEMENT FOR CONSERVATION

6. CONSERVATION OVERVIEW

The conservation strategy focuses on the conservation of flora and fauna within an arid land setting. Of the fauna species documented in the biological survey of the goldfields region (Hall et al. 1994), a number were sighted only on Wanjarri Nature Reserve.

A diverse range of flora and fauna occur on the Reserve, which is considered to have a richer vertebrate fauna than any other arid zone nature reserve in Western Australia.

Of particular significance is the occurrence of 122 bird species which is due to the location of the Reserve where species with predominantly southern, eastern or northern distribution overlap.

The mulgara, listed amongst the thirty five most threatened animals in Western Australia, has been recorded within the Reserve.

The priority 1 plant species *Calytrix uncinata* is known to exist on the Reserve. The flora of the Reserve has not been comprehensively surveyed and other priority species may also be present.

While habitat requirements and the reaction of some of these animals and plants to habitat change are not well known, management for the conservation and scientific study of these significant habitats is a high priority. Conservation should be viewed from a broader, regional perspective, given the degree of habitat change which has occurred as a result of pastoral or mining activities on all sides of the Reserve leaving it as a small ecological 'island'. Liaison and co-operation with adjoining land holders will be essential to the protection of the conservation values of the Reserve.

Parts of the western third of the Reserve have been disturbed by the pastoral activities which occurred prior to the purchase of the land for use as a Nature Reserve. Some rehabilitation of these disturbed areas could be undertaken to restore the ecosystems to their natural condition.

The presence of introduced predators such as foxes and cats is known to have dramatic effects upon native animal populations. The control of such predators in the Reserve is an important management function in relation to the long term survival of some of the native animals.

Habitat modification also occurs as a result of grazing pressure by introduced herbivores such as rabbits, goats, camels and horses. Control of these feral animals is an important part of conserving native wildlife and maintaining the natural systems.

Managing the Reserve to reduce the fire risk is problematic in that the reaction to fire of the natural plants and animals is not thoroughly understood. Continued research into the fire ecology of the various components of the Reserve is necessary to ensure that fuel reduction burns do not adversely effect the plants and animals. When more is known of the fire ecology

it may be possible to use fire as a means of sustaining species diversity when natural forces fail to do so.

Wanjarri is relatively small in area and is not representative of all the land forms occurring in the north eastern goldfields. Other habitats occur on adjoining pastoral leases outside the Reserve, which are not specifically managed for nature conservation purposes. The joint management of pastoral leases around the Reserve for conservation purposes, including feral animal control, control of grazing pressures and appropriate fire management, would help to address long term conservation goals in the north eastern goldfields, particularly in the arid mulga woodlands.

7. GEOLOGY, LANDFORMS AND SOILS

The objective is to conserve geological features, landforms and soils.

GEOLOGY/SOILS

Wanjarri Nature Reserve is part of an extensive plain developed on Archaean (greater than 2,500 million years in age) rocks. The topography of the area is generally subdued with a characteristic relief of between 6m and 30m.

Gneisses and granitic rocks of the Yilgarn block form the main bedrock, interrupted by several layered intrusions roughly aligned in a north-south direction. These intrusions are of meta-sedimentary[5] and meta-igneous rocks that include meta-basalt and banded iron stone. The meta-sedimentary and meta-igneous rocks have formed gently undulating plains, or abrupt, long, steep-sided hills.

Over much of the Reserve there is a mantle of sand forming extensive areas of sandy plains with the configuration of broad valleys and watersheds. These large areas of sandplain readily absorb rainfall, preventing any run off. Run off only occurs in areas with hard setting soils of heavy texture or exposed bedrock. Drainage consists of sheet flooding and is mostly uncoordinated.

LANDFORMS

A system of landform classification developed by Newbey and Milewski (Hall and Milewski, 1994) is used in the biological survey of the eastern goldfields as the basis for describing vegetation, flora and the vertebrate fauna. There are ten landform units within this system, eight of which occur within the Reserve. One of these, the hills landform has been divided into sub-units on the basis of bedrock type.

Breakaways

This landform occurs throughout the eastern goldfields and occurs within the Reserve. They are formed over granitic and mafic rocks and occur mostly within broad valleys. This landform

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1[5]Meta - when used as a prefix denotes metamorphism of the rock described.

arises as a result of weathering where a hard capping has remained over a weaker lower layer yielding a steep escarpment with a sheer upper slope and debris mantled slope below (Mabbut 1977). The face of the breakaway is subject to undermining which results in caves or overhangs.

Broad Valleys

These valleys are often barely discernible with a relief of less than 2° and may be up to 15km wide. The soils are generally deep, loamy red earths which are well drained.

Undulating Plains

These plains occur within the western part of the Reserve but are not extensive. Throughout the eastern goldfields this landform has formed over greenstone bedrock.

The undulating landscape includes ridges with slopes less than 10° and colluvial flats 50-500m wide. The soils are alkaline.

Sandplains

This landform dominates the eastern and north eastern parts of the Reserve and is characterised by red, freely drained coarse soils developed from coarse grained parent rocks. The landform is of low relief - generally less than 15m, with gradients mostly about 2°.

Dunefields

Areas of dunefields occur within the sandplains. These sand dunes are the result of previous arid epochs, the last of which occurred about 15,000 years ago (Bowler, 1976).
These dunes are mainly parallel or longitudinal and have been formed as a result of the action of prevailing regional winds. The growth of dunes results from the accumulation of saltating[6] sand on sand covered areas rather than sand free areas.

Drainage Lines

This landform is uncommon in the Reserve and is confined to areas around hills and undulating plains. These drainage lines have generally eroded earth banks 1-3m high and a sandy or gravelly wash line (Hall and Milewski 1994).

Granite Exposures

These outcrops include low, rounded features and vary in size. Granitic soils are present and form a peripheral apron up to 2m thick.

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[6]Saltation is the term used to describe the movement of sand particles initially rolled along the ground by wind pressure, but which then are lifted above the surface to move forward in a bounding motion.

Hills

This landform unit has been divided into three sub-units based on the bedrock underlying the area. The main area of hills occurs in the west of the Reserve associated with the base of a long series of breakaways. The surfaces of the hills are largely covered with skeletal, well-drained soils and areas of bare rock.

The identification of a landform as granite exposures or hills is quite arbitrary.

General

The sand-plain landform dominates the Reserve; other landforms include small areas of dunefield, granite exposures, drainage lines, breakaways, undulating plains and sandplains are also represented. The remaining two landforms, Salt Lake features and Calcareous plains identified by Newbey and Milewski are not represented at all within the Reserve.

Landforms within the Reserve do not represent the complete range of diversity of surface types and associated vegetation communities that occur regionally. This, together with the degradation within some of the vegetation communities as a result of pastoral activities, leads to the need to consider extending the Reserve or to the management of adjoining lands for conservation in association with pastoral or mining activities.

RECOMMENDED STRATEGIES

1. **Provide interpretive information on the geology, landforms and soils of the Reserve and their vulnerability to damage. (M)**

2. **Identify areas that are vulnerable to damage and develop measures to protect them. (L)**

3. **Liaise with adjoining land holders to develop compatible conservation land management strategies. (H)**

8. VEGETATION AND FLORA[7]

The objectives are to:-

- **conserve vegetation communities including their structure, diversity and distribution.**
- **conserve flora with an emphasis on declared rare[8] or priority extant taxa.[9]**

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[7]Vegetation refers to plant communities and their structure while flora refers to the plant species present.
[8]The term "declared rare" is used to mean any plant taxon that is threatened with extinction and declared by the Minister for the Environment under the Wildlife Conservation Act as rare flora, ie. "is likely to become extinct or rare or otherwise in need of special protection".
[9]extant taxa refers to plant species known to be still surviving. c.f. extinct.

Wanjarri Nature Reserve lies within the Wiluna sub region of the Austin Botanical District (Eremaean Botanical Province). The Reserve is dominated by mulga (*Acacia aneura)* formations which occur on a range of different landforms. *Eucalyptus* communities are prominent on sandplains and dunefields (*Eucalyptus gongylocarpa,* low woodlands and mixed mallees) and along drainage lines (*Eucalyptus camaldulensis* and *E. lucasii*). The vegetation of the Reserve has been surveyed as part of the Biological Survey of the Eastern Goldfields (1994).

MAJOR VEGETATION COMMUNITIES

Breakaways

This landform occurs along the western and southern parts of the Reserve. There are four distinct elements comprising the breakaway landform: summit flats, scree slopes, colluvial base and drainage channels. Each element supports a different range of plant species with the drainage lines supporting the richest communities (Keighery et al. 1994).

Summit flats within the Reserve support tall scrublands of *Acacia aneura, A. linophylla, A. quadrimarginea, Calytrix uncinata, Dodonaea petiolaris, Eremophila latrobei, Podolepis capillaris, Sida calyxhymenia* and *Ptilotus obovatus.*

The range of species occurring on the slopes, colluvial base and drainage channels include *Acacia aneura, A. quadrimarginea, A. tetragonophylla, Hakea suberea, Gastrolobium laytonii* and *Eremophila fraserii.* The ephemeral community is quite rich (up to 40 species) at the base of the breakaways and is strongly influenced by drainage channels.

Drainage Lines

The banks of larger drainage lines support *Eucalyptus camaldulensis* woodlands and low woodlands. These landforms are one of the few in which introduced weeds have been consistently recorded (Keighery et al. 1994). Small drainage lines are dominated by *Acacia aneura, A. burkettii,* and *Eucalyptus lucasii.*

The ephemeral community under these woodlands is diverse (over 50 species). The dominant species include *Brachycome ciliocarpa, Calotis multicanus, Helipterum maryonii, H. tenellum, Podolepis kendallii* and *Stenopetalum filifolium.*

Broad Valleys

This landform supports *Acacia aneura* associations which are the dominant vegetation type within the western third of Wanjarri Nature Reserve. These associations reflect their position, and the influence of drainage within this landform. Shrubs present in the sparse understorey include *Eremophila spectabilis, Acacia tetragonophylla, Dianella revoluta* and *Eremophila leucophylla.* The ephemeral community recorded on the flat plains is not rich. Vegetation complexes are modified by drainage patterns, particularly in areas accumulating run on. The ephemeral communities in particular reflect the effect of drainage on species diversity.

Sandplains

These are also a significant landform within the Reserve supporting associations of *Eucalyptus* mallees over a dense cover of *Triodia basedowii*. Typical species occurring are *Eucalyptus gongylocarpa, E. kingsmillii* and *E. oldfieldii*. Bunch grasses present are *Aristida contorta*, *Eriachne helmsii* and *Stipa trichophylla*.

Dunefields

This landform is associated with sandplains. The vegetation on dunefields varies with the height and structure of the system. Broad, low dunes support *Eucalyptus gongylocarpa* over *Triodia basedowii* while narrow steep sided dunes have a lower vegetation with a noticeable zonation from crest to swale. Dune slopes supported mallees of *Eucalyptus kingsmillii* and *Acacia coolgardiensis*, while *Lomandra leucocephala* and *Grevillea* spp. characterised the crests and upper slopes. The ephemeral flora is essentially the same as that which occurs on the surrounding sandplain.

Low Granite Hills

This landform occurs mainly in the south east, east and to a much lesser extent in the west. It occurs more extensively on lands adjoining the Reserve.

Acacia aneura as a tall shrubland occurs on this landform with other shrubs including *Dodonaea petiolaris*, *Santalum spicatum*, plus the bunch grass *Cymbopogon ambiguus* and ephemerals *Brachycome ciliaris*, *Helipterum maryonii* and *Trachymene ornata*.

Undulating Plains

Within this landform the vegetation is characterised by *Acacia aneura, A. burkittii,* with *Ptilotus obovatus* in the sparse understorey. There is considerable similarity between the vegetation of the undulating plains and the broad valleys.

However, there is significant difference in the herbaceous stratum to that of the adjoining broad valleys. Ephemerals include *Brachycome ciliocarpa, Calotis hisidula, Helipterum maryonii, H. tenellum, Lepidium oxytrichum, Ptilotus aervoides, Stenopetalum filifolium* and *Vittadina eremaea.*

FLORA

No species of flora declared rare under Section 23F(2) of the Wildlife Conservation Act 1950 are known to occur in the Reserve. However, *Grevillea inconspicua* occurs just outside the Reserve on the Montague Landform Unit (Churchward, 1977) (low, stony hills with extensive exposed country rock). There is a minor occurrence of this landform unit in the south west of the Reserve. Extensive field surveys have failed to locate this plant within the Reserve (A Chapman, pers. comm.).

The priority 1 taxon[10] (Atkins, 1994) *Calytrix uncinata* is known to occur within the Reserve.

There has been considerable modification to vegetation by pastoral activities, particularly in the mulga communities within the undulating plains and broad valleys. Within these landforms the soil is shallow, is easily compacted, and the environment is suited to the establishment of introduced plants. As a result, some of the mulga communities around the shearing shed and mills have suffered considerable degradation. In contrast, the highly infertile, unproductive sandplains have not been utilised by pastoralists and remain essentially in their natural state.

Introduced weeds have been recorded predominantly within the well defined drainage lines.

RECOMMENDED STRATEGIES

1. **Undertake further detailed vegetation and flora surveys of the Reserve. (H)**

2. **Locate any threatened or priority flora species and develop management strategies for their conservation.(H)**

3. **Rehabilitate areas of vegetation degraded by pastoral activities. (L)**

4. **Minimise or prevent the removal of or damage to vegetation from the development of facilities for visitor use, particularly firewood collection. (H)**

5. **Provide visitors with interpretive information about the vegetation and flora of the Reserve and the fauna dependent upon it. (H)**

6. **Continue research into the effects of fire on the vegetation of the Reserve. (M)**

7. **Develop conservation management opportunities with adjoining landholders. (H)**

9. FAUNA

The objective is to conserve indigenous fauna populations and their habitats.

Indigenous Fauna

The indigenous fauna of the area are adapted to arid conditions. This usually means most species will be widely distributed though they will very seldom be continuous throughout their range. For example, most species present within the Reserve also extend eastward well into the Great Victoria Desert.. However, the Reserve is within the Austin rather than the Helms

[10]Priority 1 taxa are known from one or a few (generally <5) populations which are under threat.

Botanical District of Beard (1976), thus the vegetation has stronger Murchison than desert affinities but this is only partially reflected in the fauna. For example, the presence in the Reserve of the fat-tailed antechinus (*Pseudantechinus woolleyae*) and Finlayson's little bat (*Eptesicus finlaysoni*) rather than their desert counterparts *Pseudantechinus macdonnellensis* and *Eptesicus baverstocki*. A few species, for example the grey currawong, mallee fowl, and the vagrant regent parrot, are at the northern edge of their range in the Reserve. None of these birds has been recorded recently suggesting that they are particularly sensitive to environmental change at the fringes of their natural range. Environmental variation, particularly rainfall events, can result in significant fluctuations in population numbers due to either immigration or emigration or local breeding cycles. This is characteristic of species adapted to the arid environment.

The introduction of feral predators and herbivores, along with changes to fire regimes and pastoralism have undoubtedly affected the fauna of the Reserve, and of the entire arid zone. While there are no site specific data about changes to fauna population numbers and distribution, some evidence of changes is present at a surface cave deposit 90km south-west of the Reserve. Within this cave the remains of 10 mammal species were recorded which no longer occur in the area (Henry-Hall 1990). Reptiles and frogs are least affected by changes to habitat brought about by European settlement in the arid zone although some pythons are vulnerable (Pearson 1993).

Changes to avifauna populations coinciding with settlement of arid areas of WA have been documented by Curry and Hacker (1990) who recorded 11 species which have declined, including several local extinctions, and 20 species which have increased. Those species that increased are those already common while those that decreased were uncommon and are now rare or living in small disjunct populations.

In their study of the impact of pastoral settlement in the Murchison catchment Saunders and Curry (1990) recognised increased bird species as well as decreased bird species. They also identified 89 species for which there are no indications of change since 1910. Similar studies in New South Wales recorded a much higher rate of decline which has not yet stabilised (Smith et al. 1994). The disparity in results of these two studies is difficult to interpret; either pastoral management in WA has been more conservative, or the full effect of pastoralism is yet to appear as in NSW which was settled some 30 - 40 years earlier. Which ever the case, there is a need to explore the concept of conservation management of pastoral lands adjoining the Reserve.

Biological investigations reveal that the Reserve has a rich vertebrate fauna but that population numbers can fluctuate dramatically with climatic conditions. Even so, the Reserve, which is relatively small in area for the arid zone, does not include all landforms and associated fauna of the region and therefore does not conserve the full range of biodiversity of the region.

The biological surveys conducted on the Reserve and in the region generally, have focussed on the vertebrate fauna (see McKenzie et al. 1994). However, it is important that future scientific research should also study invertebrate fauna to gain an understanding of the part they play in ecological processes.

Although McKenzie et al. (1994) identified a relationship between surface stratigraphy and vertebrate species composition the particular habitat requirements of animals is not well

understood and may include a range of factors such as moisture, temperature, interrelations with other organisms and physical or chemical requirements.

Furthermore, it is difficult to determine where one habitat ends and another begins and there may be some overlap in the use of habitats by some animals. The following broadly defined habitats are present within the Reserve.

Breakaways

Breakaway outwash areas offer the only available chenopod shrubland vegetation on the Reserve, though this shows the effects of past grazing pressures. Rock holes on the edge of breakaways now provide the only available source of surface water for animals.

Dunefields

Dunefields are not well developed on the Reserve though they are a most conspicuous part of the landscape. The dune slopes support an open shrubland dominated by *Grevillea integrifolia.* The swales are most often vegetated with spinifex and low shrubs. These areas support a particularly rich small mammal and reptile fauna.

Low Granite Hills

These outcrops support tall shrublands and a rich annual flora. Exfoliating granite provides a niche for a wide range of invertebrates and small reptiles. Pooling of water following rainfall events provides a temporary mesic habitat[11].

Drainage Lines

Drainage lines support taller trees which provide significant breeding and roosting habitat for birds and bats. Drainage lines are very limited in extent on the Reserve.

Broad Valleys

This landform supports low mulga woodlands with perennial grasses. Where drainage lines cross these valleys there is groving of mulga which provides a significant drought refuge particularly for birds. In some low lying points within this landform small groves of *Eucalyptus lucasii* provides an important habitat for birds.

Sandplains

This landform supports spinifex with taller open shrubs occurring where loamy sands occur. This landform is often described as the hummock grasslands because of the visual effect of the 'hummocks' of spinifex grass. This habitat is occupied by the threatened mammal, the mulgara, as well as the infrequently recorded striated grass wren and rufous-crowned emu wren.

[11]Mesic is an ecological term used to describe a habitat characterised by a moderate amount of water.

Introduced Animals

Introduced animals in the Reserve include sheep, camels, horses, goats, rabbits, foxes, cattle, feral cats, and house mice. Amongst these introduced animals the herbivores are causing significant impact on the native fauna through competition for food, habitat modification, disturbance of nesting sites and the inhibition of the regeneration of some plants, for example, sandalwood.

Predation by foxes and cats has probably impacted on the numbers of birds and smaller animals. The significance of this impact is not directly understood, though recent research findings indicate the recovery of native animals following feral animal control programs.

Dingoes

The dingo, although a declared animal under the Agricultural and Related Resources Protection Act is not treated as so by CALM when on CALM land and remote from pastoral leases. However, control measures may be necessary where smaller reserves are adjacent to pastoral proerties, or where specific activities such as fauna rehabilitation or translocation occur.

Threatened Fauna

Threatened fauna known to exist on the Reserve include the mulgara (*Dasycercus cristicauda*), mallee fowl (*Leipoa ocellata*) and grey honeyeater (*Conophila whitei*). The mulgara has been recorded as recently as 1994 and is known from 3 separate localities. The mallee fowl has not been recorded since 1969 (Moriarty, 1972), possibly due to its habitat modification by sheep grazing in mulga and *Acacia* communities. The grey honeyeater has not been recorded since 1972. Both the mulgara and the mallee fowl are listed amongst the 35 most threatened animal taxa in Western Australia (CALM 1992).

There is evidence of a decline in threatened species as well as others that are at the edge of their range. Future management will, as a matter of priority, have to secure the existence of currently known threatened species as well as consider the reintroduction of others, like the mallee fowl, once the agencies of decline have been identified and addressed.

RECOMMENDED STRATEGIES

1. **Carry out and promote research into the biology and habitat requirements of the fauna of the Reserve and use this knowledge to improve management. (H)**

2. **Prepare recovery plans for the management of threatened species including the reintroduction of species once present but now not known from the area. (H)**

3. **Carry out research into the impact that prescribed burning programs have on fauna survival and fauna habitat. (H)**

4. **Monitor and control feral animal populations, particularly where habitat rehabilitation or species reintroduction programs are undertaken. (M)**

5. **Provide interpretation opportunities for the general public about the fauna of the area. (H)**

6. **Carry out research into feral animal control and the impacts on non target species. (H)**

10. ABORIGINAL HISTORY

The objective is to protect and conserve the Aboriginal cultural heritage of the Reserve.

The land within the Reserve would have once been used by Aboriginal people for gathering, hunting and religious ceremonies. Aboriginal people with traditional ties to this area now live in towns in the region although the area still forms part of the culture of the desert Aborigines.

The importance of the area is not well understood, though a number of significant sites are located within the Reserve and are registered with the Aboriginal Affairs Department. Included in the 19 registered sites are a rock art gallery and women's area.

The Aboriginal Affairs Department (Division of Heritage and Culture) will be notified of any further identification of Aboriginal sites.

RECOMMENDED STRATEGIES

1. **Ensure Departmental staff are trained in the recognition of Aboriginal sites and are aware of the provisions of the WA Aboriginal Heritage Act 1972-80. (M)**

2. **Promote public understanding and appreciation of the Aboriginal culture. (M)**

3. **Consult local Aboriginal groups in the management of significant sites. (H)**

4. **Protect significant Aboriginal sites from damage by visitors. (H)**

11. EUROPEAN HISTORY

The objective is to protect and conserve the European cultural heritage of the Reserve.

Europeans arrived in the area about 100 years ago when prospectors ventured into the region in search of gold. The area was surveyed and mapped in 1896 by Henry Mitchell who found and named Coondie Soak in what is now the south east of the Reserve. Near the soak stands a corkwood tree which has been carved with the name J. Gardiner and the date 2.10.96 (1896).

Pastoralists moved into the area about this time also. In 1920 a local entrepreneur, John Currie, leased a virgin block of land on which to develop Kathleen Valley Station.
In 1940 the lease passed to Currie's son-in-law, Tom Moriarty, who developed the western one third of the lease to run a small number of stock. The developments completed by Moriarty included the construction of fences, yards, shearing shed, a small 2 roomed quarters with a kitchen on the verandah and the erection of a number of windmills.

The shearing shed and yards along with the previous owner's quarters and an assortment of old machinery including the remains of an old car and parts of a wooden wool press, remain as a silent reminder of a bygone era in station life.

RECOMMENDED STRATEGIES

1. **Carry out historical research into the exploration and development of the area. (L)**

2. **Provide interpretive material for visitor information. (M)**

3. **Where possible protect relics and structures of significance from damage, and carry out appropriate maintenance while ensuring visitor safety. (M)**

12. LANDSCAPE

The objective is to protect and conserve the landscape values of the Reserve.

Landscape has been described in various ways including; - the view of an area as seen in perspective (Hartshorne, 1939); the landforms and their plant cover (Dickinson, 1939) and; the relief and the natural vegetation. The term was first introduced as a technical term of painters and is based upon a visual image. In most places the natural landscape has now been modified by the activities of man to become the cultural landscape. In this context the landscape, having already undergone modification, will continue to be changed. It is the rate at which change occurs and the degree of impact on the visual perspective which are important to the management of the area. For most Australians the visual image of the outback does not include modern industrial sites or buildings. Rather, it is a vast, open space devoid of developmental influences except perhaps a dirt road. Although this is a rather romantic vision, it nonetheless signifies that the potential impact of development on the landscape should be carefully planned and managed.

The potential for landscape alteration on adjoining lands or the Reserve requires careful planning so that the visual qualities of the area are not drastically altered.

RECOMMENDED STRATEGIES

1. **Encourage adjoining landholders to recognise the importance of landscape management by the sensitive siting of facilities and signs and careful planning and siting of utilities and roads. (M)**

2. **Implement CALM's policy No. 34 (Landscape Management of CALM's Lands and Waters) in all aspects of land management within the Reserve. (M)**

3. **Implement CALM's Visual Landscape Management Guidelines. (M)**

13. EROSION, MINING AND REHABILITATION

The objectives are to:

- **minimise the impacts of exploration and mining that modify or destroy habitats.**

- **restore degraded areas to a stable condition, resembling the natural environment as much as possible.**

- **protect the conservation and landscape values of the Reserve from the impacts of exploration and mining.**

EROSION AND REHABILITATION

The aridity and climatic characteristics of the area affect the geomorphic processes (Mabbut 1977).

Infrequent but locally intense rains and dry turbulent air flows passing over dry, sparsely vegetated land results in erosion. The landscapes of today are a result of erosional processes which have occurred over a very long period of time and which continue today.

These natural landforming processes can often be altered by human activities such as the introduction of hard footed herbivores; construction of tracks and roads and burning programmes.

Within the Reserve water erosion is degrading some tracks that have been established across the contours of some slopes. There appears to be some minor rilling on flat wash plains which may have resulted from reduced vegetative cover, soil disturbance and surface compaction caused by pastoral activities.

MINING AND REHABILITATION

Mineral exploration has occurred within the Reserve as evidenced by two seismic lines. This exploration pre-dates the present status of the land as an A class nature reserve.

The issue of the degree of environmental disturbance is important in the assessment and granting of mining tenements. Where significant disturbance is likely to occur consultation with the NPNCA, CALM and the Department of Minerals and Energy (DOME) is required and assessment by the Environmental Protection Authority (EPA) is likely. The granting of tenements other than a mining lease requires the concurrence of the Minister for the Environment. The granting of a mining lease for developmental or productive mining can occur only after EPA and NPNCA assessment and Parliamentary approval. Conditions, including the requirement for rehabilitation and removal of waste materials, are imposed when mining tenements are granted.

Given the degree of mining acitivity on land surrounding the Reserve, its relatively small size and high conservation value together with the general lack of reserves in the north-eastern goldfields, the Reserve should be provided maximum protection from mining development.

GAS PIPELINE

The construction and operation of a natural gas transmission pipeline from the Pilbara to the Goldfields which passes through the Reserve has been approved following consultation with CALM, Department of Environment Protection, the Department of Resources Development and assessment by the EPA. A number of operational conditions and rehabilitation commitments have been made and are outlined in the Public Environmental Review (PER) and Environmental Management Plan (EMP). The construction corridor through the Reserve is shown on Map 3.

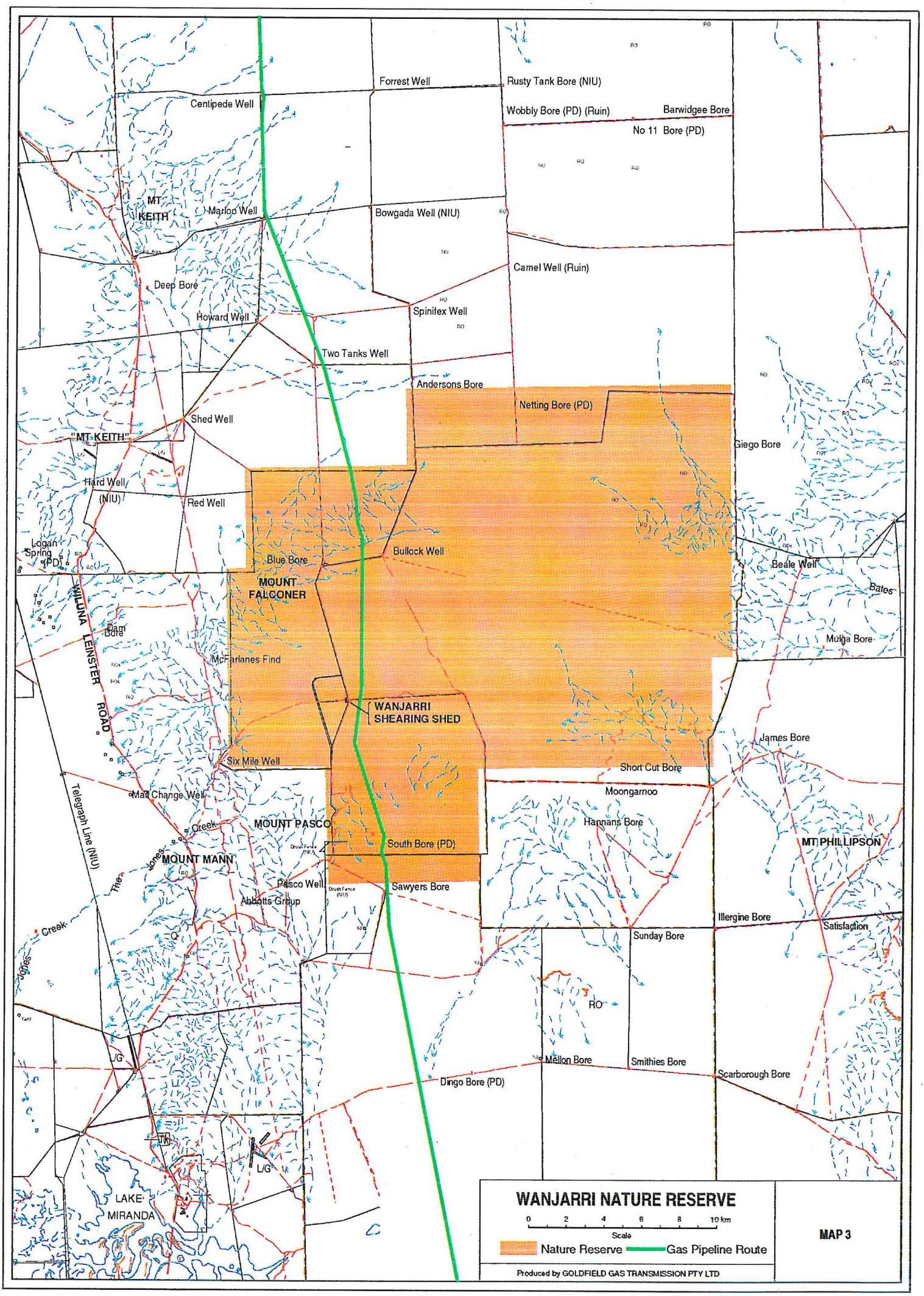
BASIC RAW MATERIALS

Basic Raw materials (gravel, shale, sand, clay, limestone and other rocks) are classified as minerals and therefore dealt with by the provisions of the Mining Act. In addition to the statutory requirements, the movement of basic raw material from or onto the Reserve will be subject to NPNCA policy.

GROUNDWATER EXPLORATION AND ABSTRACTION

Groundwater exploration and abstraction is subject to the Rights in Water and Irrigation Act (1979).

The effects of groundwater abstraction on the groundwater table level and plant health are not well understood. At present no ground water is abstracted from within the Reserve, except for the windmill situated near the old shearing shed.


Forrest Well
Rusty Tank Bore (NIU)
Centipede Well
Wobbly Bore (PD) (Ruin)
Barwidgee Bore
No 11 Bore (PD)
MT KEITH
Marloo Well
Bowgada Well (NIU)
Camel Well (Ruin)
Deep Bore
Howard Well
Spinifex Well
Two Tanks Well
Andersons Bore
Netting Bore (PD)
Shed Well
"MT KEITH"
Giego Bore
Hard Well (NIU)
Red Well
Logan Spring (PD)
Blue Bore
Bullock Well
Beale Well
MOUNT FALCONER
Bates
Dam Bore
Mulga Bore
McFarlanes Find
WILUNA LEINSTER ROAD
WANJARRI SHEARING SHED
James Bore
Six Mile Well
Short Cut Bore
Moongarnoo
Mail Change Well
Telegraph Line (NIU)
Creek
MOUNT PASCO
Hannans Bore
MT PHILLIPSON
South Bore (PD)
MOUNT MANN
Jones
Pasco Well
Sawyers Bore
Abbotts Group
Illergine Bore
Satisfaction
Creek
Sunday Bore
RO
Mellon Bore
Smithies Bore
Scarborough Bore
Dingo Bore (PD)
L/G
L/G
LAKE MIRANDA
WANJARRI NATURE RESERVE
0 2 4 6 8 10 km
Scale
Nature Reserve
Gas Pipeline Route
MAP 3
Produced by GOLDFIELD GAS TRANSMISSION PTY LTD

RECOMMENDED STRATEGIES:

1. **Monitor erosion of tracks and implement appropriate measures for control. (M)**

2. **Continue to assess all applications for mining tenements to ensure impacts on the conservation values of the Reserve are minimised. (H)**

3. **Rehabilitate degraded areas to a stable state resembling the surrounding landform using local vegetative species. Rehabilitation will be in accordance with Departmental policy. (L)**

4. **Monitor and evaluate the effectiveness of rehabilitation programs. (L)**

5. **Investigate the establishment of a zone of influence adjacent to the reserve within which development projects are likely to have an impact on the values within the Reserve. (H)**

6. **Initiate a memorandum of understanding with DOME that includes the referral of development proposals within the zone of influence for CALM's assessment and recommendations. (H)**

7. **Ensure the offsite impacts of the gas pipeline construction and operation are minimised. (H)**

8. **Monitor the effects on vegetation of any large scale water abstraction operations on or near the Reserve. (H)**

14. FIRE

The objective is to protect people, property and conservation values in and around the Reserve.

In most situations wildfires can cause extensive damage to property, destroy valuable grazing areas, kill stock and may threaten human lives. They may also burn out very large areas of vegetation which, from a conservation viewpoint, is undesirable as entire habitats may be altered, endangering plant or animal populations.

In some vegetation types, such as mulga woodlands, the plants are very susceptible to wildfires and regenerate very slowly. Preventing wildfire from affecting these management units can be achieved through low fire intensity prescribed burning in adjacent areas.

Fire can be used to create habitats with the different stages required for flora and fauna conservation. The diversity achieved by burning ensures animals are provided with shelter and food. Although further research is required it appears that, for example, the mulgara favours areas that are in the early stages of regeneration following fire.

The decision to carry out prescribed burning is influenced by the assessment of the risk to adjoining pastoral properties or mining establishments, the impacts upon the vegetation and fauna within and around the Reserve, the fuel dynamics, prevailing weather conditions and the operational requirements such as personnel, machinery and equipment.

Prescribed burns have been undertaken within the Reserve to protect research plots, mulga communities and specific habitats. Some bare earth firebreaks have been created and are maintained around the old shearing shed.

RECOMMENDED STRATEGIES

1. **Develop a strategic burning plan to protect the conservation values of the Reserve. (H)**

2. **Carry out prescribed burning to protect values and create diversity within habitats. (M)**

3. **Liaise with adjoining land holders and Shires to achieve an integrated approach to fire suppression. (H)**

4. **Provide information to the public about the risks of wildfires and their impacts on the environment. (H)**

MANAGEMENT FOR RECREATION

15. OVERVIEW

Increased pressure from visitors on the conservation values of the Reserve needs careful monitoring. At present the Reserve is utilised by day visitors who enter from the west or north and most often are mining personnel travelling to the old shearing shed for recreational purposes. As mining activity and tourist travel increases, greater pressure will be exerted on the conservation values of the Reserve.

While it is recognised that people will continue to visit the Reserve, the level of use must be consistent with the overall conservation purposes. Low impact activities and those which result in increased awareness and understanding of the natural systems will be provided within the area of the old shearing shed. This will allow visitors to become more aware of the management purposes and values of the Reserve.

Under the Wildlife Conservation Regulations for this category of land (nature reserve), camping is illegal without the written permission of the Executive Director. Given the historic use of the Reserve for recreation and camping, and the difficulty of controlling this activity due

to the remoteness of the area, it is recommended that the classification of the land be changed from Nature Reserve to Conservation Park.

16. ACCESS

The objective is to provide suitable visitor access while minimising any adverse impact on the conservation values of the Reserve.

The prime destination for visitors is the old shearing shed which is accessed by dirt roads from the west and north. The western approach is by far the most heavily utilised access.

These tracks remain from the time when pastoral activities occurred and link sites where windmills and yards were located, or are boundary tracks along fence lines. None of the tracks are maintained and they may be impassable after heavy rain.

No signs are provided on the main road between Wiluna and Leonora indicating access to the Reserve.

Due to mining development to the west of the Reserve a new access track through Yakabindie will be constructed by the mining company.

RECOMMENDED STRATEGIES

1. **Monitor visitor pressures and modify access where these pressures conflict with conservation or scientific values of the Reserve.** (M)

2. **Confine public access to developed tracks where possible.** (M)

3. **Provide interpretive opportunities through the provision of a self guided walk track.** (L)

17. DAY USE

The objective is to provide day use recreation facilities appropriate to the environmental setting and consistent with the Reserve purpose.

The information gathered to date from visitors to the Reserve is mostly informal, is based on the observation of what impact has occurred once visitors have left, or is anecdotal. However, it appears that visitors come to the Reserve primarily to picnic near the old shearing shed. It is presumed the site is chosen for its historic and landscape values as well as its remote setting. Visitor interest in gaining knowledge and understanding of the environment and its management requires assessment and evaluation.

Fires are not permitted because of the risk of wildfire and the impacts of firewood gathering on native vegetation. Visitors may use fuel stoves. Information about lighting fires, and the use of fuel stoves, should be provided in an information bay at the entrance to the Reserve.

RECOMMENDED STRATEGIES

1. **Develop the day use site at the old shearing shed. (M)**

2. **Develop appropriate data gathering procedures to evaluate visitor attitudes, interests and reaction to the facilities provided. (M)**

3. **Provide environmentally sensitive toileting facilities. (M)**

4. **Provide information about lighting fires in the Reserve. (H)**

18. CAMPING

The objective is to ensure visitors are aware of the statutory requirements regarding camping in nature reserves.

According to the Wildlife Conservation Regulations, camping is not permitted on any nature reserve "except by permission in writing" of the Executive Director and then only in areas set aside for this purpose (Reg. 44 (2)). Policy Statement No. 18 (Recreation, Tourism and Visitor Services) states that permission will only be granted for activities consistent with the Reserve purpose.

Monitoring visitors activities in the Reserve is difficult because of the remoteness and limited staff resources. The appointment of locally based Honorary CALM Officers[12] who are able to visit the reserve on a more frequent basis than CALM staff from the Kalgoorlie Office would assist in the provision of advice to visitors and feedback to CALM.

RECOMMENDED STRATEGIES

1. **Provide information to visitors about camping. (M)**

2. **Appoint a locally based Honorary CALM officer. (M)**

[12] Section 46(1) of the CALM Act allows the Executive Director to appoint any person to be ... an honorary CALM Officer, for the whole or specified part of the State. Honorary CALM Officers undergo training relevant to the area in which they work and may be provided with powers where necessary.

19. DOMESTIC ANIMALS

The objective is to protect the conservation values of the Reserve and visitors, from the negative impacts of pets.

Pets disturb wildlife and visitors to the Reserve, can introduce diseases and foul recreation sites. Their presence and scent can interrupt native fauna activity.

Domestic animals, other than guide dogs, are not permitted within the Reserve.

RECOMMENDED STRATEGIES

1. **Prohibit domestic animals in the Reserve. (H)**

2. **Provide information about the impacts of domestic animals on conservation values. (M)**

COMMUNITY RELATIONS

20. INFORMATION AND INTERPRETATION

The objective is to increase awareness, appreciation and understanding of the Reserve's values and purpose, and encourage a responsible attitude towards nature conservation.

At present there is little public information available about the Reserve. However, it is recognised that a well-informed and supportive public greatly assists the Department in the management of remote areas where regular staff presence is not possible.

There is a clear difference between the concepts of visitor information and interpretation. Information about the Reserve, its size, features, distances, code of practice, facilities and things to do could be provided at the main western entrance to the Reserve. A display board with a map of the Reserve could be developed and sited at an information bay at the entrance. On the other hand interpretation of the natural systems would require the development of static displays and material about the wildlife, landforms, ecology, potential threats to the wildlife from visitor activities such as fire and erosion, history - both Aboriginal and European, and management of the Reserve.

Interpretive displays will be designed and prepared according to standards laid down by staff of the Recreation and Landscape Branch of CALM.

Contact with the public can be personal through either informal contact in the course of day-to-day management operations or more formally structured presentations or field days. Staff contact at the site is considered the most effective means of communicating with individuals and groups, however, it is labour intensive and given the remoteness of this Reserve and the

infrequency of staff visits, other options for contact with the public must be considered. The appointment of Honorary CALM Officers will provide good opportunities to establish more regular and formal contact with visitors to the Reserve. As Honorary CALM Officers or regional staff are not available at all times, the information and interpretation provided by static displays is an important part of communicating with visitors.

RECOMMENDED STRATEGIES

1. **Appoint appropriate personnel as Honorary CALM Officers to provide informal contact with visitors.** (M)

2. **Prepare information and interpretation material and facilities.** (M)

3. **Liaise with study groups using the Reserve, such as the Royal Australasian Ornithologists Union (RAOU), in the exchange of information.** (L)

21. EDUCATION

The objective is to facilitate and encourage the use of the Reserve by educational groups, maximise information dissemination and minimise impact on the conservation and other values of the Reserve.

Community education is concerned with teaching about the area in a formally structured way. Educational programs require considerable resources and time, involvement of experts and field activities.

Although the area is remote from large population centres, the High School at Leinster has begun a Junior Land Care District Committee (LCDC). This group, together with other LCDC^{S} may have an interest in arid land ecology and conservation of natural resources which could be enhanced by the provision of educational opportunities in the Reserve.

The Reserve offers a unique opportunity for field studies by research students or staff from tertiary institutions. This opportunity can potentially assist the Department in broadening its knowledge of the wildlife and natural processes of the area.

RECOMMENDED STRATEGIES

1. **Liaise with educational or scientific institutions over the use of the Reserve for field study.** (L)

2. **Provide educational opportunities or assistance wherever possible.** (L)

RESEARCH AND MONITORING

22. RESEARCH STRATEGY

Effective conservation management is based upon a thorough knowledge and understanding of the nature and extent of biological communities and their structure and function.

Further detailed study is required in the Reserve and surrounding land in areas such as mulga regeneration, the effects of fire, feral animal impacts, the ecology of threatened species, and further detailed inventories of the fauna and flora of the Reserve. Research into the effect of water abstraction from borefields established for mining operations in close proximity to the Reserve will become a priority once these become operational.

While the Science and Information Division within the Department of CALM is responsible for most research work on CALM lands, others such as Universities, environmental consultants and the CSIRO also contribute considerable resources to biological research. There is a requirement for close co-operation and communication with other research organisations.

Reliable information about visitor use of the Reserve, including the number of visitors, their destination within the Reserve, their purpose for visiting and their perceptions of the conservation values of the area is also required.. This information is valuable when making management decisions about visitor facilities, interpretative material and general information about the Reserve. The impacts of visitor activities need to be closely monitored to ensure that the conservation values of the area are not adversely affected.

23. NATURE CONSERVATION RESEARCH

The objectives are to:-

- **increase knowledge of the flora and fauna of the Reserve.**
- **increase knowledge and understanding of the natural processes occurring within the Reserve.**

More biological survey work and research into the factors influencing plant and animal population distribution and abundance is required for the long term conservation of species. At present there is a gap in the knowledge and understanding of the ecology of invertebrate species, and the role of fire in habitat modification is not fully understood.

Feral animals, particularly goats and rabbits, and others, such as foxes and cats, are recognised as having a significant impact on population numbers and perhaps distribution of some animals, particularly the smaller marsupials. A concerted control and monitoring program is necessary and should be carried out with input from the Agriculture Protection Board (APB) and pastoralists.

Similarly, further surveys of the occurrence of weeds within the Reserve is required, with adequate control and monitoring procedures developed.

The biological survey work recently reported by Hall et al. (1994) did not extend across the entire Reserve. Further work is required to complete the inventory of flora and fauna occurring within the Reserve. It would be useful to extend this type of survey into adjoining pastoral lands. As a result of further biological surveys the number of threatened or priority species found on the Reserve may increase. With more extensive knowledge habitats can be managed for the long term conservation of species.

The mulga communities in the western one third of the Reserve have been impacted by previous pastoral activities. A fairly extensive area, particularly around the old shearing shed, is heavily impacted with few trees surviving. The cause for such impact in this localised area is unknown, though high numbers of sheep, perhaps, intermittently, would have been held within this vegetation type around shearing time. Moriarty (1972) suggests the trees may have died as a result of prolonged frosts. It is known that fire provides the "most dramatic perturbation to mulga communities" (Fox, 1985) although the fire history of the area is unknown. Mulga is known to re-establish from seed (Morrisey 1984). The fact that these degraded areas have not regenerated remains an important management problem. There is significant opportunity within this mulga community to carry out regeneration research with the view to rehabilitating the area to its former state. Co-operation with research groups will be important if a regeneration program is to be undertaken.

RECOMMENDED STRATEGIES

1. **Continue biological inventories, research and monitoring programs within the Reserve and adjoining lands. (H)**

2. **As a priority, carry out research into the habitat requirements of threatened or priority flora or fauna. (H)**

3. **Continue research into the role of fire in habitat modification and effect of fire on the flora and fauna of the Reserve. (H)**

4. **Continue to control and monitor feral animal populations. (M)**

5. **Carry out inventories of declared and environmental weeds and implement control and monitoring programs. (M)**

6. **Carry out research into mulga regeneration. (L)**

7. **Carry out research into the reconstruction of the habitat requirements of the mallee fowl and consider the re-introduction of this animal to the Reserve. (L)**

24. SOCIAL RESEARCH

The objectives are to:

- **monitor visitor use of the Reserve.**
- **monitor the impact of visitor use on management activities and conservation values.**

Visitor numbers to the Reserve will increase as mining activities on land adjoining the Reserve increase, bringing more people into the region. To assist in planning and the development of information, interpretation and other facilities, managers must have a thorough knowledge of the numbers of visitors, their expectations and purposes for travelling to the Reserve.

To date very little is known about the number of people visiting the Reserve, other than anecdotal information. The expectations, attitudes and preferences for particular recreational opportunities are not known. Similarly, there is little monitoring of the impact visitors are having on the conservation values of the Reserve.

Neighbour and visitor surveys provide information about patterns of use, the expectations of visitors, the provision of facilities and perceptions of what could be provided in the future. Continued liaison with visitors will provide important feedback about the degree to which their needs are being met and will enable changes to be made to visitor facilities, interpretation opportunities and other information.

The involvement of honorary CALM officers and volunteers provides opportunities to provide informal contact not usually possible due to infrequent staff presence on the Reserve.

RECOMMENDED STRATEGIES

1. **Conduct appropriate visitor surveys to determine patterns of use, attitudes and expectations. (M)**

2. **Monitor visitor impacts on the environment and make management changes to ensure adverse environmental impacts do not occur. (M)**

3. **Appoint and train Honorary CALM officers to assist with informal contact with visitors and to monitor visitor usage. (M)**

PLAN IMPLEMENTATION

The management plan for Wanjarri Nature Reserve is part of a management system developed by the Department of CALM. This system comprises relevant Legislation, such as the CALM Act and Wildlife Conservation Act, Departmental and NPNCA policies and strategic planning at corporate and regional levels.

The implementation of this management plan will be undertaken within the annual program of the Goldfields region. Implementation activities will also be subject to broader regional priorities and will depend on the availability of staff and resources. Given the area of the region and the operational demands placed upon the staff it will be necessary to explore options to have work completed on the Reserve by volunteers, Honorary CALM Officers, and other research organisations. Funding for projects may be available from alternative Federal or State Government sources, mining companies or other businesses interested in being associated with conservation of the environment.

Development operations will be carefully assessed for their potential for adverse environmental impact and modified accordingly where risks are evaluated to be too high. Consultation with relevant Government agencies will continue to be a high priority. If amendments to the plan become necessary, this will be done in accordance with section 61 of the CALM Act.

The strategies within this management plan have been assigned a priority (high, medium, low) following careful consideration by the planning team, and provide a logical order in the implementation of operations. These priorities are summarised below:

STRATEGY	*PLAN REFERENCE*	
HIGH PRIORITY	**SECTION**	**STRATEGY**
Ensure clearly demarcated boundaries	5	1
Oppose mining developments on Reserve	5	2
Liaise with adjoining landholders to develop conservation management strategies	7, 8	3,7
Undertake flora surveys	8	1
Locate and manage priority flora	8	2
Manage firewood collection	8	4
Interpretive information on vegetation and flora	8	5
Undertake biological surveys	9, 23	1, 1
Prepare recovery plans	9	2
Research fauna reaction to prescribed burns	9	3
Change Classification to Conservation Park	9	3
Interpretive information about fauna	9	5
Consult aboriginal groups	10	3
Protect significant sites	10	4
Assist applications for mining tenements	13	2
Zone of influence around Reserve	13	5
Memorandum of understanding	13	6
Gas pipeline impacts	13	7

HIGH PRIORITY (cont'd)	SECTION	STRATEGY
Water abstraction monitoring	13	8
Develop strategic burning plan	14	1
Integrated approach to fire suppression	14	3
Public information about wildfire risks	14, 17	4,4
Prohibit domestic animals	19	1
Research into rare or priority flora and fauna	20	2
Research into role of fire in habitat modification	20	3
MEDIUM PRIORITY		
Stockproof fences	5	3
Interpretive information on geology landforms and soils	6	1
Fire effects on vegetation	8	6
Monitor feral animal numbers	9	4
Research into feral animal control	9, 23	6, 4
Staff training to recognise Aboriginal sites	10	1
Promote understanding of Aboriginal sites	10	2
Interpretive information for visitors	11	2
Protection of relics and structures	11	3
Landscape management on adjoining lands	12	1
Implement CALM's Policy 34	12	2
Implement CALM's Landscape Management Guidelines	12	3
Monitor erosion on tracks	13	1
Prescribed burning and habitats	14	2
Monitor visitor pressures	16	1
Confine public access to roads	16	2
Provide information about camping	18	1
Appoint locally based Honorary CALM officer(s)	18, 20, 24	2, 1, 3
Provide information about domestic animals	19	2
Information and interpretive material	20	2
Declared weeds and their control	23	5
Visitor surveys	24	1
Monitor visitor impacts	24	2
LOW PRIORITY		
Identification of land vulnerable to damage	7	2
Rehabilitation of degraded land	8, 13	3, 3
Historical research	10	1
Monitor effectiveness of rehabilitation programs	13	4
Self guided walk track	16	3
Liaison with interest groups	20	3
Field studies by research organisation	21	1
Provision of educational opportunities	21	2
Re-introduction of mallee fowl	23	7

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