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PROMINENT HILL COPPER-GOLD PROJECT

SIGNIFICANT ENVIRONMENTAL BENEFIT (SEB) OFFSET AREA – STAGE 1 MANAGEMENT PLAN

Submitted by
Oxiana Ltd
2006

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Government of South Australia
Primary Industries and Resources SA

Oxiana
Prominent Hill

6 December 2006

Ms Jayne Randall
Environmental Officer
Minerals and Energy Division
Mining Regulation and Rehabilitation Branch
Primary Industries and Resources South Australia
Level 5, 101 Grenfell Street
Adelaide SA 5000

Re: Prominent Hill Copper-Gold Project Significant Environmental Benefit (SEB) Offset Area

Dear Jayne

Please find enclosed the Prominent Hill Copper-Gold Project SEB Offset Area Stage 1 Management Plan. This plan is intended to guide Oxiana in the establishment and management of the offset area to achieve a Significant Environmental Benefit for the Prominent Hill Copper-Gold Project, and is based on advice from a wide range of specialist consultants and government personnel.

Management of the offset area has already commenced, including:

- Exclusion of stock from the mining lease area, and the majority of the offset area.
- A targeted fauna survey was conducted during September 2006 to identify populations of the thick-billed grasswren and chestnut-breasted whiteface in the offset area, and estimate the populations of these birds in this area.
- Planning for further work in December 2006 to conduct detailed flora surveys in known habitat of these species to characterise the condition and composition of this vegetation at the macro- and micro-scale.
- Liaison with representatives from the Arid Recovery project to identify linking feral animal control activities (in particular, aerial baiting for foxes and feral cats) at Olympic Dam and around the Arid Recovery Reserve with feral animal control in the Prominent Hill offset area.

The Stage 1 short-term work will form the basis for the development of the Stage 2 plan, which will address the long-term management of the offset area. Condition 20 of the Mining Lease Approval document for the project states that Oxiana must submit a detailed SEB Offset Area Management Plan within 12 months from the grant of the lease. The Stage 2 plan will be this document, which must be submitted to PIRSA (who will refer it to DWLBC) in August 2007.

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As discussed during the meeting with PIRSA, DWLBC and DEH on 9 August 2006, Oxiana agreed to provide you with a copy of this plan to demonstrate how Oxiana intends to manage the offset area over and above on-site ecological restoration (i.e., managing the area for the benefit of the thick-billed grasswren and chestnut-breasted whiteface). In return, Oxiana was to receive a 50% reduction in the SEB ratio for the project. Any comments or advice that PIRSA, DWLBC or DEH personnel have regarding the management of the offset area will be appreciated and considered, however it should be noted that there is no regulatory requirement for Oxiana to address these comments for the Stage 1 Management Plan.

It would be appreciated if you could forward this report to other relevant personnel in PIRSA and DWLBC. Please contact me on 08 8229 6602 or Dan Moriarty at Enesar (03 9418 0600) if you have any questions.

Kind regards

Mick Wilkes

General Manager, Prominent Hill
Oxiana Limited

Prominent Hill SEB Offset Area Stage 1 Management Plan

Oxiana Limited, Prominent Hill Copper-Gold Project

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Prominent Hill Copper-Gold Project

Prominent Hill SEB Offset Area
Stage 1 Management Plan

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A Information on the chestnut-breasted whiteface and thick-billed grasswren.
B Baseline flora and fauna monitoring methods.
C Fencing methods, feral animal and kangaroo control.

1. Purpose of this Document

The Prominent Hill SEB Offset Area has been accepted in principle by regulatory authorities as an area providing a Significant Environmental Benefit (SEB) in the development of the Prominent Hill Copper-Gold Project. This document is intended to guide Oxiana in the establishment and management of the Prominent Hill SEB Offset Area (hereafter referred to as the 'offset area').

Development of the area has been divided into two stages:

- Stage 1 – focuses on the short-term management of the offset area (i.e., the next 6-12 months).
- Stage 2 – addresses the long-term management of the offset area (i.e., after Stage 1 and continuing for the life of the mine).

This document outlines the Stage 1 work that will provide the basis for the long-term management of the offset area, which will be guided by a Stage 2 (Final) Management Plan. This document:

1. Presents the background to the establishment of the offset area.
2. Describes the offset area.
3. Outlines vision and objectives for the area.
4. Canvasses issues relevant to its management.
5. Proposes essential Stage 1 works.
6. Outlines the elements of the Stage 2 (Final) Management Plan.
7. Proposes a timetable for development of the Stage 2 (Final) Management Plan.

2. Background

2.1 Introduction

Oxiana Limited (Oxiana) is developing the Prominent Hill Copper-Gold Project, located some 650 km north-northwest of Adelaide, about half way between Roxby Downs and Coober Pedy (Figure 1.1).

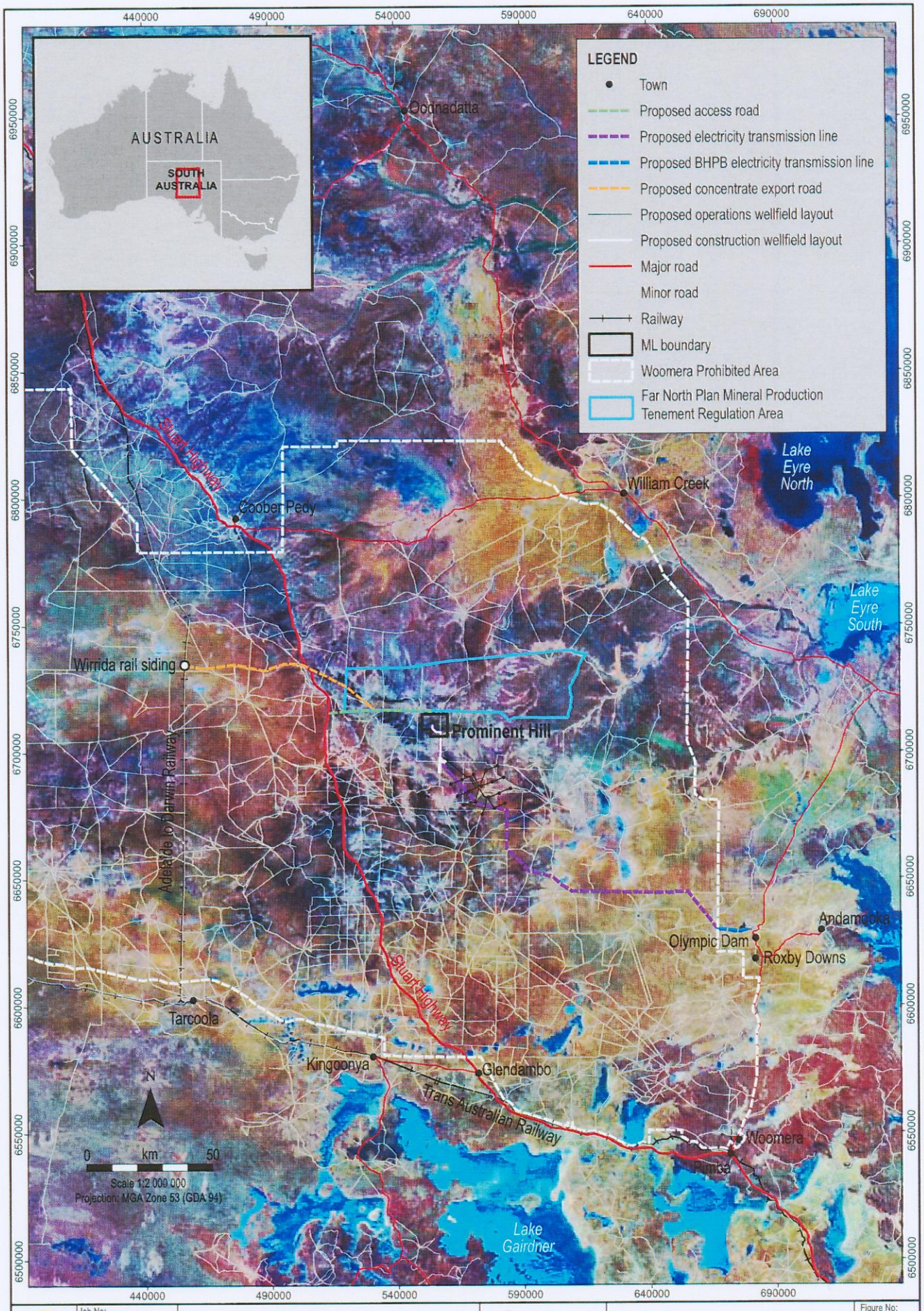
The environmental aspects of the project were assessed under the South Australian *Mining Act 1971*, which is administered by Primary Industries and Resources South Australia (PIRSA). The principal assessment/regulatory document is the Mining and Rehabilitation Program[1] (MARP). Assessment of the project via the MARP process under the *Mining Act 1971* was accredited by the Commonwealth Department for the Environment and Heritage (DEH) on 18 August 2005.

As part of the MARP submission (Enesar, 2006a), a Native Vegetation Management Plan (NVMP) (Enesar, 2006b) was developed in accordance with Version 3.12 of the MARP Guidelines for the Preparation of a Mining and Rehabilitation Program, (PIRSA, 2006a). The NVMP outlined how Oxiana intends to achieve a Significant Environmental Benefit (SEB) for the project by the provision and management of an SEB offset area within the Mount Eba Pastoral Lease.

Development of this SEB followed the Draft Guidelines for a Native Vegetation Significant Environmental Benefit Policy for the Clearance of Native Vegetation Associated with the Minerals and Petroleum Industry (DWLBC, 2005), and is consistent with the agreement by PIRSA that, in administering the Native Vegetation Regulations 2003, *inter alia*, the following objectives should be established for mining operations (DWLBC, 2005):

- Biological diversity of vegetation is maintained through appropriate land management practices, including a suite of measures such as vegetation retention and re-establishment.
- Where native vegetation clearance is unavoidable, measures are undertaken to counter-balance the loss of that vegetation with a significant environmental benefit either on the site or within the same region, either by works undertaken by the proponent, or through payment of money into the native vegetation fund (as established under the *Native Vegetation Act 1991*).
- The significant environmental benefit should support the highest possible biodiversity outcomes in terms of quality, position in the landscape, and ongoing management.

[1] The 'Mining and Rehabilitation Program' supersedes the 'Mining and Rehabilitation Proposal' following endorsement of the document by PIRSA.



enesar	Job No: 1126	Oxiana Limited	Oxiana LIMITED	Figure No: 2.1
	Date: 1126_17_F2.01_HB	Prominent Hill Project	Project location	

By managing the offset area, Oxiana will meet these guidelines for the provision of a SEB, i.e.:

- Biological diversity of vegetation in the offset area will be maintained and enhanced where possible through a range of land management practices (e.g., stock exclusion, fencing, feral animal control).
- The clearing of vegetation for the project footprint will be counter-balanced by a SEB at the site of operations (i.e., Mt Eba Pastoral Lease).
- The management of the SEB will be designed to support the highest biodiversity possible in that area, with specific focus on threatened species.

The proposed SEB offset area outlined in the MARP (and the NVMP) has been accepted in principle by PIRSA.

2.2 Consultation

Considerable consultation has taken place during the development of this management plan and the ideas and opinions of a range of stakeholders have been incorporated into the concepts for management, goals and issues associated with the offset area (Table 2.1).

Table 2.1 Stakeholders consulted for the management of the offset area

Organisation	Name	Position/Department	Date
Department for Environment and Heritage (South Australia)	Phillip Ainsley	Germplasm Research Coordinator	27/6/06
	Geoff Axford	Conservation Program Manager, Outback Region	7/7/06
	Jenny Bourne	Biological Science and Survey	27/6/06
	Peter Copley	Senior Ecologist, Threatened Species	26/6/06
	Angela Crimes	Senior Environmental Officer	27/6/06
	Jeff Foulkes	Coordinator, Biological Survey Science and Conservation	29/6/06
	Vicki Linton	Senior Ecologist	27/6/06
Department of Primary Industries and Resources South Australia	Eric Lock	Environmental Officer, Strategic Environmental Services	26/6/06 9/8/06
	John Morton	Manager, Regulation Services Minerals and Energy Division	9/8/06
	Jayne Randall	Environmental Officer, Minerals and Energy Division	23/6/06 9/8/06
Department of Water, Land and Biodiversity Conservation (SA)	Amanda Camp	Scientific Officer	26/6/06 9/8/06
	Graham Carpenter	Scientific Officer	9/8/06
	Craig Whisson	Assistant Executive Officer, NVC Secretariat	9/8/06
	Sarah Ryan	Senior Environmental Officer, Environmental Assessment Branch	23/6/06

Table 2.1 Stakeholders consulted for the management of the offset area (cont'd)

Organisation	Name	Position/Department	Date
Badman Environmental	Frank Badman	Private Consultant	Ongoing
Ecological Horizons	Katherine Moseby	Private Consultant	Ongoing
Francis Crome Consulting P/L	Francis Crome	Private Consultant	Ongoing

During this consultation, there was general consensus regarding:

- The need to begin baseline monitoring and assessment work as soon as possible.
- The lack of detailed knowledge about the ecology of threatened species in the offset area (particularly the chestnut-breasted whiteface and thick-billed grasswren).
- The importance of controlling the populations of feral animals in the offset area, particularly predators such as foxes and cats.
- Recognition that Oxiana was talking to the 'right people' to get the best possible advice as to how the offset area should be established and managed.
- The potential for Oxiana to achieve significant 'kudos' from stakeholders through this program.

However, some diverse opinions were evident regarding:

- The most important threatening processes to the threatened species in the offset area (particularly the chestnut-breasted whiteface and thick-billed grasswren).
- The focus of monitoring and assessment (i.e., monitoring to determine the success of the offset area versus monitoring to determine potential impacts of the mine).
- The best methods for meeting the objectives of the offset area, including:
  - The importance of excluding feral animals by the installation and management of a vermin proof fence versus installing a stock fence and using a range of other control methods.
  - The importance of including or excluding kangaroos from the offset area. Although kangaroos are a native species common to the region, they have the potential to significantly increase grazing pressure in areas where they are present in high densities.
  - The potential for creating a 'zoo' by installing a vermin and kangaroo proof fence around the perimeter of the offset area, thereby creating an offset area with few links to the surrounding environment.
  - The likely success and ability to band and relocate individual chestnut-breasted whiteface and thick-billed grasswren birds.
  - The advantages and disadvantages of feral animal control methods, e.g., ripping of rabbit warrens may reduce rabbit populations, however it is also likely to destroy habitat for the thick-billed grasswren.

3. The Offset Area

The area that Oxiana will manage and protect for the SEB is 12,415 ha of land within the Mount Eba Pastoral Lease. As this parcel of land incorporates the mine and its associated infrastructure, 11,129 ha of this land is considered to be the SEB offset area (i.e., 12,415 ha minus a disturbance footprint of 1,286 ha).

This offset area is more than double Oxiana's SEB offset requirements for the project and provides Oxiana with approximately 5,993 ha worth of SEB credits should they be required for future projects in South Australia.

The location of the offset area has been selected for the following reasons:

- It contains a significant proportion of habitat (bluebush stony rises interspersed with low lying cracking clay gilgais) (Plate 3.1 and 3.2) known to support the chestnut-breasted whiteface (Plate 3.3) and thick-billed grasswren (and possibly the plains rat) (Figure 3.1). These species are listed as threatened species under the South Australian *National Parks and Wildlife Act 1972* (NPW Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Information on the whiteface and grasswren is provided in Attachment A. The southwestern corner of the offset area was extended specifically to incorporate more of this habitat type.
- It encompasses areas of breakaway mallee painted hills habitat to the north (Plate 3.4 and 3.5). This habitat type will not be affected by project activities but is the preferred habitat for two plants of conservation significance, the NPW Act listed *Zygophyllum crassissimum* (thick twinleaf) and the EPBC Act listed *Frankenia plicata*.
- It contains the same habitat/vegetation types as those that will be disturbed by the project, including mulga creeklines (Plate 3.6) (Figure 3.2).
- It will facilitate management during the life of the mine as part of Oxiana's regular operations.

Plate 3.1
Bluebush stony rises.

Plate 3.2
Cottonbush gilgais on stony plains.

Plate 3.3
Chestnut-breasted whiteface.

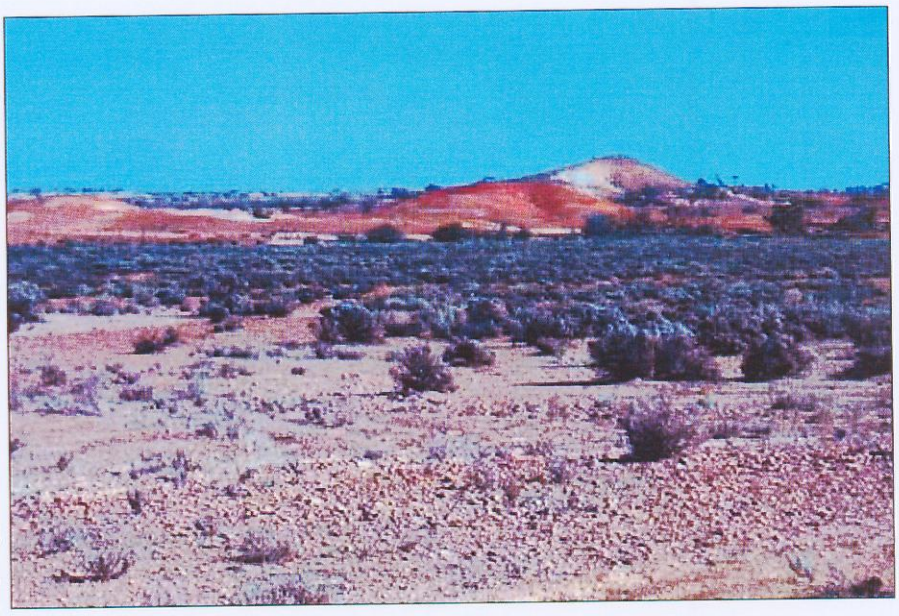
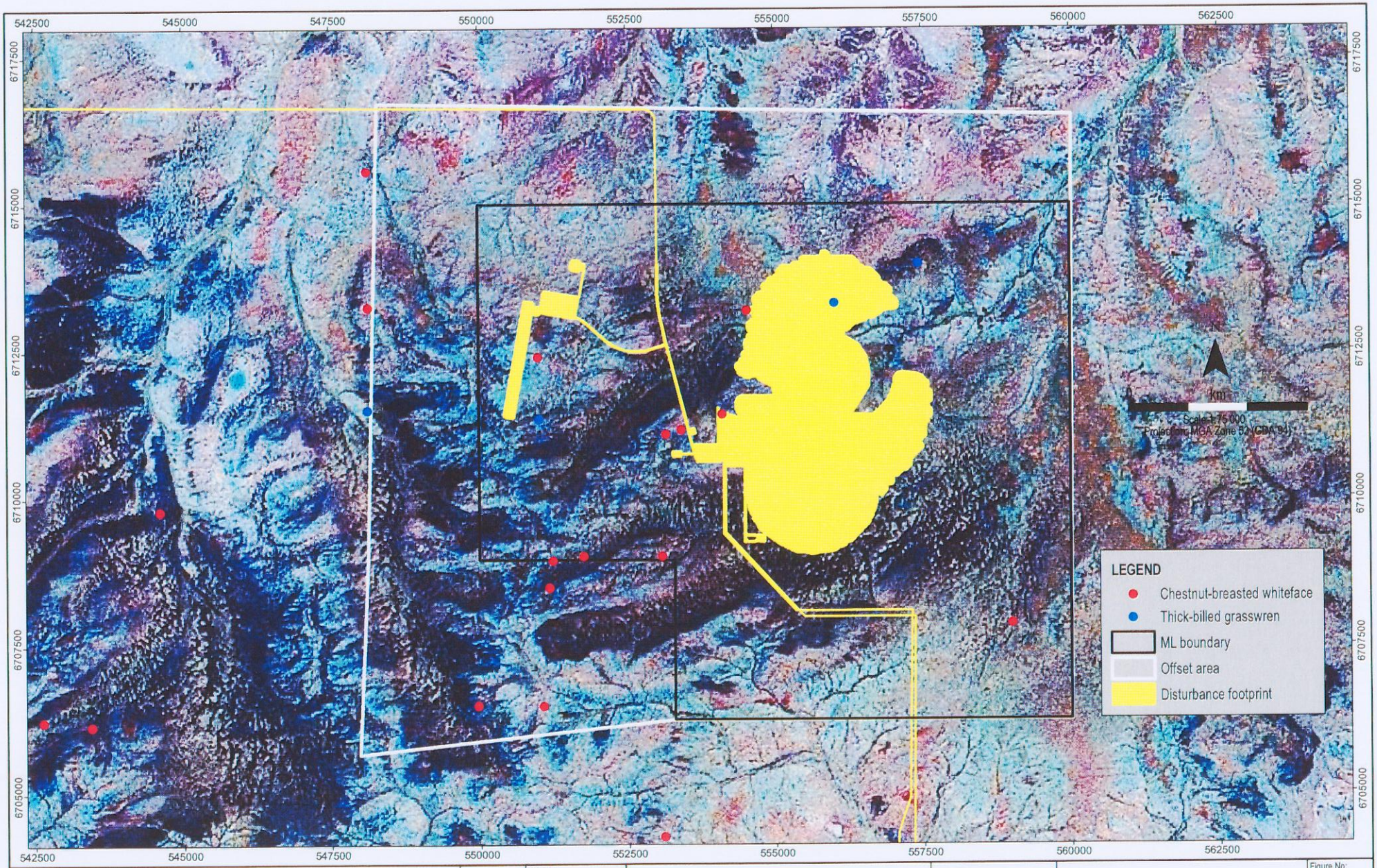


Plate 3.4
Prominent Hill landmark, with adjacent painted hills.

Plate 3.5
Mallee painted hills.

Plate 3.6
Mulga creeklines.



Source: Based on data from Moseby (2006).

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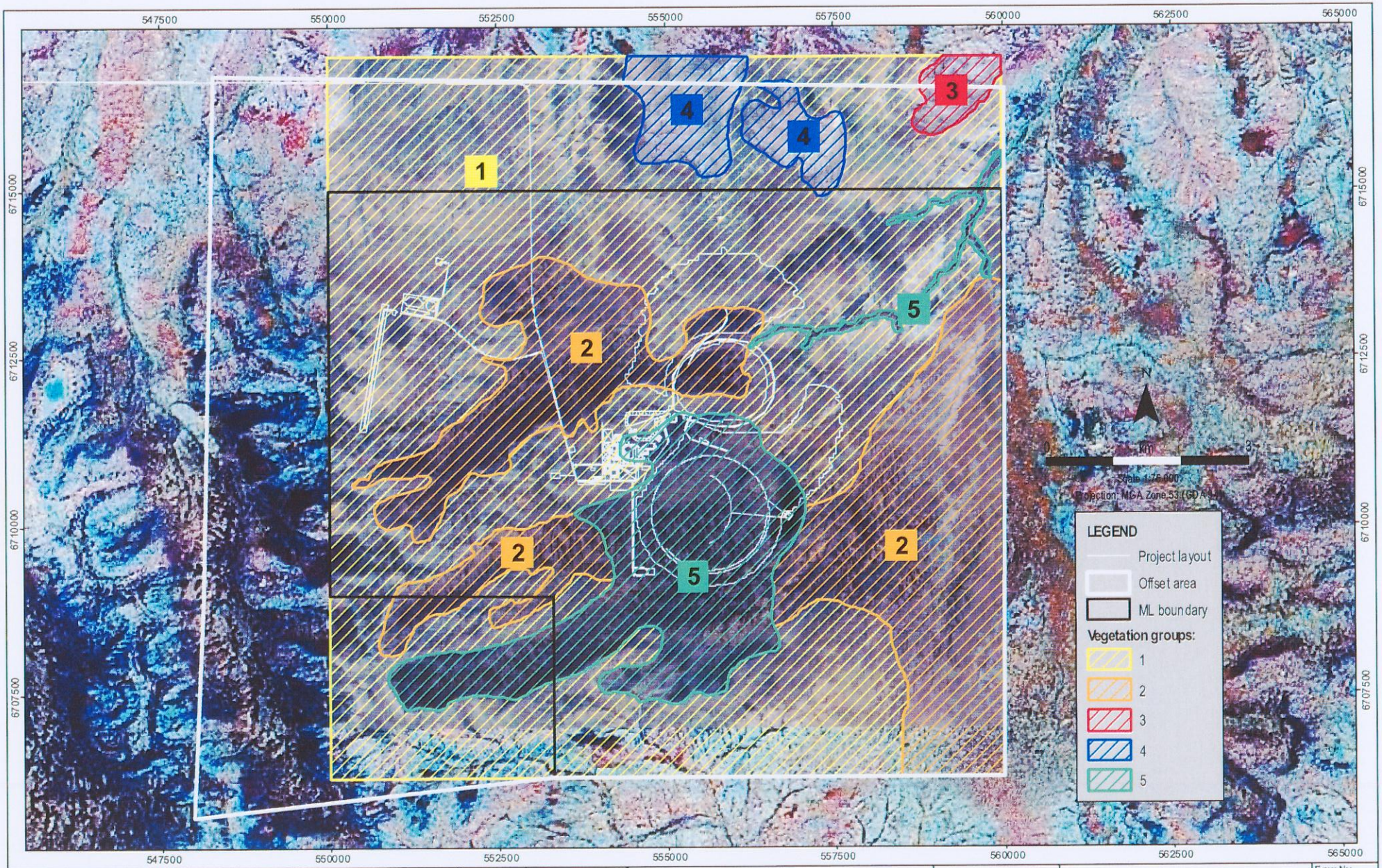
Proposed offset area and recordings of threatened bird species

Figure No: 3.1



Source: Based on data from Badman (2006).

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Vegetation groups in the offset area

Figure No: 3.2

4. Vision and Objectives

4.1 Vision

A vision should be developed for the Prominent Hill SEB Offset Area in the Stage 2 Management Plan. This vision is a higher-level conservation statement that is the philosophical underpinning of any plans developed for the area. The following vision has guided the development of this Stage 1 Management Plan and may be suitable for the Stage 2 (Final) Management Plan:

> That the Prominent Hills SEB Offset Area protects and enhances the survivability of an important sample of the ecosystems of the Stony Plains Bioregion and supports the long-term survival of the chestnut-breasted whiteface, the thick-billed grasswren and other important threatened species. In the long-term (i.e., post mine closure) the area will be self-sustaining with minimal ongoing maintenance and management requirements.

4.2 Objectives and Goals for Management of the Offset Area

The objectives for management of the offset area, in order of priority, are:

1. Enhance habitat for, and minimise the threatening processes to, two threatened birds species: the chestnut-breasted whiteface and the thick-billed grasswren.
2. Maintain and enhance the biodiversity of the area.
3. Develop particular management regimes for other threatened species, should they be found to occur within the area.
4. Ensure a secure and appropriate tenure for the area following closure of the mine.

4.2.1 Stage 1

Objectives

In Stage 1, the emphasis should be on **Objective 1**, which reflects the view that managing the offset area for the benefit of the chestnut-breasted whiteface and thick-billed grasswren:

- Is the primary goal.
- Is likely to address all or most of the threatening processes common to all objectives.
- Will put in place the primary monitoring systems required for the area.
- Is likely to assist the populations of other species in the region, with the plains rat (listed as vulnerable under both the EPBC Act and NPW Act) in particular being a likely beneficiary.

Stage 1 Goals

The goals identified for **Objective 1** are:

- Estimate the populations of chestnut-breasted whiteface and thick-billed grasswren in the offset area.
- Identify the locations of key populations of these species in the offset area.
- Identify the significant locations of macro-scale[1] natural habitat favoured by the chestnut-breasted whiteface and the thick-billed grasswren.
- Identify the micro-scale[2] natural habitat favoured by these species.
- Protect and begin enhancing the macro- and micro-habitat favoured by these species.
- Initiate activities to minimise known threatening processes to these species.
- Identify and minimise previously unknown threatening processes to these species.

4.2.2 Stage 2

Goals for the remaining objectives (2–4) will be developed in the Stage 2 (Final) Management Plan.

[1] Macro-scale habitat is defined as the living place of an organism, characterised by its physical or biotic properties (e.g., vegetation composition and substrate type).

[2] Micro-scale habitat is defined as a precise location within a habitat where an individual species is usually found.

5. Issues Relevant to Management

5.1 Structure

The management structure of the offset area needs to be finalised as part of the Stage 2 (Final) Management Plan. A working model that will be used during Stage 1 of management is described below.

5.1.1 Day-to-Day Management

The establishment of the offset area and its ongoing management should be the responsibility of the Oxiana Environmental Coordinator. Environmental Officers or field staff (as necessary) should support this person.

The specific tasks that the Environmental Coordinator should undertake for the offset area include:

- Liaising with Oxiana project management to ensure that resources are available to allow the timely completion of the work schedule outlined in Table 6.1.
- Managing sub-consultants to ensure that monitoring and assessment work is satisfactorily completed.
- Managing on-ground activities such as feral animal control and fence maintenance, as required.
- Developing relationships with government agencies and research institutions, as required, regarding the progress of the management of the offset area.

5.1.2 Scientific Committee

It is recommended that Oxiana establish a scientific committee to guide the ongoing management of the offset area, with this committee comprising Oxiana representatives (including but not limited to Environment Department personnel), South Australian government representatives (e.g., DEH and DWLBC personnel) and other relevant experts as required. Consideration should be given to including community and/or aboriginal representation on the committee.

The functions, operations and composition of the committee will be elaborated in the Stage 2 (Final) Management Plan.

5.1.3 Funding

Oxiana should provide funding for the establishment and ongoing management of the offset area. This funding should be allocated in the yearly project budget estimates for the project as an item under the Environment Department.

Oxiana should also investigate mechanisms for the funding of the management of the offset area after mine closure.

5.2 Requirement for Adaptive Management

It is recommended that a cautious adaptive management approach be adopted for the offset area. At present, the area is in relatively good condition given its remoteness from stock watering points and harbours good populations of the two main target species. Therefore, a staged approach to the level of management intervention is proposed, to minimise the potential for unforseen or unintended consequences. What may appear at first sight to be sensible management interventions may have potential unforeseen counterintuitive effects (see Section 5.6). As a result, the foundation of management of the offset area is:

- Adequate monitoring.
- Development of performance criteria.
- Small-scale, focussed research investigations to determine potential effects of management interventions, prior to their wholesale introduction.
- Alertness to early warning signs of new threatening processes.

5.3 Monitoring

5.3.1 Baseline Monitoring

The offset area can make use of the monitoring system that has been proposed for the mine to identify mine-related impacts to the flora and fauna of the area. The design of this mine-impact monitoring system is based on a distance-impact model and is shown diagrammatically in Figure 5.1.

Permanent flora and fauna monitoring sites at varying distances from the mine have been established throughout the offset area. Each site is an official South Australia Department for Environment and Heritage biological survey site at which flora, fauna and vegetation structure will be regularly measured using standard methods. The baseline data for these sites has already been collected as part of the EIA studies.

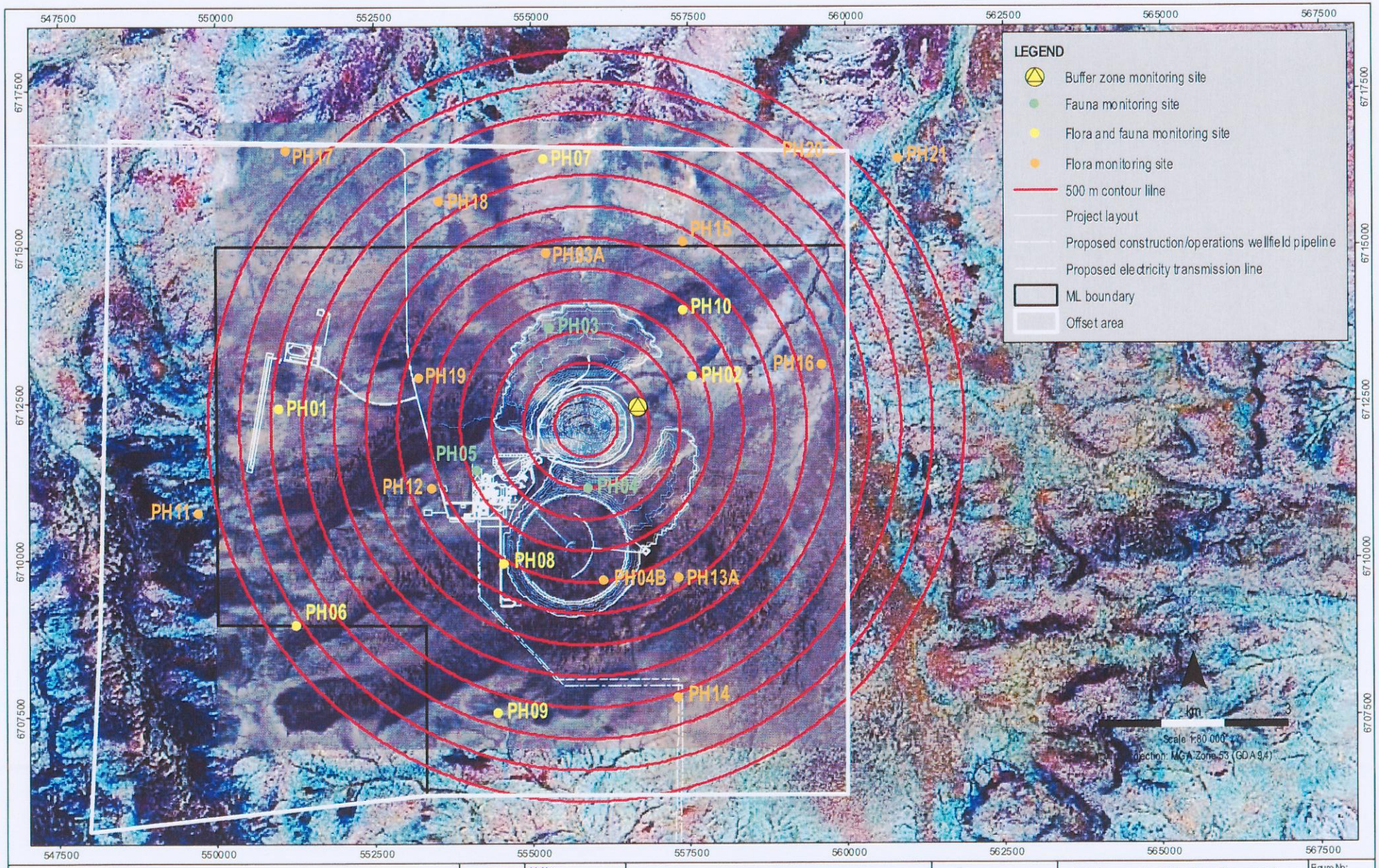
Details of suggested baseline monitoring procedures are presented in Attachment B. Baseline monitoring should be conducted in spring (August-September) and autumn (April) to sample seasonal variation. If significant rainfall occurs, opportunistic sampling should also be undertaken to detect short-lived events (e.g., mass hatching of aestivating frogs) characteristic of the arid zone.

Data collected at these sites can be used by Oxiana to monitor:

- Biodiversity composition.
- Status of major habitat types.

As part of the Stage 1 work the mine monitoring plan should be reviewed to determine if:

- Additional sites are required.
- Other parameters need to be measured (e.g., vegetation condition index).
- Direct measures of impacts need to be obtained at the sites (e.g., noise).



enesar people | place	Job No: 1126	Oxiana Limited	Oxiana	Distance stratification for existing flora and fauna monitoring sites in the offset area	Figure No: 5.1
	Date: 1126_17_F5.01_HB	Prominent Hill Project			

5.3.2 Monitoring of Buffer Zones

Monitoring of flora and fauna communities will be undertaken in the area immediately to the east of the mine pit to determine the extent of mine impacts in a 100 m wide 'buffer zone' (see Figure 5.1). This monitoring was specifically requested by DWLBC during consultation regarding the offset area.

Monitoring in the buffer zone will assess plant condition, dust deposition and fauna populations on a distance-impact transect away from the mine. Information gathered will potentially be of use to South Australian government agencies in determining the size of 'buffer zones' to be established around other mines in arid regions.

5.3.3 Species-based Monitoring

Chestnut-breasted whiteface and thick-billed grasswren

A targeted monitoring program for these species is being established. Adaptive management for these two species can then be based on adequate knowledge of population changes. Monitoring population variation and habitat forms the basis for assessing effectiveness of management in achieving the primary objective of the management of the offset area.

Population variation

This is a three phase process:

1. Survey the offset area to locate and delineate the populations of the two species.
2. Establish an appropriate census technique to estimate population size. Distance sampling is likely to be suitable in these habitats, but needs to be tested.
3. Establish a standard procedure for on-going monitoring of the key or major populations. It is suggested that surveying occurs at least twice annually (in spring and autumn).

Phases 1 and 2 of this process have been completed.

During consultation with DWLBC, banding of chestnut-breasted whiteface and thick-billed grasswren birds was discussed as a potential means of determining population variation in the offset area. Banding may allow for monitoring of individuals prior to, during and following the commencement of construction for the project. Birds present in areas to be disturbed by project infrastructure, the ML area and the offset area could be banded, with different colour banding used to identify their point of capture.

However, potential problems are associated with banding. These include:

- The large and intensive effort required to band a significant number of individuals from these species to allow for meaningful statistical assessment of monitoring results. This effort has the potential to place a large amount of stress on populations of these species, with an unknown impact of this stress (i.e., banding may do more harm than good).
- The need to re-locate banded individuals during subsequent monitoring.

- Difficulties in attaching and spotting bands on birds of this size.
- Difficulties in drawing sound conclusions from monitoring and management programs in the event that banded birds cannot be re-located (i.e., have the birds moved, died or become cryptic?).

As a result, banding of birds will not be undertaken at this stage. However, banding may be considered to monitor smaller populations of these species and their response to small-scale, focussed research investigations to determine potential effects of management interventions in the offset area.

Habitat dynamics

The chestnut-breasted whiteface and thick-billed grasswren are known to inhabit sparsely vegetated chenopod shrublands dominated by *Maireana*, *Atriplex* and *Eremophila* species. Present information indicates that within the offset area the whiteface is found in bluebush stony rises (Vegetation Group 1) and the grasswren in cottonbush gilgais on stony plains (Vegetation Group 2) (Moseby 2006 and Badman 2006) (see Figure 3.2).

The micro-scale habitat requirements for these species are not well known, although it is thought that:

- The chestnut-breasted whiteface prefers emergent taller trees of species such as *Acacia* and *Eremophila* within bluebush stony rise habitat.
- The thick-billed grasswren prefers larger cottonbush and saltbush shrubs in cottonbush gilgais on stony plains habitat.

Further investigation of these micro-habitat requirements is necessary prior to commencing monitoring of these habitat characteristics to further inform monitoring and management of the offset area. A similar three phase approach is required as for monitoring population changes.

1. Determine the microhabitat requirements of these species by assessing habitat of known populations once they have been delineated.
2. Establish an appropriate monitoring technique to track these microhabitat changes.
3. Establish a standard procedure for on-going monitoring of microhabitat changes.

Other species

Results from the baseline monitoring and any subsequent fauna surveys may result in other significant species being identified that need monitoring. For all other species a procedure to determine the approach to monitoring should be developed, and the following steps are recommended:

1. Determine if the species needs to be monitored (perhaps by a decision of the scientific committee).
2. If a decision to monitor is taken:

(a) Investigate what is to be monitored.
(b) Investigate a technique to monitor it or them.
(c) Establish a procedure for monitoring.

5.3.4 Monitoring of Threatening and Other Processes

If management resources focus on reducing threats to threatened species then the levels of these processes need to be monitored. The same procedure for establishing monitoring requirements outlined in the previous section should be followed.

5.4 Performance Criteria

Performance criteria need to be developed as part of the Stage 2 (Final) Management Plan. These criteria can be used both for assessing the effectiveness of management and expenditure and providing endpoints for monitoring.

5.5 Research and Investigations

Management of the offset area will be based on the best available information. In many cases this information will be readily available from existing knowledge and experience, while in others (e.g., effects of vermin-proof fencing), investigations will be required.

The Prominent Hill Environment Department may not have the time and/or skills required to carry out all the investigations that may be necessary. If this is the case, short-term consultancies and networking with research institutions will be required.

For urgent, critical and/or short-term investigations, consultancies will be necessary.

For medium and longer-term investigations, it is recommended that Oxiana actively approach research institutions (e.g., University of South Australia, Flinders University) and the Arid Recovery Project to develop an on-going research presence in the offset area. Factors underpinning any research program should include the need to:

- Focus research on that needed for management in return for logistical and possibly financial support by Oxiana.
- Ensure that researchers investigate *what* Oxiana is doing in management of the offset area, rather than dictate what Oxiana *should* do.

Prior to commissioning any investigations or work programs, the following needs to be established:

- Safe working procedures for visitors and researchers.
- The ethical requirements for working in the offset area. Oxiana may need to establish more stringent criteria than normal, e.g., no destructive sampling of fauna, to protect Oxiana's reputation.

5.6 Threatening Processes

Threatening processes in the offset area may include:

- Threats from grazers and predators:
  - Predation by feral animals, including foxes, cats, rats and mice.

  - Grazing impacts on habitat by stock and rabbits.
  - Trampling by stock.
  - Potential grazing impacts by native grazers, e.g., kangaroos.

- Weeds and pathogens.

- Disturbance by humans:
  - Inappropriate use of the offset area by mine personnel (e.g., for recreation).
  - Visitors.
  - Researchers.

- Potential mine impacts:
  - Dust and noise from the mine and traffic.
  - Additional infrastructure, e.g., roads and tracks.
  - Waste disposal.

Personnel involved in the management of the offset area will need to be aware of these potential threatening processes (and others that may arise) and manage them appropriately.

5.6.1 Threats from Grazers and Predators

The effects of feral predators and grazers are a major issue in the offset area and one that has already been discussed at length with stakeholders. Possible methods to control grazing and predation include a combination of fencing and/or removal of these animals, as discussed in Attachment C.

Vermin fencing has been found effective in assisting recovery of rare desert mammals, but the possibility of unforeseen effects exists in the case of the two bird species upon which management of the offset area focuses. For example, removing predators such as foxes and cats may allow an increase of native reptiles that are nest predators on birds, and the ripping of rabbit warrens may destroy habitat favoured by these species. Moreover, it is not known how the removal of grazing will effect the shrub habitats that these birds depend upon.

In addition to this significant factor, the following needs to be taken into account:

- Advice provided during consultation suggesting that removal and exclusion of stock, combined with appropriate control of feral animal populations, is likely to achieve the objectives of the management of the offset area.

- The potential that exclusion of kangaroos from the offset area may not be necessary to achieve the objectives of the management of the offset area.

- The desire to allow migration of populations of native fauna in and out of the offset area to avoid the creation of a 'zoo' within the fenced area.

- The very high cost of installing a vermin fence ($300-400,000) and relatively low cost of excluding stock and installing a stock fence (estimated to be $90,000).

- The high ongoing monitoring and maintenance requirements of a vermin fence (estimated to be one person full time for the duration of the fence being in place) and

comparatively low monitoring and maintenance requirements for a stock fence (estimated to be monthly).

Considering the above it is recommended that a conservative approach be taken to management of grazing and predation, i.e.:

1. As part of Stage 1 works, stock should be removed from the offset area. Investigations will determine whether a stock fence needs to be installed around the perimeter of the offset area to ensure the ongoing exclusion of stock from this area.

2. As part of the Stage 2 (Final) Management Plan, investigations should be carried out on a small scale as to the impact of various types of fencing on the target bird populations.

3. While the area is relatively free of vermin (i.e., foxes and cats), should vermin fencing or some other fencing method prove to be effective in further securing the populations of the target species, then the perimeter of the offset area can be fenced accordingly and appropriate predator and grazer removal undertaken.

5.6.2 Weeds and Pathogens

The area is relatively free of weeds. However, a weed and pathogen management plan needs to be developed for the offset area as part of the Stage 2 (Final) Management Plan. This should be developed in partnership with the mine monitoring system.

5.6.3 Disturbance by Humans

The Stage 2 (Final) Management Plan needs a set of procedures that control human and vehicular access and behaviour in the offset area.

5.6.4 Potential Mine Impacts

The mine monitoring system will be in place to detect and alert management to impacts related to the mine. There will be no mine-related activities in the offset area and methods to achieve this are detailed in the MARP.

5.7 Heritage Conservation

There may be pressure to include heritage conservation and the interests of aboriginal peoples in management of the offset area. This should be considered during planning of the Stage 2 Management Plan.

5.8 Stakeholder Consultation

Stakeholder consultation will be an essential aspect of management of the offset area. It is recommended that a consultation plan be developed by the Prominent Hill Environmental Coordinator to inform stakeholders of progress, results and activities associated with the management of the area. This consultation should be linked into the consultation required under regulatory approvals issued for the Prominent Hill mine to ensure efficient and effective communication between stakeholders.

6. Work Schedule

6.1 Stage 1

Table 6.1 presents a timetable for Stage 1 works, which fall into five main areas:

1. Undertake essential establishment tasks.
2. Establish management system.
3. Establish monitoring program.
4. Establish networking with institutions.
5. Commence preparation of Stage 2 (Final) Management Plan.

Table 6.1 Timetable for Stage 1 works

Task	Milestone date
1 Undertake essential establishment tasks	Q4 2006
1.1 Removal of stock from offset area	
1.2 Establish safety procedures	
1.3 Arrange logistical support for investigators	
1.4 Establish ethics requirements for management and research	
2 Establish management system	Q4 2006–Q1 2007
2.1 Design management system	
2.2 Recruit scientific committee	
3 Monitoring in Stage 1	Q4 2006–Q1 2007
3.1 Baseline monitoring	
3.1.1 Review mine monitoring plan	
3.1.2 Undertake first baseline monitoring for offset area	
3.2 Establishment of species based monitoring	
3.2.1 Populations	
3.2.1.1 Survey whiteface and grasswren populations	
3.2.1.2 Determine ongoing monitoring techniques and procedures	
3.2.2 Habitat	
3.2.2.1 Determine microhabitat needs of grasswren and whiteface	
3.2.2.2 Determine ongoing monitoring techniques and procedures	
3.2.3 Threatening Processes	
3.2.3.1 Identify previously unknown threatening processes	
4 Establish networks with universities and others	Q1–Q2 2007
5 Initiate activities to control threatening processes	
6 Initiate activities to enhance micro- and macro-habitat	

6.2 Stage 2

The schedule for Stage 2 works will be detailed in the Stage 2 (Final) Management Plan. It is proposed that development of this plan commence in Q1 2007 and involve:

- Refining the vision, objectives and goals for the long-term management of the area.
- Reviewing achievements, issues and problems associated with Stage 1.
- Designing investigations required to inform the long-term management of the area.
- Establishing performance criteria for the management of the area.
- Preparing the plan.

The Stage 2 Management Plan must be completed by August 2007, in accordance with Condition 20 of the Mining Lease Approval document (PIRSA, 2006b), which states:

> The lessee must submit a detailed Significant Environmental Benefit Offset Area Management Plan to the satisfaction of the Chief Inspector within 12 months from the grant of the lease. This must include an inventory of the flora and fauna within the offset site and a plan for the long-term future management and monitoring activities.

7. Structure of the Stage 2 (Final) Management Plan

The suggested structure of the Stage 2 (Final) Management Plan is presented in Table 7.1. This should be refined during development of the plan.

Table 7.1 Structure of the Stage 2 (Final) Management Plan

1 Introduction	Sets the scene and why the offset area was established.
2 Location and Features	
2.1 Location	Description of locations and boundaries including coordinates of corners.
2.2 Geology and Landscapes	Brief description of geology and landscapes.
2.3 Vegetation	Vegetation description and maps.
2.4 Flora	List flora and identify significant species for management.
2.5 Fauna	List fauna and identify significant species for management.
3 Tenure	Describes tenure of the area.
4 Management Structure	Describes management structure and responsibilities.
5 Vision	Statement of vision for the offset area.
6 Management Objectives and Goals	Elaborates objectives and goals with time frames.
7 Performance Criteria	Establishes performance criteria for goals and monitoring.
8 Managing Natural Heritage	
8.1 Geology, soils and landform	
8.2 Hydrology	
8.3 Native vegetation	Succinctly describes the methods for management of these components of the offset area. This is a standard SA approach but the managers of the offset area may prefer a management plan structured on the objectives and goals.
8.4 Native fauna and flora	
8.5 Exotic fauna including predators and grazers	
8.6 Exotic flora - weeds	
8.7 Pathogens and disease	
9 Managing Human Activities	
10 Closure Planning	Establishes processes for achieving sustainability of the offset area following mine closure.
11 Networking and Research	
11.1 Collaboration	Establishes basis for interaction with research institutions.
11.2 Ethics	Sets out ethics requirements for work in the offset area.
11.3 Investigations plan	Sets out investigations required to achieve management objectives and goals and how this will be achieved. The suggested topics for the first 3 years are as follows: • Effects of various fencing regimes on target species. • Analysis of microhabitat requirements of target species. • Targeted fauna and flora surveys (every two years). • Effectiveness of predator and grazer removal.

Table 7.1 Suggested Stage 2 (Final) Management plan for the offset area (cont'd)

12 Monitoring	
12.1 Baseline Monitoring	Describes monitoring system in detail.
12.2 Species-based monitoring	Describes monitoring system in detail.
12.3 Monitoring of threatening and other processes	Describes monitoring system in detail.
13 Safety Plan	Describes safety plan (ideally the same as the mine but may require additional guidelines for carrying out some research activities).
14 Consultation Plan	
15 Work schedule (high level – life of mine))	
16 Work schedule (detailed - first three years)	
17 Budget	

8. References

DWLBC, 2005. Guidelines for a native Vegetation Significant Environmental Benefit Policy for the Clearance of native vegetation associated with the minerals and petroleum industry. Prepared for the Native Vegetation Council. Department of Water, Land and Biodiversity Conservation, Government of South Australia. September 2005.

Enesar. 2006a. Prominent Hill Copper-Gold Project - Mining and Rehabilitation Proposal. Report prepared for Oxiana Limited by Enesar Consulting Pty Ltd. CR 1126_8_v3. March.

Enesar. 2006b. Prominent Hill Copper-Gold Project – Native Vegetation Management Plan. Report prepared for Oxiana Limited by Enesar Consulting Pty Ltd. CR 1126_11_v2. March.

PIRSA. 2006a. Mining Regulation and Rehabilitation Branch. 2006. Guidelines for the Preparation of a Mining and Rehabilitation Program (MARP). Version 3.12. Mining Regulation and Rehabilitation Branch, Minerals Group, Minerals and Energy Resources, Primary Industries and Resources SA.

PIRSA. 2006b. Mining Regulation and Rehabilitation Branch. 2006. Assessment Report for the Grant of a Mineral Lease to Minex Pty Ltd for Prominent Hill Mine. Mineral Claims 3515-3546 (inclusive). Minister for Mineral Resources Development. South Australia. July.

Attachment A

Information on the chestnut-breasted whiteface and thick-billed grasswren

Chestnut-breasted Whiteface. The chestnut-breasted whiteface (*Aphelocephalus pectoralis*) is the only bird species endemic to arid South Australia, and is listed as rare under the South Australian National Parks and Wildlife Act 1972 (NPW) Act. Much of its range lies within the Stony Plains Bioregion. Perennial chenopod shrubs, including *Maireana astrotricha*, and areas of bare substrate with large shrubs or small trees providing shade or shelter are important habitat features for this species (Pedlar, 1992 cited in Moseby, 2006). Read and Badman (1999 cited in Moseby, 2006) consider the species to be most frequently recorded in low rocky hills that are sparsely vegetated with bluebush and *Eremophila*. Habitat degradation by stock and rabbits is considered a threat to the survival of the species (Pedlar, 1992 cited in Moseby, 2006). The closest recorded occurrence of the chestnut-breasted whiteface to Prominent Hill is 78 km south of Coober Pedy, and it has not been previously recorded within 50 km of the project area. During the fauna surveys, this bird was recorded at a wide range of survey locations in the project area and surrounding region. The species is likely to be sympatric[1] with the thick-billed grasswren (Pedlar, 2000 cited in Moseby, 2006) and is considered sedentary in favoured habitat areas, with dispersal to adjacent habitat following periods of population build-up that may only remain viable for months or seasons while favourable conditions permit. Pedlar (1992 cited in Moseby, 2006) and Brandle (1998 cited in Moseby, 2006) consider the habitat of the region to be critical to the conservation of the species, with only four other records of this species from the entire Lake Eyre South catchment (Read and Badman, 1999 cited in Moseby, 2006).

Thick-billed Grasswren. The eastern subspecies of the thick-billed grasswren (*Amytornis textilis modestus*) is listed as vulnerable under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) and rare under the NPW Act. Previously occurring in New South Wales, South Australia and the Northern Territory, this species has suffered a significant range contraction and is now thought to have disappeared from New South Wales (probably due to habitat destruction (Schodde, 1982 cited in Moseby, 2006)), and is restricted to chenopod shrublands dominated by *Maireana* and *Atriplex* species (Garnett and Crowley, 2000 cited in Moseby, 2006). The species is considered shy and reclusive (Morocombe, 2000 cited in Moseby, 2006) and has not been formally recorded in any conservation reserves (Neagle, 2003 cited in Moseby, 2006). The Stony Plains Bioregion contains most of the range of the thick-billed grasswren and forms critical habitat. Regionally, it has been recorded in several locations to the east (3 km), southeast (30 km) and northeast (20 km) of the project area.

References

Badman, F. 2006. Prominent Hill Baseline Vegetation Survey. Badman Environmental. Report prepared for Oxiana Limited. March.

Moseby, K. 2005. Prominent Hill Flora and Fauna Desktop Assessment. Report prepared by Ecological Horizons Pty Ltd. January.

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[1] Sympatric species area those that occupy similar habitats or whose habitats invariably overlap.

Attachment B

Baseline flora and fauna survey methods

1. Flora Surveys

Flora surveys should be in accordance with the Guide to a Native Vegetation Survey using the Biological Survey of South Australia methodology and should follow the methods used in baseline surveys of the area to date.

Baseline monitoring sites (in addition to those established in the ML area in 2005) should be established in areas of suitable vegetation (macro-habitat) for the chestnut-breasted whiteface and thick-billed grasswren.

Survey methods should include surveying a 1 ha (100 by 100 m) quadrat at each site, recording the following characteristics:

- Vegetation structure.
- Vegetation condition.
- Species composition and dominance.
- Cover abundance (Braun-Blanquet system).
- Presence or absence of introduced species (weeds).
- Level of disturbance.
- Environmental features including landform and surface lithology.

Within this quadrat, a 100 m-long Jessup Transect may be established to record the number of plants belonging to each long-lived perennial species in a quadrat 100 m long and 4 m wide. It is anticipated that this will increase the knowledge of micro-habitat vegetation characteristics in areas favoured by these species.

Data from the monitoring sites should be analysed by means of the multivariate techniques of ordination and classification to allow for the identification of vegetation groups (at the macro- and micro-scale) in the offset area.

2. Fauna Surveys

Baseline fauna surveys in the offset area should target:

- Known populations of the chestnut-breasted whiteface and thick-billed grasswren.
- Known habitat favoured by these species.

This will provide information regarding the location of these species in the offset area, and allow characterisation of their distribution in this area. Subsequent monitoring of populations of the chestnut-breasted whiteface and thick-billed grasswren will provide valuable information regarding the ecology of these little-known species, including:

- Seasonal variation in population size and/or distribution.
- Preferential use of habitat.
- Breeding rates.
- Responses to disturbance.

A potential capture, banding and release program for the chestnut-breasted whiteface and thick-billed grasswren should be investigated. Banding may allow for monitoring of individuals prior to, during and following the commencement of construction for the project. Birds present in areas to be disturbed by project infrastructure, the ML area and the offset area could be banded, with different colour banding used to identify their point of capture.

However, potential problems are associated with banding. These include:

- The large and intensive effort required to band a significant number of individuals from these species to allow for meaningful statistical assessment of monitoring results. This effort has the potential to place a large amount of stress on populations of these species, with an unknown impact of this stress (i.e., banding may do more harm than good).
- The need to re-locate banded individuals during subsequent monitoring.
- Difficulties in attaching and spotting bands on birds of this size.
- Difficulties in drawing sound conclusions from monitoring and management programs in the event that banded birds cannot be re-located (i.e., have the birds moved, died or become cryptic?).

Attachment C

Fencing methods, feral animal and kangaroo control

Management of predators and grazing

1. Fencing to exclude predators and grazers

Three fencing options have been considered:

- Vermin fence.
- Kangaroo fence (including vermin fence).
- Stock fence.

Each of these are discussed below.

1.1 Vermin Fence

This type of fence would be installed to prevent vermin (cats, foxes and rabbits) and stock from entering the offset area, and has been used effectively at the Arid Recovery Project site at Roxby Downs. By excluding vermin and stock, grazing and predation pressure is reduced inside the offset area.

A vermin fence is typically approximately 1.0 to 1.2 m high and generally consists of: a floppy top to prevent climbing animals scaling the fence; wire netting with approximately 30 mm mesh at the base to prevent rabbits passing through; and a mesh apron at its foot (either loosely buried or covered with rocks) to deter animals pushing or digging under the fence. Variations to this design can include the use of electric wires to further deter climbing animals from scaling the fence.

Advantages

Vermin fences are highly effective at excluding vermin and stock from entering the offset area. For example, cats or foxes have never breached the Arid Recovery Project fence since its installation in 1998 (Arid Recovery, 2006). They allow for increased control of vermin inside the offset area, and minimise the potential for weed introduction by stock. Given their relatively low height, vermin fences also allow for most kangaroos and emus to cross the fence.

Disadvantages

Vermin fences are expensive and labour-intensive to install (approximately $7,000 per kilometre, with a total estimated cost of $315,000 and 45 days to install), and have high on-going maintenance requirements (weekly check of integrity of fence, removal of animals, maintenance and repairs) to ensure their effectiveness. Protection of the offset area using a fence such as this can lead to management of the offset area focussing on the fence rather than what is inside it, and also requires the management of kangaroo populations in the offset area. The use of this type of fence also creates a 'closed' environment for ground-dwelling native species within the fenced area.

1.2 Kangaroo Fence

In addition to preventing vermin (cats, foxes and rabbits) and stock from entering the offset area, this type of fence would also exclude kangaroos (and emus), thereby further reducing the threat of over-grazing within the offset area. The installation of this fence should only be considered if it was determined that kangaroos should be excluded from the offset area.

A kangaroo fence is almost identical to the vermin fence in design, but is typically 1.8 to 2.0 m high. The fence could also be electrified.

Advantages

The advantages of this type of fence are similar to those of vermin fences, with the added advantage of excluding kangaroos from entering the offset area.

Disadvantages

The disadvantages of kangaroo fences are similar to those of vermin fences, however they are even more expensive and labour-intensive to install (approximately $9,000 per kilometre, with a total estimated cost of $405,000 and 45 days to install).

1.3 Stock Fence

This type of fence would reduce grazing pressure and habitat degradation in the offset area by excluding stock. It would not exclude vermin, and as such needs to be considered in conjunction with a co-ordinated strategy of feral animal control.

A stock fence typically consists of 3 or 5 strings of wire. Wires in the lower portion of fence can be more closely spaced together to hinder access to the offset area by dingoes.

Advantages

A stock fence is relatively simple and inexpensive to install (approximately $2,000 per kilometre, with a total estimated cost of $90,000 and 15 days to install) and maintain (monthly check of integrity of fence, maintenance and repairs) in comparison to the other types of fences considered. It would be effective at excluding the majority of stock from the offset area and allow for kangaroos, emus and other native ground-dwelling fauna to cross the fence, thereby reducing the 'zoo' effect that would be created by installing a vermin/kangaroo fence.

Disadvantages

The main disadvantage of a stock fence is that it would not exclude vermin from the offset area. As such, other methods of vermin control in the offset area would be required.

2. Control of Feral Animal Populations

By controlling feral animal populations, threatening processes to the chestnut-breasted whiteface and thick-billed grasswren such as predation by foxes and cats and habitat degradation due to over-grazing are likely to be minimised.

The baseline monitoring and assessment program will guide the development of the adaptive management plan for feral animal control in the offset area, e.g., levels of existing populations, species to target and level of control necessary. Following this, it will be possible to assess the most suitable methods for achieving these objectives. These will depend on:

- Management objectives.
- Season.
- Population levels
- Resources available.

Four widely used methods are considered below.

2.1 Baiting

The Arid Recovery Project has used annual aerial cat and fox baiting around the perimeter of its reserve and has recently extended this aerial baiting to quarterly in an attempt to improve its effectiveness (Arid Recovery, 2006). 1080 (sodium monofluoroacetate) sausage baits are commonly used, with bait intensity, frequency and location able to be varied to determine the best regime for fox and cat control. There is the potential for native predators to be poisoned by ingesting these baits, however there is conflicting evidence as to whether this poison kills these animals (NSW NPWS, 2006).

2.2 Shooting

Professional shooters can be employed to control the populations of foxes and cats, however government regulations prohibit firearms on a mine lease.

2.3 Trapping

Permanent traps can be set to reduce cat, fox and rabbit populations. In the Arid Recovery Project, soft-leg traps with audio lures have been successfully used to control fox and cat populations around the perimeter of the reserve (Arid Recovery, 2006). These traps are linked to a remote telemetry system that allows them to be 'checked' daily, and a similar system could be used for this project. When the traps have been triggered, personnel are able to visit specific traps to remove and destroy the trapped animals and re-set the trap.

2.4 Ripping of Warrens

The ripping of rabbit warrens is highly effective in reducing populations of rabbits. However, there is concern that several native species (including the thick-billed grasswren) use warrens as habitat, and that their destruction may affect the populations of these native species. Ripping of warrens should not be undertaken before it can be

shown that doing so would not have a significant detrimental effect to the population of the thick-billed grasswren in the offset area.

3. Control of Kangaroos

Kangaroos have the potential to place significant grazing pressure on the offset area if populations are not controlled. In the event that a stock fence is installed, a co-ordinated program to control the population of kangaroos in and around the offset area may be needed and could include:

- Reducing the amount of surface water in the offset area, thereby reducing the attraction for kangaroos.
- Reducing the number of stock watering points surrounding the offset area (in consultation with pastoralists).
- Culling of kangaroos if/when their population reaches levels that can potentially have a significant detrimental effect on the quality of habitat favoured by the chestnut-breasted whiteface and thick-billed grasswren.

4. References

Arid Recovery. 2006. Arid Recovery – Restoring Australia's Arid Lands. A www publication accessed in July 2006 at www.aridrecovery.org.au.

NSW NPWS 2006. New South Wales National Parks and Wildlife Service. Aerial baiting for wild dogs: the impact on spotted quoll populations. A www publication accessed in July 2006 at: www. nationalparks.nsw.gov.au/npws.nsf/Content/aerial_baiting.