Triako Resources Limited

ABN: 46 008 498 119

REVIEW OF ENVIRONMENTAL FACTORS

for the

Exploration Decline at the Hera Deposit

within Exploration Licence 6162

Via Nymagee

Prepared by:

R.W. CORKERY & CO. PTY. LIMITED

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SECTION 1 INTRODUCTION

1.1 SCOPE

This Review of Environmental Factors (REF) provides the Department of Primary Industries (Mineral Resources) (DPI(MR)) with a description and environmental assessment of the exploration decline at the Hera deposit near Nymagee (**Figure 1.1**), proposed by Triako Resources Limited. The exploration activities involved are being undertaken within Exploration Licence 6162.

Information is provided on the proposed Category 3 exploration activities including an exploration decline and bulk sampling. The information is provided in sufficient detail to allow DPI(MR) to confidently identify the likely extent, duration and significance of any environmental effects arising from the exploration activities.

This REF is to be assessed by DPI(MR) under Part 5 of the *Environmental Planning and Assessment Act 1979* and as such, follows the requirements for matters to be included in a REF, which are provided in **Annexure 2** (DPI(MR), 2005).

1.2 THE PROJECT SITE

The Project Site is coincident with "The Peak" property (Lot 664, DP 761702, Parish of Roset). The property covers an area of approximately 2 000ha and is also covered by Western Lands Lease 2455.

1.3 THE COMPANY

Triako Resources Limited ("Triako") was a public company listed on the mining board of the Australian Stock Exchange. Triako, a gold explorer focussing on the Mineral Hill to Cobar region in Central New South Wales, became a wholly owned subsidiary of CBH Resources Limited (CBH) in October 2006. Triako owned and operated the low cost gold-copper Mineral Hill Mine, which is planned to re-open under CBH's ownership. Triako holds prospective exploration tenements north and south of Mineral Hill Mine over a distance of 120km, including the Hera polymetallic deposit. This area of tenements will be the focus of considerable exploration activity over the next few years with the objective to develop a number of small satellite mines feeding ore to the processing plant at the Mineral Hill Mine.

1.4 FORMAT OF THE DOCUMENT

This REF has been prepared in seven sections with a set of appendices.

Section 1: presents a brief outline of the objectives and proposed activities, introduces the Company and identifies the personnel involved in the preparation of this REF.

Section 2: briefly identifies the Category 3 exploration related activities planned for the Hera deposit. This section specifically emphasises those proposed activities that have potential to impact on the local environment.

Section 3: provides an overview of the relevant aspects of the existing environment, discusses the environmental management measures the Company would incorporate into its proposed activities and provides an assessment of any residual impact following the implementation of those measures.

Section 4: provides a conclusion and a justification for the proposed exploration decline activities.

Section 5: provides a Plan of Environmental Management, consisting of a number of individual management plans, as requested by DPI(MR).

Section 6: presents all relevant figures for the proposed activities.

Section 7: provides a list of the reference material referred to throughout this document.

The following appendices are included in this document.

Annexure 1: provides the Notification of Exploration Activities as required under Part 5 of the *Environmental Planning and Assessment Act 1979*.

Annexure 2: presents a table of the Matters for Inclusion in a Review of Environmental Factors as presented in the Department of Minerals Resources document *EDG09 Sample Contents of a Review of Environmental Factors* as well as a table providing the factors that the determining authority is required to consider when assessing the REF in accordance with Clause 111 of the *Environmental Planning and Assessment Act 1979*. The tables presented in this annexure also identify where these matters are addressed in this REF.

Annexure 3: acid rock drainage investigations report, prepared by GeoTerra.

Annexure 4: flora and fauna assessment report by Charles Sturt University Johnstone Centre.

Annexure 5: Aboriginal heritage information, including the Hera related extract from a previous Aboriginal heritage assessment and subsequent correspondence from John Appleton, consultant archaeologist.

Annexure 6: a preliminary soils assessment prepared by Geoff Cunningham Natural Resources Consultants Pty Ltd for soils samples from the settling ponds and WRD sites

1.5 CONSULTATION

Discussions were initially held with Ms Judith Egan and Mr Craig Roberts, both of DPI(MR), Broken Hill, with respect to the appropriateness of the REF process for this exploration activity and the level of detail required in the REF. Comments were provided on a draft version of the document by Mr Scott Brooks, also of DPI(MR). The text has been adjusted to reflect Mr Brooks' comments.

The Company has consulted with the nearest neighbour, Ms Janenne Dunne, whose main issue relates to where the water for the proposal would be sourced. This issue is addressed in Section 2.13.2.

Additionally, the Company held a community presentation for the project in Nymagee on the 12th April 2006 to discuss the planned exploration activities with the local community. The presentation was attended by approximately 50 people, including representatives of the local media, DPI(MR) and Council.

Issues arising from this meeting are listed below, along with the section of the REF where the issue is addressed.

Community Issues	Comment / Relevant REF Section
Where would the mine source its water? Would bore water be sufficient for the operation's commencement?	Section 2.13.2.1
Is there water in the old Nymagee mine?	Yes, but not suitable for use - not applicable to this project
Where would the exploration decline source power from?	Section 2.13.1
What is the potential for other exploration / mine sites in area?	Hebe deposit to the south of Hera on "The Peak". Not yet fully explored.
Rural Fire Service – would explosives be used on site etc. impact on RFS, ie. would it stretch their services?	Section 2.6.4
Have you started tendering process for contractors / suppliers etc?	Not yet – would commence once have approval from DPI(MR)
Are all drill holes on your own land?	All Hera related drill holes are on "The Peak"
When drilling exploration holes on private land and the Company strikes water – can the landowner access the water identified?	Dependant on requirements for bore licences. Not applicable to this project.
What are the nine threatened bird species identified on the property?	Section 3.3.4.1

Community Issues	Comment / Relevant REF Section
Impact on local employment?	Section 2.18
Which way would the ore be transported to Mineral Hill if the ore goes there?	Section 2.14.3.2
Bee keeper – what about chemicals etc. from explosives etc? Would it kill trees and affect my business?	Section 2.10 Section 3.3.7.2

Additionally, letters have been forwarded to the Condobolin Local Aboriginal Land Council and the Widajuri Condobolin Cultural and Heritage Company to advise them of the proposed activities and notify them that the Aboriginal heritage assessment that they were involved in during 2004 applies (refer to Section 3.3.5).

1.6 DOCUMENT PREPARATION

This document was prepared by Kim Ferguson (B. Env. Sc. (Hons)), Senior Environmental Consultant with R.W. Corkery & Co. Pty Limited initially, in conjunction with Peter Ingham, Mining Consultant, with Triako Resources Limited. The document has been finalised by Agi Patrikios, Group Manager Mining with CBH and reviewed by Rob Corkery, principal of R.W. Corkery & Co. Pty Ltd.

Specialist assessments were undertaken for a number of environmental aspects by the following specialist consultants.

- Acid rock drainage investigations: GeoTerra (Andrew Dawkins).
- Surface water management: Department of Lands Soil Conservation Service (David Howley).
- Ecology: Charles Sturt University Johnstone Centre – Environmental Consulting (Craig Grabham, Leigh Thompson and Steven Sass).
- Aboriginal heritage: Archaeological Surveys and Reports Pty Ltd (John Appleton).
- Soils: Geoff Cunningham Natural Resource Consultants Pty Ltd (Geoff Cunningham)

SECTION 2 DESCRIPTION OF PROPOSED ACTIVITIES

2.1 OUTLINE AND OBJECTIVES

2.1.1 Introduction

This section details the activities proposed to be undertaken on "The Peak" property to establish and operate an exploration decline into the Hera deposit (**Figure 2.1**). The information is presented in sufficient detail to allow the potential environmental effects arising from these activities to be identified and assessed (refer to Section 3).

2.1.2 Outline

The activities to be undertaken as part of the Category 3 exploration works are as follows and are illustrated on **Figure 2.2**.

- Site establishment
  - Surface infrastructure area including;
    - office, unsealed carpark and ablutions;
    - laydown area;
    - fuel and generator storage area; and
    - workshop.
  - Access road to surface infrastructure area.
  - Box cut to create the portal for the exploration decline.
  - Waste rock dump (WRD) for the waste rock from the box cut and exploration decline.
  - Ore stockpile for the bulk sample.
  - Settling ponds for the containment of dewatered groundwater.
  - Two ventilation rises to provide fresh air to the deeper sections of the exploration decline.
  - Waste disposal trench.
- Exploration decline establishment
  - Use conventional underground mining methods to create an exploration decline with two sub-levels.

- Resource definition
  - Undertake infill drilling of the Hera deposit from various sub-levels of the exploration decline.
  - Collect an approximate 10 000t to 12 000t bulk sample from the Hera deposit during the establishment of the exploration decline to provide further information relating to resource quality.

2.1.3 Objectives

The objectives of the Hera exploration decline are as follows.

1. To provide access to the Hera ore body to better define the geometry and grade of the resource.
2. To obtain a bulk sample to allow metallurgical testing of the resource and test the continuity of the resource.

Should the exploration work undertaken from the exploration decline provide promising results and the Hera deposit resource be assessed as economically viable and engineeringly feasible to mine, then a development application and supporting environmental assessment documentation would be prepared for a full scale underground gold-base metal mining operation.

2.2 EXPLORATION ACTIVITY TIMETABLE

The indicative timetable for the exploration activities is provided in **Table 2.1**. The timetable also records the period of processing / evaluation of the bulk sample, and if necessary, site decommissioning.

2.3 LICENCES AND APPROVALS REQUIRED

Following consultation with DPI (MR), it was determined that the proposed exploration decline and associated infrastructure is deemed Category 3 exploration (required to enable bulk sampling – a Category 3 activity) under the conditions of EL 6162 and as the bulk sample to be removed is less than 20 000t, the activity does not trigger Major Project status.

As such, approval of the activity, following the submission and subsequent assessment of a REF, is required from DPI (MR).

Additionally, as there is potential for the exploration decline to intercept groundwater, dewatering may be required. Dewatering would require a Bore Licence from the Department of Natural Resources (DNR) under Clause 116 of the *Water Act 1912*.

Table 2.1
Indicative Activity Timetable

Activity	2007											2008											
	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
REF approved by DPI (MR)	★																						
Surface Infrastructure Establishment	■																						
Box Cut	■																						
Exploration Decline Establishment		■	■	■	■	■	■	■	■	■	■	■	■										
Ventilation Rise Establishment											■	■											
Exploration Drilling from Decline									■	■	■	■	■										
Bulk Sampling from sublevels off the Decline											■			■									
Transport of Bulk Sample from Site											■			■									
Processing / Evaluation of Bulk Sample															■	■	■						
Decision to Decommission Site*																		✪					
Site Decommissioning																		■	■	■	■	■	■
* Or proceed with mine development																							

A WorkCover licence would be required for the storage of explosives, boosters and detonators with the magazine (refer to Section 2.6.4).

As the activity is primarily exploration and the putrescible waste to be generated and disposed of on site would be of minimal volume and less than 2t over the year, an Environment Protection Licence is not required.

2.4 MINERAL DEPOSIT AND RESOURCES

2.4.1 Mineral Deposit

Mineralisation at Hera consists of several sub-parallel lenses of intense anastomosing veins, and clast- to matrix-supported breccias containing pyrrhotite, sphalerite, galena, pyrite, chalcopyrite and gold, with minor to trace cubanite and niccolite. Host sandstones, siltstones and minor volcanics (dacites) are pervasively silicified and sericitised, with varying green chlorite and biotite alteration and commonly contain disseminated, non-magnetic pyrrhotite, typically aligned parallel to cleavage. Quartz veining is common and several zones of milky white quartz veins, up to 1m thick, are spatially associated with sulphide mineralisation.

The sulphide lenses strike around 346° N AMG and dip steeply to the west (>80º). Based on drilling, the top of the sulphide package occurs about 170m below surface and appears to plunge moderately to the south at about 45°, extending along strike for at least 550m. Drilling indicates at least two sub-parallel lenses of mineralisation – the Far West and Main Lenses (**Figure 2.3**). Far West Lens is sub-parallel to Main Lens and occurs about 75m to the west of Main Lens. Other lenses referred to as West, Westwest and East Lens occur in a limited strike zone around Main Lens. Conjecture as to the orientation of these lenses exists as correlation from section to section is not clear cut. It is possible that these lenses have some orientation that is oblique relative to the orientation of Main and Far West Lens.

The East and West Lens mineralisation occurs an average of 15-20m and 10-50m east and west respectively from the Main Lens mineralisation. There are indications from drill results to date that West Lens may be better developed to the north and East Lens to the south, suggesting the possibility of an en-echelon structural setting. Although similar to Main Lens in form, orientation, mineralogy, and associated wall-rock alteration, East Lens and West Lens are characterised by clast- to matrix-supported breccias having sphalerite-galena-pyrrhotite infill. A number of other minor mineralised structures have been intersected in drilling. Of these, the most significant result (e.g. 2m of 8.2 g/t gold from 400m in drill hole TNY007) indicates that significant gold-only mineralisation is present within the Hera mineralised system.

2.4.2 Mineral Resources

The Hera resource has been quantified based on existing drilling results.

The resource is detailed in **Table 2.2**.

Table 2.2
Hera Deposit Mineral Resource*

Category	Tonnes	Au g/t	Cu %	Zn %	Pb %	Ag g/t
Indicated	668 000	7.6	0.3	3.0	2.9	16
Inferred	1 272 000	6.2	0.15	2.7	2.3	13
Total	1 940 000	6.7	0.2	2.8	2.5	14
* As defined August 2005						

2.5 SURFACE PREPARATION

2.5.1 Introduction

Surface preparation would be confined to those surface areas to be disturbed by the exploration activities and associated surface infrastructure. The indicative areas requiring vegetation clearing and soil stripping are provided in **Table 2.3**. Additional small areas of disturbance would be required for the small sediment basins to be located adjacent to each surface disturbance footprint.

Table 2.3
Indicative Disturbance Areas

	Disturbed Area[1] (ha)	Undisturbed Area (ha)	Total Area (ha)
Magazine	0.02	0.37	0.39
Box cut	0.04	0.42	0.46
Waste rock dump	0.09	2.51	2.60
Ore stockpile	0.03	1.37	1.40
Laydown Area	0.05	0.45	0.50
Workshop and offices	0.02	0.33	0.35
Settling ponds and waste trench	0.01	0.78	0.79
Generators / fuel bay	-	0.15	0.15
Water tank	0.01	0.05	0.06
Ventilation rises	-	0.08	0.08
Internal roads	0.20	3.99	4.19
Water management structures[2]	-	0.70	0.70
TOTALS	**0.47**	**11.20**	**11.67**

[1] relates to areas already disturbed by grazing and/or exploration activities
[2] includes an estimated 0.5ha total for diversion banks and 0.2ha for the sediment basins

All disturbance footprints would be clearly defined on the ground prior to activities to ensure that disturbance is contained within the nominated area.

Surface preparation would entail tree clearing and soil stripping, as detailed in the following sub-sections.

2.5.2 Tree Clearing

The areas of surface disturbance are located within the Bimble Box / Red Gum / White Cypress Pine vegetation community. The vegetation in this community consists of trees over sparse groundcover with negligible mid-storey.

Tree clearing of all areas nominated for surface disturbance would occur in one campaign, following a pre-clearing fauna inspection to ensure that any roosting or nesting fauna are identified and relocated from the area.

Trees would be cleared using a bulldozer or front-end loader with the blade up so as to not disturb the groundcover or surface soils. This would minimise the opportunity for erosion prior to soil stripping. Felled trees would be track rolled to break up the larger trunk section and pushed to the stockpile location adjacent to each individual area of disturbance. The stockpiling of vegetation close to the source would provide for minimal handling and for easy access to replace the vegetation over the area once it has been rehabilitated. Where practical, the vegetation stockpile would be located on the down-slope side of the infrastructure area to act as a natural sediment trap.

2.5.3 Soil Stripping

Soils in the surface disturbance areas appear skeletal, however, they comprise both a topsoil (between 0.15m and 0.3m thick) and subsoils/parent material to at least 1.8m deep. An appreciation of the characteristics of the topsoils and subsoils within the areas of proposed surface disturbance was gained through an analysis of a topsoil and subsoil sample from two pits, sampled by the Company within the area designated for the settling ponds and WRD. The soil analyses were conducted by the Department of Lands (Soil Conservation Service) Soil and Water Testing Laboratory at Scone and a commentary upon the laboratory results was prepared by Geoff Cunningham Natural Resource Consultants Pty Ltd, a copy of which is reproduced as **Annexure 6**.

Where sufficient topsoil does exist for stripping, the topsoil would be stripped with the groundcover to ensure the maximum seed bank is retained, provide structure to the soils within the soil stockpiles and provide the best opportunity for groundcover to re-establish over the soil stockpiles. Where it exists, topsoil and groundcover is to be pushed to the stockpile location, adjacent to each infrastructure area, by bulldozer or front-end loader. This stripping method minimises the requirement for soil handling and ensures the soil from each area is available for replacement on that area during rehabilitation. Soil stockpiles would be located between the infrastructure area and the vegetation stockpile.

The chemical and physical testing of the topsoils and subsoils within the proposed area of disturbance established that the soils display a moderate to high erodibility, are non-saline and show negligible to slight dispersibility. The subsoil beneath the proposed settling ponds had a measured pH value outside the acceptable range and contained substantial gravel. This material is more likely parent material rather than a developed subsoil.

In light of the laboratory analyses, it is proposed to only recover the topsoils from the areas of disturbance given their value as seed banks for the various native vegetation species within the area of disturbance.

2.6 SURFACE INFRASTRUCTURE ESTABLISHMENT

2.6.1 Introduction

The surface infrastructure, apart from the ventilation rise, is to be located within an approximate 40ha area to the southeast of the Peak hill (**Figure 2.1**). This location was selected based upon the following parameters.

1. Geology

   The geological profile in this area of the property provides consolidated strata approximately 1m below surface, as opposed to up to 70m deep in other areas. This presence of shallow consolidated strata provides better geotechnical conditions for the box cut and exploration decline, hence allowing the box cut to be smaller. This results in less surface disturbance and a quicker transition from surface operations in the box cut to underground continuation of the decline, hence reducing the duration of potential dust and noise impacts.

2. Visibility

   The selected location is visibly shielded from the Burthong Road by the topographical high of the Peak hill and from surrounding properties by the native vegetation, hence minimising potential visual amenity impact.

3. Drainage

   The surface infrastructure as proposed is located entirely within the boundary of one sub-catchment, draining to an existing dam. As such, surface water management would be simpler.

4. Future Development Potential

   Where possible, the infrastructure has been located so as to provide for the potential future full scale mining of the Hera deposit. For example, the waste rock dump has been located and shaped so as to provide access between the pad for a future ROM stockpile and the ore hopper.

2.6.2 Office Buildings, Workshop and Laydown Area

The offices, workshop and laydown area are located within the primary area of surface disturbance (**Figures 2.1 and 2.2**) and cover a total area of approximately 0.36ha. This infrastructure area consists of the following buildings and infrastructure areas.

- Laydown Area – given the skeletal soils and limited depth of weathered material, it is anticipated no gravel would be required to produce the laydown area. This area would be used to store large equipment, supplies and scrap steel.
- Offices – including an engineering office, geology office (connected by a breeze way) and a contractor’s office complex including a cribroom. All these buildings would be transportable buildings.
- Mines Rescue / Stores Building – a transportable building for the storage of small equipment and supplies and mines rescue equipment such as rescue breathing apparatus.
- Ablution Blocks – transportable buildings providing ablution facilities.
- Car Park – the adjacent car park would be unsealed and the edges would be clearly marked with large rocks and/or bollards.
- Workshop – the workshop would consist of a large shed with a concrete pad for all equipment work. The concrete pad would have a perimeter drain at the workshop draining to an oil/water separator. The workshop activities would be managed using best practice techniques, drip trays and spill kits, to minimise the incidence of spilt hydrocarbons.

2.6.3 Generator Area and Fuel Bay

The generator area and fuel bay covers an area of approximately 0.15ha. The fuel bay would be separated from the generators with an earthen bund formed from topsoil or, if insufficient volumes of topsoil, waste rock. The primary fuel storage tank (50 000L) would either be located within this bund or, should a self-contained tank be used, adjacent to the bunded area. Should a bund be required (if a self-contained tank is not to be used), an earthen bund would be constructed, lined with an appropriate impermeable liner and sized to contain at least 110% of the volume of the largest containment vessel (ie. 55 000L capacity minimum), or 25% of the total volume stored with the bund, whichever is larger. Adjacent to the fuel storage area would be a concrete pad for refuelling. The bund and the concrete pad would be drained to a common, lined sump, which would be pumped out as required.

The generators would be skid mounted and located adjacent to the fuel bay, with all drainage directed to the common, lined sump. There would be a primary generator and a back-up generator. In addition to the generators, there would be a compressor located in the same area to supply compressed air to underground.

2.6.4 Magazine

A magazine would be required for the storage of the explosives, boosters and detonators to be used for the box cut and subsequently, the underground decline construction. The magazine would cover an area of approximately 0.38ha. The magazine would be constructed with earthen bunds between the various storages and would be securely fenced and locked to meet all relevant DPI(MR) requirements. The material for the bunding would be sourced from the disturbance footprint of the magazine, supplemented with waste rock from the box cut if required.

A WorkCover licence would be obtained for the storage of less than 2.5t explosives at the magazine and the magazine would be managed in strict accordance with this licence, including the minimisation of fire risk through bunding and clearing in the immediate vicinity.

2.7 BOX CUT

The box cut would be constructed to provide a suitable portal for the exploration decline.

The box cut would be constructed through conventional drill and blast mining. The box cut would taper down to approximately 16m deep, formed in one bench. A ramp into the box cut would be constructed at a slope of approximately 1:7 (V:H) with side batters of approximately 45º (**Figure 2.4**). The highwall above the portal would also be formed to a 45º batter and would include a 3m berm (ie. at approximately 3m deep). The portal face would be at approximately 72º.

As the consolidated strata is present approximately 1m below the surface in this area, blasting would be required almost immediately on commencement. It is anticipated that blasting would loosen up to a maximum of 2 300m^3 per blast, with these relatively small blasts being undertaken to best suit the work cycle. An excavator and dump trucks would be used to excavate the blasted waste rock from the box cut and transport it to the WRD.

It is anticipated that the box cut would take approximately 3 to 4 weeks to complete (refer to **Table 2.1**).

2.8 WASTE ROCK DUMP

2.8.1 Introduction

The Waste Rock Dump (WRD) has been located and shaped to provide a suitable access between a pad required for a future ROM stockpile and the ore hopper above the jaw crusher, should the Hera deposit justify the construction of an on-site processing plant. This section reviews the approach to the design and construction of the WRD both in the event that an on-site processing plant is constructed and used on site or that no further exploratory work takes place.

The waste rock from the box cut, ventilation rise and exploration decline would be predominantly unweathered siltstone. The ore and waste rock have been analysed for acidic drainage potential and the results are presented in detail in **Annexure 3**. The acid rock drainage assessment conservatively estimated that approximately 30% (19 800 bcm / 30 000 loose m^3) of the waste rock recovered during the various activities would be Potentially Acid Forming (PAF) with the remaining 70% (46 500 bcm / 70 000 loose m^3) defined as Non Acid Forming (NAF). Details of the PAF / NAF breakdown for the proposed decline are included in the updated review of the acid rock drainage data compiled by S. Jeffrey, Triako's Senior Mine Geologist (see **Annexure 3**).

Whilst it is acknowledged that the estimate of PAF may be conservative, a program of quality control would be adopted to characterise representative occurrences of waste rock as it is drilled and before it is blasted. The quality assurance program would be based upon on-site total sulphur tests that are cross-referenced to NAGP levels. Early studies indicate total sulphur concentrations of <1% correspond to a negative NAGP. This level would be reviewed during the early stages of the exploration decline.

It is noted that irrespective of whether the PAF material is fully encapsulated as part of an ongoing operation or removed as part of decommissioning, it is proposed that the small quantity of weathered waste rock recovered from the area of the box cut would be stored in the area of the ore stockpile and road train loop and used to provide the final surface of the WRD, ie. prior to placement of topsoil.

2.8.2 Ongoing Operations

The approach to the design of the WRD in the event of an ongoing operation would be to fully encapsulate all PAF waste rock with a store / release cover that will avoid acid generation.

In order to firstly avoid the generation of any acid from the stockpiled waste rock and secondly to manage any acid generated, the following management measures would be implemented for the WRD.

- The base of the WRD would be consolidated bedrock. Any localised areas of weathered material would either be removed and set aside for rehabilitation of the WRD and/or compacted by on-site machinery. The importation of clay is not considered necessary given that the consolidated bedrock is so close to the surface in this area.
- A spoon drain would be formed around the perimeter of the WRD and all surface water runoff would be directed to the sediment basin (SB1) located adjacent to the ore pad (see **Figure 2.5**). This sediment basin has been sized to capture runoff from a years worth of average rainfall (refer to Section 2.12).
- Water monitoring at strategic locations would be undertaken (Section 5 - EMP 5). This monitoring would identify any potential leachate generation. In the event the presence of leachate is identified, additional water management measures could be implemented, such as increasing the size of the sediment basin to ensure continued isolation from the larger water management system. Should such contingency measures be required, they would be discussed with DPI(MR) as appropriate.

The WRD has been designed with a capacity of 100 000 loose m^3 and would be formed to a maximum final height of 10m with NAF material initially stockpiled in the form of a horseshoe up to 15m high and at angle of repose (approximately 37°) (see **Figure 2.6**). The WRD would effectively be constructed in a manner that encapsulates all PAF waste rock within the lower section of the dump. The WRD would be placed in the horseshoe in layers approximately 3m high, through paddock dumping of waste rock by the dump trucks. It is intended that the horseshoe would comprise NAF waste rock within which the PAF waste rock would be placed. The PAF waste rock would be effectively encapsulated by at least 15m of rock on its sides using this method of construction.

The upper edges of the WRD would be bunded throughout its construction with a bund at least half the height of the wheel of the largest piece of mobile equipment, in accordance with applicable safety requirements and standards.

The disturbance footprint of the WRD would be approximately 2.6ha which incorporates the area required to create the rehabilitated 1:4 (V:H) batter slopes (refer to Section 2.21.3). The area would be cleared from the outset to provide sufficient area for the trucks and dozer to manoeuvre within.

In the event that it is decided to proceed with a mining operation and construct / operate an on-site processing plant, the WRD would be completed through the covering of the PAF material with the NAF material pushed from the sides of the horseshoe. The exact thickness of cover above the PAF material would be established prior to this activity occurring based upon the quantity and ARD potential of the PAF material and the characteristics of the NAF material to be used to form the cover.

Once all NAF material is pushed over the PAF material and it is fully encapsulated with its store / release cover, weathered rock would be recovered from the interim stockpile area within the ore stockpile and road train loop and placed on the outer slopes of the WRD after which topsoil would be spread. The surface of the WRD would remain uncovered given its intended use as a ROM stockpile area.

2.8.3 No Further Operations

In the event it is decided, following the evaluation of the bulk sample, that no further operations are appropriate, the following approach would be adopted to complete the WRD.

1. All PAF material would be retrieved from within the horseshoe and placed back underground into the bulk sample area, cross cuts and within the box cut.
2. The NAF material remaining in the horseshoe would be pushed inwards to create a final landform approximately 6m high with side slopes of 1:4 (V:H).
3. The final outer slopes of the WRD would be covered with the weathered rock recovered from the interim stockpile area within the ore stockpile and road train loop and placed over the entire WRD after which topsoil would be spread.

2.9 UNDERGROUND EXPLORATION

Once the box cut is completed, a portal would be established from the base of the box cut for the commencement of the exploration decline. The decline would be constructed using typical underground mining methods of jumbo drill and blast, with broken material loaded onto dump trucks for transport to the WRD.

The exploration decline is designed to provide drill sites for further infill drilling as it progresses downwards. There would be two sublevels developed from the decline to provide bulk ore samples at 10 140mRL and 10 080mRL. These samples would provide a total of approximately 10 000t to 12 000t.

2.10 VENTILATION RISES

Two ventilation rises would be required to provide a supply of fresh air to the deeper sections of the exploration decline and would be located to the west of the Peak hill (**Figure 2.2**). The ventilation rises would have fans installed at the bottom with mine air blown up and out of the vent. This removal of mine air would in turn pull fresh air in from the decline. Air blown through the ventilation shaft would be diluted with fresh air and gas levels would be maintained below occupational health and safety statutory requirements.

The construction of the ventilation rises would require a small area of surface disturbance (approximately 0.08ha in total) for the drilling of each rise. A raiseborer would be used for the construction of the rises with all waste rock transported to the WRD via the decline.

2.11 ORE STOCKPILING

The ore for the bulk sample would be brought to the surface by dump trucks and placed on the nominated ore stockpile area. The ore stockpile area covers approximately 1.4ha and is located to the south of the WRD (**Figure 2.2**). The ore would be stockpiled in a similar manner to the WRD, ie. end dumped in levels of approximately 2m high. When there is sufficient volume of ore to warrant transport, the ore would be loaded into road trains by a front-end loader for transport off site.

A maximum of approximately 12 000t would be stockpiled in this area, resulting in a maximum stockpile height of 2m, ie. the end of dump mound height.

The bulk sample ore placed on the ore stockpile is anticipated to be moist from groundwater and would contain negligible fine material, hence is not anticipated to be a source of dust.

Samples of the ore material have also been assessed for acid rock drainage potential (**Annexure 3**). The assessment identified that the ore samples were potentially acid forming, with the acidity predominantly generated by the precipitation of metallic hydroxides.

Consequently, the following management measures would be implemented at the ore pad for the duration of the project.

- The base of the ore pad would likely be bedrock. Any localised areas of weathered material would be compacted by on-site machinery. The importation of clay is not considered necessary given that the consolidated bedrock is so close to the surface in this area.
- A spoon drain would be formed around the perimeter of the ore pad and all surface water runoff would be directed to the sediment basin located adjacent to the ore pad. This sediment basin has been sized to capture runoff from a years worth of average rainfall (refer to Section 2.12).
- Water monitoring at strategic locations would be undertaken (Section 5 - EMP 5). This monitoring would identify any potential leachate generation. On identification of such leachate, additional water management measures could be implemented, such as increasing the size of the sediment basin to ensure continued isolation from the larger water management system. Should such contingency measures be required, they would be discussed with DPI(MR) as appropriate.
- The maximum volume of ore to be stored on the ore pad is 12 000t, which is not anticipated to result in large volumes of leachate, rather very small volumes that would be heavily diluted by surface water runoff in the sediment basin. Additionally, by the campaign transport of the ore off-site, the volume of ore stored on site with the potential to create leachate would be minimised.

2.12 WATER MANAGEMENT

Water management is detailed in the appended water management plan (Section 5 – EMP) and is summarised in this section. The objectives of the water management strategy to be employed are to minimise the interaction of clean and 'dirty' water and to minimise the creation of dirty water. The approach to water management reflects best practice concepts wherever possible. All plans and concepts have been discussed with the Department of Environment and Conservation (DEC).

Dewatered Groundwater

Groundwater dewatered from the underground decline would be piped via aboveground pipe to a series of settling ponds (**Figure 2.2** and **2.5**). This water would be pumped back underground for use in drilling as required with the remainder, if any, stored in the settling ponds for evaporation. The drilling undertaken to date indicates that there would be minimal volumes of groundwater intercepted by the exploration decline. In the unlikely event that a prolonged or large rainfall event caused the settling ponds to overflow, the water would be diluted by the rainfall and any overflow would still be within the catchment of Three Gates Tank. Overflow would then be even further diluted as it reaches that dam and is not anticipated to impact on water quality. Water monitoring (as detailed in Section 5 - EMP 5) would be undertaken to ensure this is the case, and if results indicate otherwise, a contingency area (**Figure 2.5**) has been nominated for the construction of additional settling ponds as required to increase the storage capacity and minimise the opportunity for overflow.

The settling ponds are located adjacent to Three Gates Tank (**Figure 2.5**), primarily due to the sparseness of native vegetation in that area but also as the slightly thicker layer of weathered rock in this area would allow for free digging of the ponds. The settling ponds would cover an area of approximately 0.79ha with the following approximate construction parameters.

- Excavated to bedrock, hence relatively impermeable floor.
- The entire settlement pond complex would be approximately 100m x 50m.
- Five separate ponds within the settlement pond complex, each with the following approximate dimensions.
  - 18m x 28m x 2m (or to bedrock)
  - Capacity approximately 750m^3 each (total of 3 750m^3).
- Each pond would have an overflow to the next pond at 0.5m from the top to maintain a 0.5m freeboard. These pipes would have the ability to be shut off if the freeboard in any individual pond is required.

Apart from potentially high salinity, the dewatered water is anticipated to be within the criteria for stock drinking water, as indicated by surrounding bore water quality (presented in **Tables 3.2** and **3.3**).

Surface Water Runoff – Clean Water

A number of diversion banks would be constructed to minimise interaction between clean surface water runoff and areas of disturbance. The diversion banks are illustrated on **Figure 2.5** and the specifications are provided in **Table 2.4**.

Table 2.4
Diversion Bank Specifications

Diversion Bank ID	Catchment Area (ha)	Channel Bottom Width (m)	Channel Grade (%)	Bank Height (m)	Sill Width (m)	Slope Below Sill (%)
DB1	Would require a 450mm pipe or greater to run diverted waters under road					
DB2[1]	4	3	0.25	0.8	6	1.8
DB3	8	4	0.25	0.8	8	1.6
[1] Diversion bank 2 may need to be constructed if too much water is pond against the perimeter diversion bank						

Source: Department of Lands Soil Conservation Service (2006) – Table 1.1

The diversion banks would be in the form of a trapezoidal channel with bank batters of 1:3 to 1:6 (V:H) and would be grassed to minimise erosion potential.

Surface Water Runoff – "Dirty" Water

A number of catch banks would be constructed to capture potentially "dirty" water from the areas of disturbance and transport the water to the sediment basins. The catch banks are illustrated on **Figure 2.5** and the specifications are provided in **Table 2.5**.

Table 2.5
Catch Bank Specifications

Catch Bank ID	Catchment Area (ha)	Channel Bottom Width (m)	Channel Grade (%)	Bank Height (m)	Sill Width (m)
CB1	6	3	1.2	0.6	6
CB2	5	3	1.3	0.6	6

Source: Department of Lands Soil Conservation Service (2006) – Table 1.2

Two sediment basins would be constructed to hold the surface water runoff from the areas of disturbance. These sediment basins are illustrated on **Figure 2.5** and the indicative specifications are provided in **Table 2.6**. The sediment basins have been designed to allow for settling and short-term storage of "dirty" water.

Table 2.6
Sediment Basin Indicative Specifications

Sediment Basin ID	Catchment Area (ha)*	Volume (m^3)	Dimensions length *x* width *x* depth (m *x* m *x* m)	Outlet Width (m)	Sill Width (m)
SB1	5	800	50 x 20 x 1	3	6
SB2	6	800	50 x 20 x 1	3	6

Source: Department of Lands Soil Conservation Service (2006) – Table 1.3

Water would usually evaporate from these sediment ponds, however, during large or prolonged rainfall events, the sediment ponds may overflow and flow via the existing drainage channels or overland to the broader catchment dam, ie. Three Gates Tank (**Figure 2.5**). It is anticipated that, given the water management structures proposed to remove the majority of sediment from the water prior to it reaching Three Gates Tank, that the quality of the overflow water would be consistent with that of the other dams on the property. Additionally, if there is a rain event of such magnitude, then there would be natural erosion of the undisturbed soils across the Project Site in areas disturbed by feral goats and the removal of groundcover, hence increasing the background sediment level. An important feature of the management of the sediment basins would be the progressive emptying of water from the basins within 20 days of the cessation of a rainfall event. This activity is proposed to retain the significant storage within the basins, thereby retaining their effectiveness during substantial rainfall events. Furthermore, each basin would be cleared of accumulated sediment once 25% of its capacity has been reduced. EMP 5 records the procedures to be adopted in the event any water is discharged from site which exceeds the 50mg/L concentration of total suspended solids.

Water monitoring (as detailed in Section 5 - EMP 5) would be undertaken to ensure this is the case. Additionally, as an added contingency, water from the sediment basins and / or Three Gates Tank would be pumped to the settling ponds as required to provide additional operational water. In this manner, the capacity of both the dam and the settling ponds can be maintained while providing maximum operational water.

2.13 SERVICES

2.13.1 Electricity

Electricity would be supplied by the site generator, which would be backed up with a second generator. Electricity would be supplied to the decline and office area via underground cables from the generator.

2.13.2 Water

2.13.2.1 Operational

Operational water would be required for the underground resource definition activities and would be sourced from a combination of dewatered groundwater and surface water runoff captured in Three Gates Tank. If required, additional water would be sourced from licenced Skirka's bore (located on "The Peak" property). Additional sources are being investigated and bore licences would be applied for any additional bores.
No water would be used for dust suppression as experience indicates that the soils tend to react poorly to being wetted and the structure deteriorates. As these soils are relatively hard setting, dust creation from open areas that are not trafficked once set, is anticipated to be minimal.

Additionally, the WRD and ore stockpile are not anticipated to create large amounts of dust as the waste rock and ore would likely be wet from dust suppression prior to loading underground when it is bought to the surface and placed in the WRD or ore stockpile. This material would also be in large pieces, ie. not crushed, and hence contain negligible fines material to create dust.

2.13.2.2 Potable

Potable water would be trucked in as required. A tank would be installed close to the shower block for the storage of potable water. Additionally, it would likely be a condition of the contract for the work for the contractor to install a rainwater tank adjacent to the workshop.

2.13.3 Communication

A landline would be brought to the site along the road access for telephone and fax communications. Other communication would be via mobile telephones and two-way radios.

2.13.4 Sewage

The ablutions would be connected to a septic tank (leach or irrigation). All required approvals would be obtained from Council prior to the installation of the septic tank. The septic would be emptied by a licenced contractor on an as needs basis.

2.14 TRANSPORTATION AND ACCESS

2.14.1 Site Access

The site access road is illustrated on **Figure 2.2**. The access is via the existing property access road off Burthong Road.

2.14.2 Internal Transportation

There would be a number of temporary internal transport roads for the duration of the project, and these are detailed as follows and depicted on **Figure 2.2**.

- Site access road. This road would also serve as the road train access during the campaign transport of the bulk ore sample.
- Light vehicle access road to the ventilation rises.
- Access road to the magazine for light vehicles and explosives trucks.
- Internal light vehicle and dump truck roads around the surface infrastructure areas, eg. decline to WRD, ore stockpile and workshop.

All internal roads would be unsealed and, due to the nature of the site soils, built up slightly from natural ground level using screened waste rock and/or material excavated during construction of the settling ponds. If screened waste rock is required, a small mobile screen would be brought to site and located on the WRD.

2.14.3 External Transportation

2.14.3.1 Site Establishment Traffic

During initial site establishment, it is anticipated that the following trucks would be accessing the site, the majority of which are likely to originate from Cobar, and hence not passing through Nymagee township.

During the approximate one month site establishment period, the typical types and number of vehicles entering and exiting the Project Site are anticipated to comprise at a maximum:

1. low loaders (0 to 4 per day) to deliver large mobile equipment and infrastructure such as transportable buildings;
2. heavy vehicles (0 to 6 per day) to deliver consumables, fuel and other stores as required; and
3. light vehicles (up to 20 per day) for personnel transport.

2.14.3.2 Operational Transport

Apart from the transportation of the 12 000t bulk sample, the only regular transport during the life of the project would be a fuel truck delivering fuel and a supply truck on an approximate weekly basis, an explosives truck once per fortnight and the daily movement of light vehicles transporting personnel and small store items.

Road trains of approximately 50t capacity would be used to transport the bulk ore sample off site in one or more transport campaigns.

At this stage, the ultimate destination of the ore has not been confirmed and is dependent on contracts being negotiated, but is likely to be one of the following locations.

1. Endeavour Mine, Cobar – via the sealed Kidman Way. The turn off to Cobar is prior to the Nymagee township.
2. Mineral Hill Mine – via the unsealed Nymagee – Condobolin Road.

It is anticipated that road transportation of the ore would be undertaken in one or more transport campaigns that would commence toward the end of the project, when sufficient volumes are available for transport.

It is anticipated that as a maximum, up to 1000t of ore would be transported to the selected destination during any given day. This would result in ten 50t road trains, totalling 20 truck movements in a day. In order to maintain flexibility, ore, transport would be required for daylight hours, seven days per week. Transportation would occur during daylight hours, typically between about 7.00am and 6.00pm. As a worst case scenario, if the 12 000t of ore was available for transport and was transported in one campaign, there would be up to 20 truck movements per day for 12 days. A maximum of 20 truck movements per day over 11 hours would result in a maximum of four truck movements per hour.

The conduct of the ore transport operation would be the subject of discussions and agreement with Cobar Shire Council to ensure least adverse impacts occur as a result of the ore transportation, particularly in the event of wet weather.

2.15 MOBILE EQUIPMENT

2.15.1 Surface Equipment

Surface equipment would likely be limited to the following.

- **Box Cut Establishment**
  - Pneumatic drill and compressor.
  - Excavator for box cut mining.
  - Two dump trucks for box cut mining – the size of these trucks would depend on the equipment available to the contractor at the time.

- **Site Establishment and Life of the Project**
  - Front-end loader for waste rock and ore stockpile forming.
  - Front-end loader for truck loading and water management structure construction.
  - Grader Cat 12H or 14H or equivalent for road maintenance.
  - Two generators (500kVA).
  - Various light vehicles.

2.15.2 Underground Equipment

During the establishment of the exploration decline the following indicative equipment would be used underground.

- One to two jumbos for drill and blast.
- One LHD unit for loading dump trucks and one backup unit.
- Two dump trucks for transport of waste rock and ore to the surface.
- Ancillary equipment for various mine services.
- Various light vehicles.
- This machinery would be parked on the surface when not being used and for maintenance at the workshop.

2.16 WASTE MANAGEMENT

2.16.1 Introduction

Both production and non-production waste would be managed on site in a practical manner, reflecting the relative remoteness of the site, the lack of recycling services in the area and the short term nature of the proposed exploration activities.

2.16.2 Production Waste

Production waste would consist of waste rock. The management of this is detailed in Section 2.8.

2.16.3 Non-Production Waste

Oil and grease wastes from the workshop and mobile equipment servicing would be stored in a designated waste oil tank located at the workshop. Once sufficient volumes are stored, a licensed waste oil recycling contractor would remove the waste from site for recycling. Water from the oil/water separator would also be collected by a licensed contractor on an as required basis.

Waste tyres would be removed from site by the mining contractor.

Scrap steel would be stockpiled in the laydown area until there is a sufficient volume to be collected by a suitable scrap steel merchant.

Other general waste such as paper and putrescibles are anticipated to be generated in very small quantities. To provide for appropriate waste management, it is proposed to dispose of the small amount of inert waste created in an on-site waste trench (**Figure 2.1**). The use of an on-site trench in the manner described as follows, is supported by the DEC. The facility will not require any licence from the DEC given its size is substantially less than that which requires a licence.

As the proposed location of the waste trench, ie. adjacent to the settling ponds, has consolidated rock within close proximity to the surface, the trenches would be relatively shallow and there would be no opportunity for leachate to migrate to any groundwater table below. Given the low rainfall compared to the high evaporation levels in the area, negligible volumes, if any, of leachate are expected to be generated.

The waste disposal trenches would be up to 1.5m deep, up to 5m long and 2m wide. The material excavated from the trench would be used as cover. General waste would be kept in covered bins in the various areas and collected and disposed of in the active trench on a weekly basis. Immediately following waste disposal, at least 30cm of cover would be placed over the waste to minimise the potential for vermin attraction. The waste disposal trench(es) would be filled to within 0.5m of the surface and then filled to surface level with cover material. The placement of this cover material would act to compact the disposed waste. It is anticipated that only one trench would be required during the life of the exploration activities but should an additional trench be required, it would be constructed adjacent to the first.

Further management measures applicable to the waste disposal trench(es) are presented in Section 5 – EMP 4.

2.17 HOURS OF OPERATION AND PROJECT LIFE

2.17.1 Hours of Operation

Table 2.7 provides the intended hours of operation.

Table 2.7
Proposed Hours of Operation

Activity	Hours
Box Cut Excavation	7:00am to 6:00pm / 7 days a week
Site Establishment	7:00am to 6:00pm / 7 days a week
Exploration Decline	24 hours / 7 days a week
Underground Exploration / Bulk Sampling	24 hours / 7 days a week
Campaign Ore Transport	7:00am to 6:00pm / 7 days a week*

* Daylight hours

2.17.2 Project Life

Given the indicative timetable presented in **Table 2.1** in Section 2.2, it is anticipated that the exploration decline and bulk sampling activities would take approximately 12 to 14 months.

2.18 EMPLOYMENT

It is anticipated that the box cut and exploration decline would be completed by a mining contractor and local earthmoving contractor. The mining contractor would have an estimated crew of 20 to 22 people, including three shifts of four people, an electrician, leading hand, project manager and additional support personnel. The mining shift crews would work in 10 to 12 hour shifts.

Additionally, the Company would have 5 to 7 personnel dedicated to the project, primarily in geological and managerial positions, anticipated to be sourced from existing employees. This would result in total employment of approximately 25 to 29 people.

Specialised sub-contractors would be sourced to undertake specific tasks on site as required.

At this stage, it has not been identified whether the mining contractor would base employees in Cobar or establish a contractor camp in the town of Nymagee. Given that the project has a relatively short life, ie. approximately 12 months, and that there is no certainty of operations beyond this point, it is unlikely that the contractor would establish any permanent residences within Nymagee.

2.19 ENVIRONMENTAL MANAGEMENT

DPI (MR) has requested that this REF include a Plan of Management to detail how various environmental aspects are to be managed during the course of the exploration works. As such, a number of individual Environmental Management Plans (EMPs) are included in Section 5 and are listed below.

- EMP1: Vegetation Clearing
- EMP2: Soil / Overburden Stripping and Management
- EMP3: Hydrocarbon Management
- EMP4: Waste Management
- EMP5: Water, Erosion and Sediment Management
- EMP6: Rehabilitation
- EMP7: Bushfire Control
- EMP8: Complaints Management

2.20 LAND MANAGEMENT

With respect to land management, the Company intends to maintain the property "The Peak" in its current state, although the property has been de-stocked to avoid any potential land use conflict.

As the entire "The Peak" property is covered by EL 6162 and EL6150, there is no shooting permitted for feral animal control.

Regular visual inspections of the property boundary fences are undertaken and a campaign of fixing the boundary fences is currently underway. Additionally, the existing dams are being maintained with a de-silting program planned for when the dams dry out sufficiently.

With respect to weeds, Bathurst Burr (*Xanthium spinosum*) and Mexican Poppy *(Argemone spp.*) have previously been identified on the Project Site. The Company would ensure that these weeds are managed in accordance with applicable land owner obligations.

2.21 REHABILITATION

2.21.1 Introduction

There are two options for rehabilitation of the site, namely:

1. if the approval process for a full scale operational mine has started or is intended, none of the disturbed areas would be rehabilitated, as they would provide the basis for the future mining operation; or
2. if a future mining operation is not intended or not approved, full rehabilitation of the disturbed areas.

Consequently, the following rehabilitation works relate to Option 2.

2.21.2 Final Land Use

Following rehabilitation, the land use of "The Peak" would be returned to the previously existing land use, ie. grazing.

2.21.3 Rehabilitation Activities

The following rehabilitation activities would be undertaken in each area.

Exploration Decline / Box Cut Portal

The box cut would be backfilled with PAF waste rock to within 0.5m of the original surface, after which weathered rock and topsoil would be placed to return the landform to the original surface.

Ventilation Rises

All surface infrastructure would be removed from the sites and the rises covered with a concrete slab.

Waste Rock Dump

The WRD would be battered to create final profiled batters of 1:4(V:H) in the manner described in Section 2.8.3 and displayed on **Figure 2.6**. Available topsoil would be replaced on the batters and the top surface of the WRD and the batters contour ripped if required to minimise erosion opportunities. The native vegetation cleared for the WRD and stockpiled adjacent to it would be scattered over the surface to provide micro-climates to encourage the establishment of vegetation.

Laydown Area and Ore Stockpile

The laydown area, ore stockpile area and road train loop would be shaped after all weathered rock is retrieved and contour ripped to loosen compacted earth and available topsoil would be replaced over the area. The native vegetation cleared for the laydown and ore stockpile area and stockpiled adjacent to it would be scattered over the surface to provide micro-climates to encourage the establishment of vegetation.

Offices, Workshop, Generator Area and Fuel Bay

The office area, workshop, generator area and fuel bay would all be treated in a similar manner with respect to rehabilitation. All surface infrastructure would be removed from site and concrete pads would be broken and buried in the WRD. The remaining disturbance footprint would be profiled to a relatively flat surface as required. The areas would then be contour ripped to loosen compacted earth and any available topsoil would be replaced over the area. The native vegetation cleared from each area and stockpiled adjacent to it would be scattered over the surface to provide micro-climates to encourage the establishment of vegetation.

Any potentially hydrocarbon contaminated material from the fuel bay area would be spread over the disturbance footprint and regularly scarified to encourage bioremediation of the hydrocarbons prior to it being deep ripped to blend it with the in-situ weathered material to dilute any potential hydrocarbons prior to topsoil application and revegetation. Any contaminated material subject to bioremediation would be monitored to ensure it meets the required guidelines prior to final rehabilitation.

Magazine

The magazine area would have all surface infrastructure removed from site and any concrete pads would be broken and buried in the WRD. The remaining disturbance footprint would be profiled to a relatively flat surface as required. The areas would then be contour ripped to loosen compacted earth and any available topsoil would be replaced over the area. The native vegetation cleared from each area and stockpiled adjacent to it would be scattered over the surface to provide micro-climates to encourage the establishment of vegetation.

Roads

Those roads not required for general access around the property would be ripped, along the contour where possible, and any available topsoil replaced.

Settling Ponds

The banks and floor of the settling ponds would be sampled for salinity and heavy metals to determine if any remedial works are required prior to final rehabilitation. Should the material be above the required criteria, the material would be mixed and diluted with benign material from around the activity areas (such as silt from dam maintenance) to ensure it meets the required guidelines before final rehabilitation.

The settling ponds would have their banks pushed in to recreate the relatively flat landform in this area. The area would then be contour ripped to minimise the opportunity for erosion and any available topsoil would be replaced over the area. The native vegetation cleared from each area and stockpiled adjacent to it would be scattered over the surface to provide micro-climates to encourage the establishment of vegetation.

Water Management Structures

The banks and floor of the two sediment basins (SB1 and SB2) would be sampled for salinity and heavy metals to determine if any remedial works are required prior to final rehabilitation. Should the material be above the required criteria, the material would be mixed and diluted with benign material from around the Project Site (such as silt from dam maintenance) to ensure it meets the required guidelines before final rehabilitation. Should there not be sufficient material for dilution, the possibility of removing the material and encapsulating it within the waste rock dump would be reviewed and implemented where this is proven to be a viable alternative. As a contingency, the material could also be placed down the decline prior to the decline being sealed, however, this would depend on the location of groundwater intersected and this option would be discussed with DPI(MR) prior to implementation.

Following the removal of any contaminated material from the sediment basins, the area would be reprofiled to a shallow depression and the area would then be contour ripped to minimise the opportunity for erosion and any available topsoil would be replaced over the area. The native vegetation cleared from each area and stockpiled adjacent to it would be scattered over the surface to provide micro-climates to encourage the establishment of vegetation.

Diversion banks and catch drains would be retained in their existing grassed and stable condition on final rehabilitation.

2.21.4 Revegetation

For disturbance areas where there is available topsoil for replacement, appropriate pasture grasses would be identified in consultation with the local DPI (Agriculture) officers and seeded over the area.

Disturbance areas that do not have available topsoil would be seeded with White Cypress Pine. Given the evidence of regrowth in disturbed areas on the site, it is envisaged that encroachment of other native vegetation species would occur within these areas also.

2.22 FEASIBLE ALTERNATIVES

2.22.1 Underground Exploration Techniques

The only other option to completing the infill drilling of the deposit is to drill the holes from surface. The disadvantages of this approach are as follows.

- The high cost of drilling long holes from surface.
- The lack of accuracy in drilling the holes to the required pierce points in the deposit.
- The uncertainty of the gold grade due to the sample size of a drill hole. The deposit has a high nugget effect for both gold and zinc. Only a bulk sample from underground can provide the information required to predict the grade with confidence.

2.22.2 Surface Infrastructure Location

The only other potential location for the surface infrastructure area is the cleared area adjacent to the site access gate, where the current homestead, exploration offices and core yard are located.

While this location has the advantage of already being cleared, the disadvantages are as follows.

- The weathered rock in this area extends to a much greater depth, resulting in more uncertain geotechnical conditions for the exploration decline and would require a much larger box cut.

- Greater risk of flooding during high rainfall periods due to the lack of slope from the area.
- Would be highly visible from the Burthong Road, adjacent to that part of "The Peak".

2.22.3 Site Access Road Location

The only feasible alternative for the site access road is to upgrade the existing track that currently runs along the northern boundary of the property. While the use of an existing track would minimise clearing of native vegetation, the use of this route would result in the road trains and delivery trucks interacting with haul trucks transporting material from the exploration decline. From a safety management perspective, every opportunity is taken to minimise opportunities for such conflict. Additionally, the use of this route would result in the road trains and other delivery trucks being close to the adjacent property and as such, potential visual and noise impacts would possibly be greater.

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SECTION 3 EXISTING ENVIRONMENT, MANAGEMENT AND EFFECTS

3.1 INTRODUCTION

This section provides information on the existing environment that may be affected by the exploration activities, outlines the proposed mitigation strategies to manage any likely effects and provides an indication of how effective the mitigation is likely to be through a prediction of the residual impact.

For clarity and to avoid repetition, the information presented in this section has been kept brief, with details on the specific management measures provided in Section 5 as part of the individual environmental management plans.

3.2 RELEVANT PLANNING INSTRUMENTS

The site of all exploration-related activities is located within the planning control of the Cobar Local Environmental Plan 2001 (LEP). The Project Site zoning under this plan is General Rural 1(a).

The proposed exploration activities are permitted under the Exploration Licence and the LEP does not strictly apply. Nonetheless, the objectives of the zone have been considered during the preparation of this document.

There are no heritage listed items within the Cobar LEP that occur within, or in the vicinity of, the Project Site. Additionally, the Project Site does not constitute 'sensitive lands' under the definition of the Cobar LEP.

3.3 EXISTING ENVIRONMENT, MANAGEMENT MEASURES AND ENVIRONMENTAL EFFECTS

3.3.1 Soils

3.3.1.1 Existing Environment

Soils in the areas of disturbance are generally skeletal, becoming even more so to the east toward the Peak hill. Where soils do exist, they are hard setting red brown loams and clay loams. There is little soil profile development across the site.

Although the Project Site is relatively flat and there are no well formed drainage lines, in some larger drainage areas, soils are slightly deeper and softer, encompassing red brown sands.

There are moderate to low levels of sheet erosion evident across the site, while the inflow areas to the various dams exhibit severe erosion.

3.3.1.2 Management Measures

- The disturbance footprint has been designed to minimise disturbance and to be suitable for any future exploration operations also, thereby further minimising disturbance.
- Existing access tracks are being used for the magazine access and for the power line to the ventilation rise.
- Where topsoil exists, it would be stripped from disturbance footprints and stockpiled for future rehabilitation use.

Refer to Section 5 - EMP 2 for further information on management measures.

3.3.1.3 Environmental Effects

In the areas of disturbance where soil exists, soils would be stripped and stockpiled. Given the method of stripping and stockpiling proposed, ie. the stripping of the soil with any groundcover, the fact that the presence of soil is limited in the area and the careful delineation of areas to be stripped that would be employed, it is anticipated that the effect on the soils surrounding the areas of disturbance would be negligible. The soils within the footprint of disturbance would obviously be disturbed, however, once stockpiled, the soils would remain unimpacted and able to establish groundcover for stabilisation and erosion minimisation until such time as the site requires rehabilitation.

3.3.2 Surface Water

3.3.2.1 Existing Environment

The Nymagee regional area is generally dry and contains only ephemeral creeks that flow during and after flood events. The main watercourse in the vicinity of the Project Site (located approximately 8km to the northeast) is Box Creek, which has its headwaters to the south of "The Peak" property and flows northwards.

There are no defined drainage lines through "The Peak" property, with drainage confined to rain event overland flow. Drainage channels across the property, constructed during agricultural activities, divert overland surface water flow to a number of bunded earthen dams, located at strategic positions throughout the property (**Figure 2.5**).

Dams on "The Peak" include Three Gate Dam, Pete's Dam, Back Dam and the Main Dam adjacent to the homestead.

Rainfall is typical of an arid area, ie. in the order of 416mm per annum.[1] As such, surface water flows across the site are rain related and generally of short duration.

Table 3.1 indicates that the existing quality of the water captured in the dams across the property is well within the criteria for livestock (sheep) drinking water.

Table 3.1
Surface Water Quality Table

	SS01[1]	**SS02**[2]	**SS03**[3]	**Stock water quality**[4]
pH	5.9 – 7.23	6.15 – 7.51	6.00 – 6.49	6.0 – 9.0
Electrical Conductivity µS/cm	21 – 42	43 – 5590	37 – 38	7463
Total Dissolved Solids (mg/L)	45	362	236 – 396	0 – 5 000
Suspended Solids (mg/L)	10	9 - 80	138	
Arsenic (mg/L)	<0.001 – 0.002	<0.001 – 0.004	0.002 – 0.003	0.5
Cadmium (mg/L)	<0.001	<0.001 – 0.001	<0.001	0.01
Chromium (mg/L)	0.004 – 0.012	0.004 – 0.030	0.009 – 0.021	1
Cobalt (mg/L)	0.001 – 0.005	0.001 – 0.014	0.003 – 0.011	1
Copper (mg/L)	0.003 – 0.011	0.004 – 0.027	0.011 – 0.026	0.4
Lead (mg/L)	0.003 – 0.007	0.004 – 0.022	0.006 – 0.016	0.1
Nickel (mg/L)	0.003 – 0.007	0.002 – 0.21	0.006 – 0.013	1
Selenium (mg/L)	<0.010	<0.010	<0.010	0.02
Silver (mg/L)	<0.001	<0.001	<0.001	
Zinc (mg/L)	0.006 – 0.020	0.013 – 0.055	0.017 – 0.033	20
Iron (mg/L)	5.8	7.93	<0.001	
Gold (mg/L)	<0.001	<0.001 – 0.001	<0.001 – 0.003	

1 Sample dates: 14/06/05, 26/06/05, 21/10/05
2 Sample dates: 14/06/05, 22/06/05, 26/06/05, 21/10/05, 17/01/06
3 Sample dates: 14/07/05, 29/09/05, 17/01/06
4 Stock water quality for sheep (Table 4.3.2 and 4.3.1, Chapter 4 Primary Industries, *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (2000)
For sampling locations, refer to **Figure 3.1**

3.3.2.2 Management Measures

- A surface water management plan would be implemented that includes the separation of clean and 'dirty' water.
- Areas of disturbance would be carefully marked on the ground to ensure disturbance is minimised and opportunities for sediment creation are minimised.
- Topsoil stockpiles would be revegetated with ground cover to minimise erosion opportunities and sediment creation.
- Dewatered groundwater would be contained within dedicated settling ponds (refer to Section 2.12) to avoid interaction with surface water runoff.
- The disturbance footprint has been largely contained within one surface water sub-catchment on the property to minimise potential impact areas and maximise management opportunities.

1 Bureau of Meteorology: Kenmure Station, Nymagee – from 118 observations.

- Vegetation would be stockpiled downslope (where possible) of cleared areas to act as a silt fence.
- Sediment basins would be constructed in strategic locations to maximise sediment retention off disturbed areas.
- Sediment basins have been sized for greater than an average annual rainfall event.
- Any potentially acidic or metal leachate from the WRD or ore pad would be captured in the sediment basins.
- Fuel and the generators are to be stored in a centrally located, bunded area. All drainage from this area would be directed to a lined sump, which would be periodically pumped to the oil/water separator.
- All drainage from the workshop would be directed to the oil/water separator.
- Where possible with minimal vegetation disturbance, wide and shallow diversion drains would be constructed upstream of the disturbance areas to minimise the potential for 'clean' water to mix with 'dirty' water.
- Regular water quality monitoring would continue to be undertaken (refer to Section 5 – EMP5).

For further detail on the surface water management for the site, refer to Section 5 – EMP5.

3.3.2.3 Environmental Effects

Surface water on the site is generally overland flow from rain events and as such, the mitigation measures that would be implemented are aimed at minimising the opportunities for this water to collect and transport sediment and/or hydrocarbons. While it is acknowledged that there may be a short term increase in sediment load in surface water runoff from the site during site establishment activities, this sediment is anticipated to settle out in the water management structures prior to being captured in Three Gates Tank.

Given that the water from the dewatering of the exploration decline is to be kept separate from the general surface water runoff of the area and that the water quality of this water is anticipated to remain at stock watering quality (Section 3.3.2.1), the capturing of all surface water runoff within sediment ponds and only clean water being diverted to Three Gates Tank, the fact that no processing is to be undertaken on site and the distance to the nearest water course, the potential impact on surface water resources in the area is considered negligible.

3.3.3 Groundwater

3.3.3.1 Existing Environment

The Project Site lies within the Department of Natural Resources' (DNR) Far West Region with the producing aquifers comprising the Central West and / or Far West Fractured Rock aquifer. (The distinction between the Central West and the Far West region has not been accurately defined by DNR). There are no known Groundwater Management Areas covering the study area (GeoTerra, 2005).

Eleven DNR registered bores and one well are located within a 30km^2 x 30km^2 area around the Project Site, with the bores and well being used mainly for stock and / or domestic use. Three of these bores are located on "The Peak" property, namely Skirka's Bore (WB01), Back Bore (GW020656) and House Bore (GW020657) (see **Figure 3.1**). The DNR bore database indicates bore yields range from 0.25L/sec to 1.1L/sec, with standing water levels ranging from 15.2mbgl to 62mbgl in bores from 25.9m to 110m deep (GeoTerra, 2005).

GeoTerra (2005) undertook hydrogeological field work on the site in 2005. Their assessment identified that the property does not contain significant groundwater resources, with the main source being fractured rock aquifers comprising sandstone, slate, quartzite and siltstones of the Lower Amphitheatre Group, Burthong Formation and the Roset Sandstone.

They also asserted that the existing bores provide low yields (<1.5L/sec) from a range of potentially confined to semi-confined aquifers, with an anticipated, unquantified diminution of standing water levels after extended droughts as no local groundwater monitoring records are available from DNR to confirm these assumptions.

No major or significant groundwater resource is utilised in the region, with the main water resource in the region being from surface runoff captured in dams. Limited water from bores is intermittently used to supply up to 1.4L/sec from siltstone, schist or slate formations.

The Hera deposit lies within the siltstones and sandstones of the Lower Amphitheatre Group in the west and Burthong Formation in the east. These geological formations provide only a minor groundwater source from low yielding basement aquifers for limited stock and domestic use (GeoTerra, 2005).

GeoTerra (2005) identified that at present, properties to the north and south of "The Peak" do not regularly use or rely on groundwater and there are no known groundwater dependent ecosystems in the vicinity of "The Peak".

Water quality data is provided in **Tables 3.2** and **3.3**. This information indicates that apart from the salinity levels, the groundwater in the area generally meets the ANZECC criteria for stock water, with shaded results exceeding the stock water criteria.

Table 3.2
Bore Water Chemistry – Major Ions (mg/L)

Bore	pH	EC uS/cm	TDS	Na	Ca	K	Mg	Cl	F	NO3	SO4	HCO3	Tot P
Skirka's (WB01)# (June 05)	7.16	**4970**	3875*	631	235	26	270	1580	_	_	_	383	_
Back (June 05)#	7.21	1420	1105*	163	36	8	39	192	_	_	_	375	_
House (June 05)#	7.40	**3320**	2590*	537	41	25	70	917	_	_	_	420	_
TNWB2	**8.11**	**4360**	3380	803	96	35	179	1650	1.2	0.533	752	_	**0.04**
TNWB3	7.01	**4310**	3400	626	149	30	207	1780	0.4	0.036	446	_	**0.10**
ANZECC Stock Water Criteria (sheep)	6.5 – 8.0+	125-2200+	5000	–	1000	–	–	–	–	400	1000	–	0.005+

Note: + ANZECC 2000 default trigger values (SE Australian Lowland River)
* TDS calculated from EC.
# Refer to **Figure 3.1**

Source: Table 3 (GeoTerra, 2005)

Table 3.3
Bore Water Chemistry – Major Metals (mg/L)

Bore	Cu	Pb	Zn	Cd	Fe	Sb	As	Cd	Cr	Co	Ni	Se
Skirka's (WB01)* (June 05)	0.005	<0.001	0.019	<0.0001	_	<0.001	0.001	<0.0001	<0.001	0.003	0.023	<0.01
Back* (June 05)	<0.001	<0.001	0.02	0.0002	_	<0.001	0.002	0.0002	<0.001	<0.001	<0.001	<0.01
House* (June 05)	0.004	0.002	0.013	<0.0001	_	<0.001	0.002	<0.0001	<0.001	<0.001	0.002	<0.01
TNWB2	0.008	0.011	0.037	0.0008	0.23	0.148	0.003	0.0008	<0.001	-	0.036	<0.01
TNWB3	0.008	0.003	0.067	0.0008	0.10	<0.001	<0.001	0.0008	<0.001	-	0.008	<0.01
ANZECC Stock Water Criteria (sheep)	0.4	0.1	20	0.01	_	_	0.5	0.01	1	1	1	0.02
* Refer to **Figure 3.1**												
Source: Table 4 (GeoTerra, 2005)												

3.3.3.2 Management Measures

- Dewatered water would be pumped to the settling ponds detailed in Section 2.12. This water would be the primary source of operational water (for use underground for drilling as required).
- The water in the settling ponds would be monitored for water quality on a regular basis (refer to Section 5 – EMP 5).
- Any overflow from the settling ponds would be captured within the adjacent Three Gates Tank.

Refer to Section 5 – EMP 5 for additional detail on management measures.

3.3.3.3 Environmental Effects

There is very limited groundwater on "The Peak" and as such, the exploration decline is not anticipated to intersect high volumes of groundwater. This prediction is reinforced by the poor yield of registered bores in the area and the low volume of groundwater intersected by the exploration drill holes on the property.

Given that all bores in the local area are low yielding and the conclusion of GeoTerra that the geological formation that hosts the Hera deposit is not suitable to produce large volumes of groundwater, it is concluded that the exploration decline and associated dewatering would not have a significant impact on drawdown or groundwater availability either on the property or on adjacent properties. Additionally, the exploration decline activities are short term and any impact that is realized, though highly unlikely, would also be short term.

The property has a number of bores that are used to provide low volumes of water to supplement surface water resources as required. These bores are monitored on a weekly basis for water level and quarterly for water quality and as such, would be the first to indicate the presence of an impact as a result of the exploration decline. Should such an impact be identified, the Company would discuss potential contingency measures with both DPI(MR) and DNR.

3.3.4 Flora and Fauna

3.3.4.1 Existing Environment

Charles Sturt University Johnstone Centre (CSU) was commissioned to undertake the flora and fauna assessment. Prior to the surveys, a desktop assessment was undertaken and a list of threatened biota was compiled from a literature review and database search. As a result, 12 threatened flora species, 54 threatened fauna species, one threatened population and one threatened ecological community are known to occur within the region.

Consultants from CSU undertook a number of flora and fauna surveys during 1 to 5 December of 2004, 25 and 26 June 2005 and 19 to 23 September 2005. The flora survey revealed 171 species of flora from 58 families. Of these species, 16% were exotics with the remaining being native species (including cosmopolitan species). No threatened flora, or flora of conservation concern were recorded during the survey.

Approximately 95% of the site is covered by native vegetation comprising the following five main vegetation communities (**Figure 3.2**).

1. Bimble (Poplar) Box/White Cypress Pine woodland
2. Red Box/White Cypress Pine woodland
3. Mallee (Eucalyptus spp.)
4. Mugga Ironbark/White Cypress Pine woodland
5. Cleared grassland/shrubland

White Cypress Pine, Red Box and Bimble Box are the dominant canopy species across the property. Native species generally dominated the ground cover of woodland and forested areas.

The vegetation across the site has been disturbed through agricultural activities, feral goat grazing and past and present exploration activities (**Figure 3.3**). At least 200ha of the property has been previously cleared of smaller trees and shrubs for the purpose of containing woody weed encroachment and maintaining stock carrying capacity. The exact location and timing of this clearing has not been identified. It is anticipated that more than this area has been previously cleared for agricultural purposes.

Diversity of ground cover was characterised by past and present disturbance history, with diversity generally poorer in areas that have been heavily grazed.

The likelihood of additional threatened species previously recorded within the region to occur within the property was also assessed. As a result of a review of the ecology, habitat requirements and historical records for each threatened biota, it was determined that a further one threatened reptile species; 14 threatened birds; nine threatened mammals (including ground dwelling, arboreal and microchiropteran bats) and two threatened plants could potentially occur within the property.

The following threatened species were recorded within the property as a result of the flora and fauna survey (**Figure 3.4**).

1. Pink Cockatoo (*Cacatua leadbeateri*)
2. Grey-crowned Babbler (*Pomatostomus temporalis temporalis* (eastern subspecies))
3. Hooded Robin (*Melanodryas cucullate*)
4. Chestnut Quail-thrush (*Cinclosoma castanotus*)
5. Speckled Warbler (*Chthonicola sagittate*)
6. Pied Honeyeater (*Certhionyx variegates*)
7. Diamond Firetail (*Stagonopleura guttata*)
8. Superb Parrot (*Polytelis swainsonii*)
9. Black-chinned Honeyeater (*Melithreptus gularis gularis* (eastern subspecies))
10. Little Pied Bat (*Chalinolobus picatus*)

3.3.4.2 Management Measures

After consideration of advice from Charles Sturt University Johnstone Centre, the following mitigation measures would be implemented.

Pre-clearing

- A pre-clearance survey would be undertaken by a qualified ecologist to identify the following.
  - Vegetation/habitat which may harbour fauna (e.g. habitat trees).
  - Suitable locations for nesting boxes or relocation of hollow limbs if necessary.
- Following the pre-clearance survey, any identified species would be relocated to surrounding vegetation of a similar type.
- Where appropriate locations for nesting boxes have been identified, these would be erected.

During Clearing

- Areas to be cleared would be clearly marked to ensure no accidental clearing occurs.
- Where clearing of native vegetation is unavoidable, an attempt would be made to collect mature seed from native trees and shrubs felled. Any seed collected would be stored for future use in rehabilitation of the site.
- Where mature and old growth trees are removed (e.g. any tree with a trunk diameter of approximately >40cm), any trees/limbs would be stockpiled in nominated areas or placed in adjacent vegetation to provide habitat.
- Any noxious weed and other weed material encountered during exploration activities, would be destroyed by spraying and subsequent burial in the landfill trench to ensure weeds do not spread to other sites, especially in regards to invasion of drainage lines and dams.

Rehabilitation

- Rehabilitation would be undertaken with indigenous plant species found on the property within that vegetation community.
- Final rehabilitation of the disturbance areas should be monitored to ensure native vegetation regeneration is successful.

General Property Management

As a responsible property manager, the Company would manage their property accordingly. Activities currently undertaken on the property would be continued for the length of the project and include:

- weed management;
- water management structure management and maintenance; and
- feral animal management as appropriate.

To minimise the potential interaction of stock and mining and exploration activities, stock has been removed from the entire property. The potential for fencing off some areas of the property to return the area to grazing would be regularly reviewed during the course of the project in light of weed management and bush fire control.

3.3.4.3 Environmental Effects

A number of potential impacts have been identified by CSU. Given the existing state of the site, the small area of proposed disturbance and the proposed mitigation measures, the following conclusions were made with respect to the potential ecological impacts.

- Further reduction and fragmentation of vegetation and associated habitat of the Project Site by the proposed activity may further decrease the ecological value of the area, although this impact is considered to be minimal.

- Approximately 12ha (maximum) or less than 1% of the 190 000ha of native vegetation in the local area would be removed as a result of the proposed activity. The vegetation to be removed/modified is largely White Cypress Pine woodland, co-dominated by Red Box and Bimble Box. This vegetation is the dominant vegetation type of the Project Site and is well represented within the general locality. In local and regional terms, the removal of this amount of vegetation is not regarded as of particular consequence. At a local and regional level the removal of the types of vegetation is also not of concern.

  Removal of this vegetation and associated habitat would not constitute a significant portion of any vegetation type for any threatened biota. The Project Site is well connected to surrounding areas of vegetation and the proposed activity would not result in the Project Site becoming isolated from adjacent areas of habitat. The proposed activity is also unlikely to create a barrier to the movement of any fauna or remove or significantly alter the value of any wildlife corridors.

- Edge effects, caused by vegetation removal and modification, already occur throughout the Project Site, particularly in areas divided by the existing operations and the internal road network. The proposed activity would exacerbate edge effects by removing vegetation and exposing remaining vegetation to newly created edge boundaries, thus increasing fragmentation and creating additional edges within an already disturbed area. This may in turn affect the natural diversity of the site by modifying the existing native seed bank and providing more suitable habitat for exotic species, as exotic species would adapt to disturbed areas more readily than native species. These potential impacts can be managed through the implementation of appropriate measures, as detailed in Section 3.3.4.2.
- Noise pollution would increase as a result of the exploration operations, possibly deterring native fauna from utilising the Project Site and surrounding area for movement and habitat and potentially disrupting the breeding/pollination cycle, foraging and roosting behaviour of some species during the life of the project. Given the noise levels emitting from the previous exploration operations, vehicle traffic and nearby road, it is considered unlikely that the proposed activity would increase noise levels beyond levels already experienced. It is considered unlikely that it would cause a significant affect to the survival of any of the native species mentioned in this report or those that may otherwise use the site as part of their overall habitat area.

Individual Section 5A assessments were conducted for each threatened species identified on the Project Site in order to determine if the proposed activity "*is likely to have a significant effect"* upon these species (presented in **Annexure 4**). As a result of this assessment and given the implementation of the mitigation measures described in Section 3.3.4.2, it is considered that the proposed activity is "unlikely" to impose a "significant effect" upon threatened species identified within the Project Site.

3.3.5 Aboriginal Heritage

3.3.5.1 Existing Environment

Archaeological Surveys and Reports Pty Ltd conducted an assessment of the western portion of "The Peak" property (entirely encompassing the proposed drilling area) in March 2004 in conjunction with representatives of the Condobolin Local Aboriginal Land Council. No sites were identified and as survey visibility was excellent, this result is assumed to be representative of the absence of artefacts in the area (ASR, 2004). The relevant section of this assessment report is presented in **Annexure 4**.

A map of the proposed Category 3 exploration activities was provided to Archaeological Surveys and Reports Pty Ltd and they determined that the area of surface disturbance lies within the area that was surveyed (**Annexure 4**). As such, the conclusions of that assessment, ie. that there are no sites within the area of disturbance and that no further consultation with Aboriginal groups is required, still apply.

3.3.5.2 Management Measures

- Due to the lack of sites, no mitigation measures are required.
- Although highly unlikely, should any items of potential significance be identified during disturbance activities, DEC(NPWS) would be notified and activities in that area would temporarily cease.

3.3.5.3 Environmental Effects

There would be no environmental effects on Aboriginal heritage as a result of the exploration activities.

3.3.6 European Heritage

3.3.6.1 Existing Environment

No items of European heritage significance have been identified on, or in the vicinity of, the property.

3.3.6.2 Management Measures

Due to the lack of heritage values on the area, no management measures are required.

3.3.6.3 Environmental Effects

Given that there are no items or places of European heritage significance on the property, nor in the vicinity, no adverse European heritage effects would occur.

3.3.7 Air Quality

3.3.7.1 Existing Environment

"The Peak" is an agricultural property that has recently been subject to relatively close spaced exploration drilling. Dust management measures have been employed during the course of the exploration drilling. Adjacent to the property are unsealed roads and additional agricultural properties.

As such, the air quality in the area is high but impacted by the dust creation from vehicles travelling on unsealed roads and natural wind erosion of areas disturbed by agriculture. The soils in the area are hard setting, however, and if the soils are set and undisturbed by vehicles or stock, dust creation from wind erosion would be minimal.

3.3.7.2 Management Measures

- The area of disturbance would be minimised and contained to that which is required for surface infrastructure and the box cut.
- Screening activities that may be undertaken to provide road base would not produce fine material.
- Blasting for the box cut would not be undertaken on windy days to minimise the potential travel of dust.
- The internal roads would be built up over the existing surface using screened waste rock and/or material from the construction of the settling ponds. This surfacing of the roads would minimise the dust creation from vehicle travel.
- Soil would be stripped with groundcover to provide for the retention of more soil structure and rapid groundcover re-establishment over the stockpiles, hence minimising opportunities for erosion.
- While noxious gases are not anticipated to be intersected by the exploration decline, should they occur, the ventilation system would dilute these gases to well below the statutory levels with fresh air. As a result, there would be negligible amounts of gas emitted from the ventilation rises.
- The ventilation system would dilute any concentrated gases resulting from underground blasting with fresh air, hence minimizing the concentration of gas emitted from the ventilation rises.

3.3.7.3 Environmental Effects

The waste rock and bulk sample ore brought to the surface would not be crushed and as such, would contain very little fines for dust creation. The areas of disturbance have been minimised and the internal roads would be built up with competent material. As such, opportunities for dust creation during the period of activity are limited.

The ventilation practices proposed with respect to blasting and underground gases are standard for underground operations and any gases emitted from the ventilation rise is anticipated to be too dilute to cause an effect of any noticeable extent.

In summary, there may be some increase in dust during surface blasting for the box cut, soil stripping and transport campaigns, however, given the relatively short term nature of this potential adverse effect and the unsealed nature of the roads in the local area around the property, it is considered that air quality would not be adversely effected to a significant level, particularly at surrounding residences given their distance from the area of activity.

3.3.8 Noise and Vibration

3.3.8.1 Existing Environment

"The Peak" is surrounded by agricultural properties, primarily used for stock grazing, although some cropping is undertaken. The rural setting provides for background noise to be low and dominated by vehicles and agricultural machinery. The exploration activities currently being undertaken on the property adds to the background noise on a short term, intermittent basis.

It should be noted that the nearest resident is located approximately 2.7km to the north and there has been no complaints with respect to noise during the current exploration activities.

3.3.8.2 Management Measures

- As much as practical, blasting during the box cut construction would not be undertaken on cloudy days when the sound could be amplified.
- Surface blasting would only be undertaken between the hours of 9.00am to 5.00pm.
- Each blast would be designed to minimise the vibration impact at surrounding residences.
- The transport of the bulk ore sample would be undertaken on a campaign basis to minimise the noise impact of the road trains to a short duration.
- The majority of the surface activities would be undertaken during daytime hours, ie. 7.00am to 6.00pm.
- A program of blast notification would be developed with surrounding landowners to alert them to the likely day / time of blasts, particularly those involved in the excavation of the box cut.
- Any complaints related to noise or vibration would be dealt with according to the Company's existing complaints management system.

3.3.8.3 Environmental Effects

There would be some noise impact to surrounding land users as a result of the exploration activities. The largest noise impact would occur during the box cut and site establishment phase. This phase is anticipated to only last approximately one to two months and activities would only be undertaken during daytime, hence the effect is not anticipated to be significant in extent or duration.

Blasting may also have a vibration effect on the adjacent residences, however, given that the nearest residence is approximately 2.7km away, and the blasts would be designed to minimise vibration, this effect is anticipated to be minimal, if any, and would only occur for the short duration of each blast. Given the relatively small blasts planned over a time period of less than 12 months, this is not anticipated to be a significant impact and is not anticipated to create structural damage on any surrounding residences. In any event, Triako would require the mining contractor to monitor the initial blasts at the closest residence to confirm blast impacts are within DEC nominated criteria.

Should structural impact occur, it is likely that the first signs of this impact would be at "the Peak" homestead, hence contingency actions such as the re-design of blast parameters could be implemented prior to any potential impact occurring at surrounding residences.

3.3.9 Visibility

3.3.9.1 Existing Environment

"The Peak" is largely covered in vegetation, with some grid lines from current and previous exploration activities visible. The front part of the property that adjoins the Burthong road, is largely cleared and consists of a homestead and the Company's exploration offices and core yard.

3.3.9.2 Management Measures

- The surface infrastructure has been located behind the Peak hill to minimise visual intrusion for users of the Burthong road.
- The waste rock dump has been kept to a maximum of 10m high to minimise visual intrusion on surrounding residents.
- Surface lighting would be kept to a minimum during night operations.

3.3.9.3 Environmental Effects

Due to the relatively flat topography, the area of "The Peak" to be disturbed by the exploration activity is not visible from any of the surrounding residences or the Burthong Road, from which the site is accessed.

The waste rock dump may be visible from some residences to the west and north once it reaches its full height of 10m. Given the rocky outcrop of the adjacent Peak hill, the waste rock dump is not anticipated to be too dissimilar to that landscape during the operational period, and would be extremely similar once rehabilitated, hence would not result in a significant visual intrusion.

3.3.10 Land Tenure and Surrounding Residents

3.3.10.1 Existing Environment

The Project Site is entirely owned by the Company.

The Project Site is covered by Western Lands Leases 2455 and EL6162 (**Figure 3.5**).

The nearest residence is located 2.7km to the north and there are only four residences within a 4km radius of the site (**Figure 3.5**).

3.3.10.2 Management Measures

The management measures explained in the sections above to minimise adverse effects on air quality, water resources, noise and visual intrusion would all act to minimise amenity impacts on the surrounding residents.

Additionally, the implementation of the management measures presented in the individual EMPs in Section 5 would further minimise the potential for environmental effects.

3.3.10.3 Environmental Effects

The exploration activities have been designed to have minimal impact on the surrounding land owners, residents and land users. While there would be some impact with respect to noise, vibration and visual intrusion, these impacts are anticipated to be either very short term (ie. one to two months during site establishment) or short term (12 to 14 months of exploration activities). The potential advantages to the community from the influx of the employees and contractors for the work and the support of town services and events by the Company may compensate for the low level effects on amenity as a result of these activities. Additionally, without the undertaking of this Category 3 exploration work, the full potential of the Hera deposit may not be realized and the potential benefits of a full-scale mining operation for the Nymagee township and the general area not realised.

Surrounding land tenure and land use would not be effected by the exploration activities.

3.4 ENVIRONMENTAL MANAGEMENT

The management of all environmentally-related issues would be the ultimate responsibility of the Safety, Health and Environment (SH&E) Manager of CBH Resources Limited. The SH&E Manager would be supported by the General Manager – Mineral Hill / Hera who in turn would closely manage on-site personnel to ensure all appropriate operational tasks are completed to achieve a high standard of environmental performance. Environmental responsibilities of the contractor and its workforce would be comprehensively included in all contract documentation.

The approach to environmental management on site would involve a range of activities, each of which are described below.

Planning

All activities involving vegetation removal, topsoil recovery and stockpiling, weathered rock placement and water management structures would be undertaken in accordance with approved plans. The contractor would be required to complete a job safety and environmental analysis for each activity to ensure that the management of all safety and environmental issues are appropriately planned.

Competency and Training

All environmentally-related tasks would only be carried out by personnel assessed to be competent for those tasks. Where it is assessed by Triako's on-site representative that the level of competency is not adequate, appropriate training would be provided.

Internal Auditing

A program of internal auditing would be introduced to ensure that, at least on a monthly basis, all environmentally-related issues are reviewed. Internal audits would focus both on compliance issues and Triako's expectation regarding best practices. The quality assurance program for characterising waste rock would be included in the internal audit program. Within 2 months of the commencement of this program, an external audit would be commissioned to ensure that the practices adopted in the waste rock characterization program are appropriate.

Reporting

A program of reporting would be introduced to record the progress with all environmental issues – culminating in a comprehensive 6 monthly report included as part of the reporting for EL 6162.

SECTION 4 JUSTIFICATION AND CONCLUSION

The proposed activities would result in the disturbance of less than 12ha and would provide the Company with valuable geological and geotechnical information to enable an informed decision regarding the feasibility of developing a full scale production mine at the site. Should a full scale production mine be developed, the majority of the infrastructure has been sited so as to service such a development with limited requirement for additional surface infrastructure.

The Company has committed throughout this document and in the attached environmental management plans, to a number of mitigation measures that would result in a high level of environmental management and a resultant relatively low impact on the surrounding residents and the local environment.

Based on the assessment of residual impact following the implementation of the mitigation measures, it has been determined that there would not be a significant environmental impact on ecology, air quality, noise or visual amenity as a result of the proposal.

The primary potential adverse impacts that could occur as a result of this proposal are:

- reduction of the area of habitat within the property until rehabilitation is undertaken;
- small increases in relatively short term noise at the nearest residence (2.7km away);
- small decrease in air quality for relatively short term durations at the nearest residence;
- short term and campaign basis increase in heavy truck traffic on the roads surrounding Nymagee township.

The potential benefits arising from the proposal are:

- increase in economic benefit for Nymagee and surrounding towns such as Cobar and Condobolin;
- provision of important resource information to allow for decisions on the feasibility of a full scale operation that would result in further economic and social benefits; and
- removal of stock from the entire property, hence allowing for the regeneration of the existing native vegetation.

Overall, this project represents an opportunity for a low impact development in the Nymagee area, an area which currently lacks active development and development opportunities.

The potential impacts of the proposed exploration activities have been assessed in conjunction with the existing exploration drilling activities, hence cumulative impacts have been considered throughout the impact assessment.

SECTION 5 ENVIRONMENTAL MANAGEMENT PLANS

- EMP1: Vegetation Clearing
- EMP2: Topsoil Stripping and Management
- EMP3: Hydrocarbon Management
- EMP4: Waste Management
- EMP5: Water, Erosion and Sediment Management
- EMP6: Rehabilitation
- EMP7: Bushfire Control
- EMP8: Complaints Management

Environmental Management Procedure Accountability Matrix

Position	**EMP 1: Vegetation Clearing**	**EMP 2: Topsoil Stripping and Management**	**EMP 3: Hydrocarbon Management**	**EMP 4: Waste Management**	**EMP 5: Water, Erosion and Sediment Management**	**EMP 6: Rehabilitation**	**EMP 7: Bushfire Control**	**EMP 8 Complaints Management**
Site Manager								
Technical Assistant								
Mining Contractor								
Earthmoving Equipment Operators								
Maintenance/ Workshop Personnel								
All Employees/ Contractors								
Visitors								

Hera Deposit

Environmental Management Plan 1

VEGETATION CLEARING

Revision	Written by:	Date	Managerial Approval	Reason for Change	Next Review due:
0	R.W. Corkery & Co. Pty. Limited	May 2006		New Site Management Plan	May 2007

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PLAN: VEGETATION CLEARING

1.0 Applicability of Procedure

This procedure only relates to those areas within the proposed disturbance footprints as detailed in Section 2 and illustrated on **Figures 2.1** and **2.2**.

2.0 Objective

The objective of this procedure is to provide the principles for effective and environmentally responsible vegetation clearing and ensure compliance with the commitments made throughout this REF.

Vegetation clearing on site will be controlled by this procedure to ensure minimal clearing is undertaken and that the cleared vegetation is appropriately stored and used effectively in rehabilitation of disturbed areas.

3.0 Process

Vegetation clearing is to be undertaken in all naturally vegetated areas to be disturbed prior to any other earthmoving activities. Vegetation clearing is to be undertaken in all areas in one clearing campaign. Important components of the vegetation clearing activities include the following.

1. The area of vegetation to be cleared must be clearly defined (if necessary, mark area boundary) ahead of vegetation clearing activities. This designated area must include the area to be cleared for the vegetation windrows and topsoil stockpiling (if topsoil is available for stockpiling).

2. Ensure all personnel involved in the clearing can identify, and clearly understand, the boundaries of the clearing.

3. All vehicles / equipment are to use existing and designated tracks and construction activities are to be conducted only within the disturbance footprints nominated.

4. A pre-clearing survey is to be undertaken of all vegetation within the designated areas to identify any nesting or roosting fauna. Should any nesting or roosting fauna be identified, they will be relocated to similar vegetation at least 100m away from the disturbance areas.

5. Following completion of the pre-clearing survey, vegetation is to be cleared using a bulldozer/front-end loader with the blade up (ie. groundcover is retained).

6. Vegetation is to be track-rolled to break up the larger trunks and pushed into windrows at the limit of the disturbance footprint (allowing room for topsoil stockpiles where applicable).

7. Vegetation windrows are to be retained until final rehabilitation of the adjacent area of disturbance.

8. Once final rehabilitation is required, the vegetation in the windrows is to be pulled back over the area and spread as mulch, habitat and erosion protection.

9. The native vegetation behind the vegetation windrow is not to be disturbed, hence vegetation is to be pulled back onto the disturbed area – not pushed.

4.0 Workforce Awareness

These procedures are available to all members of the workforce on site, particularly those responsible for vegetation clearing. The responsible workforce will be made aware of the procedures through inductions prior to any relevant activities. A copy of this Environmental Management Plan will be retained on site and will be available to all employees / contractors.

5.0 Responsibility and Accountability

The ultimate responsibility for this procedure is the Site Manager.

The following positions are also accountable.

Position	Accountable Task
Site Manager	Clearly and accurately marking limit of clearing on ground.
Bulldozer/ Front-end loader Operator (Clearing)	1. Ensuring clearing done with a raised blade. 2. Ensuring vegetation windrowed on the edge of the nominated disturbance footprint.
Bulldozer/ Front-end loader Operator (Rehabilitation)	3. Ensuring vegetation is pulled onto final landform areas and no further areas of vegetation are disturbed during this process.

Hera Deposit

Environmental Management Plan 2

TOPSOIL STRIPPING AND MANAGEMENT

Revision	Written by:	Date	Managerial Approval	Reason for Change	Next Review due:
0	R.W. Corkery & Co. Pty. Limited	May 2006		New Site Management Plan	May 2007

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PLAN: TOPSOIL STRIPPING AND MANAGEMENT

1.0 Applicability of Procedure

This procedure only relates to those areas within the proposed disturbance footprints as detailed in Section 2 and illustrated on **Figure 2.1** and **2.2**.

Topsoil occurrence at Hera deposit is generally very limited due to the skeletal soils and as such, there is no distinction made between topsoil and subsoil.

2.0 Objective

The objective of this procedure is to provide guidance for effective soil management: from clearing to storage. Re-application of topsoil over disturbance areas is covered in the rehabilitation plan (EMP 6).

Soil is an important and finite resource. Responsible management of topsoil can avoid sterilization of the soil resource and maximise rehabilitation success.

3.0 Process

Topsoil (where it exists) is to be removed from all areas that are to be disturbed to ensure any existing soil is available for rehabilitation. Important components of the soil stripping activities include the following.

1. Areas of disturbance must be clearly defined ahead of soil stripping activities (ie. pegged / flagged on the ground). These designated areas must also include the area to be cleared for soil stockpiling.

2. Whenever possible, no soil is to be removed in wet conditions to avoid breakdown of the soil structure.

3. Identify the location of the soil stockpiles prior to stripping commencing. These stockpiles must be located immediately adjacent to the area of disturbance, preferably on the upslope side of the area of disturbance if possible, between the disturbance and the vegetation windrow.

4. Ensure the area of the soil stockpiles are stripped also.

5. Soil stripping is to include the groundcover which was retained during the vegetation clearing (contains seed bank and minimises erosion and dust between vegetation clearing and soil stripping).

6. Soil is to be stripped as much as possible to ensure that a maximum volume of topsoil is available for rehabilitation.

7. Stockpiles are to be created no higher than 2m high and with no greater than 1:2 (V:H) slopes to minimise erosion.

8. Soil stockpiles are not to be driven on or compacted.

9. If the natural seed bank in the soil does not cover the stockpiles with vegetation within a three month period OR the soils have not hard set, the stockpiles should be sown with an appropriate native ground cover species to stabilise the soil and protect it from erosion.

4.0 Workforce Awareness

These procedures are available to all members of the workforce on site, particularly those responsible for soil stripping, stockpiling and rehabilitation. The responsible workforce will be made aware of the procedures through inductions prior to any relevant activities. A copy of this Environmental Management Plan will be retained on site and will be available to all employees / contractors.

5.0 Responsibility and Accountability

The ultimate responsibility and accountability for ensuring this procedure is followed lies with the Site Manager.

Other relevant accountabilities for this procedure are as follows.

Position	Accountable Task
Site Manger	Ensure the boundaries of the soil stripping areas (including the soil stockpile area) are clearly marked on the ground.
Bulldozer/ Front-end loader Operator	To minimise soil handling and ensure stockpiles are no higher than 2m.

Hera Deposit

Environmental Management Plan 3

HYDROCARBON MANAGEMENT

Revision	Written by:	Date	Managerial Approval	Reason for Change	Next Review due:
0	R.W. Corkery & Co. Pty. Limited	May 2006		New Site Management Plan	May 2007

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PLAN: HYDROCARBON MANAGEMENT

1.0 Applicability of Procedure

This procedure is only applicable for fuel handling and storage activities within EL 6162 with respect to the exploration decline activities.

2.0 Objective

The objective of this procedure is to provide guidance regarding the required approach towards the delivery, use and storage of fuels, oils and other hydrocarbon-based materials.

3.0 Process

3.1 Fuel Delivery

Diesel, oils, greases and any other hydrocarbon materials are to be delivered to site by contractors. These contractors are to comply with all relevant requirements stipulated by the Company. The following need to be maintained and/or regularly checked.

- ⇨ Keep all delivery receipts as records for all hydrocarbon deliveries.
- ⇨ Regularly review work instructions relevant to fuel delivery and educate workforce on changes to ensure appropriate management of any spills that may occur during delivery.
- ⇨ During fuel delivery, the area must be manned at all times.

3.2 Fuel Storage / Use

All hydrocarbon materials are to be stored in a lined bunded area or in a self bunded tank. Each bund must meet all necessary statutory requirements. Bunding capacity is to be 110% of the largest vessel and/or 25% of the total hydrocarbon storage.

- ⇨ The bunded area should be well maintained and contain appropriate delivery, firefighting and refuelling facilities. Ensure collision bollards / barriers are erected, if appropriate. A spill kit should also be located near each bunded storage area.
- ⇨ All personnel handling hydrocarbons must take the appropriate precautions to minimise spillage of hydrocarbons.
- ⇨ Ensure each hydrocarbon storage area is inspected at least weekly to ensure containment, maintenance and compliance with regulations / legislation.

3.3 Vehicle / Equipment Refuelling Activities

- ⇨ All equipment is to be refuelled at the refuelling bay.
- ⇨ Store all refuelling nozzles either within the bund or on the refuelling pad in, or over, drip trays.
- ⇨ Ensure refuelling nozzles and/or mobile equipment is regularly inspected to ensure automatic cut off is working to avoid overfilling.
- ⇨ When refuelling either at the bund, the pump must be manned at all times.
- ⇨ When refuelling is complete, place nozzles back in the bund or over drip trays and ensure all hoses are removed from the drive-through area.
- ⇨ If in-situ refuelling is required for any reason, drip trays must be placed under the fuel tank and the refuelling nozzles replaced in the drip trays on the service truck.

3.4 Disposal

Waste hydrocarbons must be collected and stored in the waste oil tank located within the bunded area and sent off site to be recycled by a reputable licenced waste hydrocarbon contractor. Records of the volumes removed and date removed are to be retained.

3.5 Spill Response

In the event of a hydrocarbon spill, the following action must be taken.

- ⇨ Contain – using a spill absorbent (e.g. kitty litter) or for larger spills push up an earthen bund (or use a mobile oil boom), immediately contain the spill if possible.
- ⇨ Control – control the source of the spill, i.e. turn off the pump, right a fallen drum, cap the fuel tank. Call in support if required.
- ⇨ Clean up – all liquid hydrocarbon is to be removed by a hydrocarbon recycling contractor as soon as possible.

Contaminated kitty litter / oil booms / soil are to be removed for disposal / recycling / remediation by the waste oil appropriate contractor when they are on site. While awaiting collection, this material should be stored within the bunded area.

The contamination incident is to be reported to the Site Manager as soon as possible so that any follow up reporting requirements can be fulfilled.

4.0 Workforce Awareness

These procedures are available to all members of the workforce on site, particularly those responsible for hydrocarbon use and storage. The responsible workforce will be made aware of the procedures through inductions prior to any relevant activities. A copy of this Environmental Management Plan will be retained on site and will be available to all employees / contractors.

5.0 Responsibility and Accountability

The ultimate responsibility and accountability for ensuring this procedure is followed lies with the Site Manager.

Other relevant accountabilities for this procedure are as follows.

Position	Accountable Task
Maintenance Personnel	See Process points 3.1 to 3.4.
All employees / contractors	Process point 3.5.

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Hera Deposit

Environmental Management Plan 4

WASTE MANAGEMENT

Revision	Written by:	Date	Managerial Approval	Reason for Change	Next Review due:
0	R.W. Corkery & Co. Pty. Limited	May 2006		New Site Management Plan	May 2007

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PLAN: WASTE MANAGEMENT

1.0 Applicability of Procedure

This plan relates to all non-process waste produced by the exploration activities at "The Peak".

'Waste' in this procedure relates to all non-process wastes, ie. domestic rubbish, workshop waste, scrap steel and the like.

2.0 Objective

To ensure waste is managed appropriately and does not impact on the visual amenity of the site or site access road or impact on the environment in any way, ie. through pollution or the attraction of vermin.

3.0 Process

All waste must be disposed of in an appropriate manner so as not to cause harm to the environment or impact on visual amenity.

Waste must be appropriately separated to ensure that no waste stream is contaminated with inappropriate waste.

AT NO TIME IS ANY WASTE TO BE LITTERED EITHER ON SITE OR ALONG THE ACCESS ROAD.

Domestic Waste

(Crib room and office litter and general waste from other areas of site)

1. All waste is to be placed in the covered bins provided. Lids are to be maintained on the bins at all times to avoid the attraction of vermin and feral animals.
2. On a weekly basis, these bins are to be emptied into the active waste trench.
3. The waste trench is to be approximately 1.5m deep, 2m wide and up to 5m long. The entire trench is to be dug at one time, with the excavated material placed adjacent to the trench on the upslope side to act as a diversion bund for surface water runoff.
4. Waste is to be placed at the back of the trench, progressively moving forward until the trench is filled. The trench area is to be flagged and signed to avoid entering the trenches.
5. Once the weekly waste has been deposited in the active trench, a minimum of 30cm of cover material (excavated material stockpiled adjacent to the trench) is to be placed over the waste. When the waste is covered it will be visually inspected to ensure that it is appropriately covered.

6. Once the trench is filled along the entire length to a depth of 0.5m below surface, the remaining excavated material will be placed over the trench and compacted with the dozer.
7. If a new trench is required during the project, it is to be constructed adjacent to the first trench, with at least a 2m buffer between the trenches.
8. Any visual signs of vermin or feral animals in the area or noticeable odour are to be reported to the Site Manager as soon as possible. The first contingency action to be implemented in this event would include increasing the volume of cover to be placed over the waste on a daily basis.

Workshop Waste

(Waste oils, filters, rags, tyres and the like)

1. Workshop wastes are to be separated appropriately to ensure that wastes containing hydrocarbons do not contaminate the general domestic waste or other waste streams.
2. Waste oil is poured into the waste oil tank, located in the workshop.
3. The waste oil will be collected on an as needs basis by a licenced contractor. It is the responsibility of the mining contractor to contact the waste oil contractor and ensure that waste oil is collected often enough to maintain sufficient storage capacity.

   Waste oil is to be collected during all maintenance and servicing activities (refer to EMP3: Hydrocarbon Management).
4. Tyres are to be disposed of by the tyre dealer, organised by the contractor as part of their contract.

Other Operational Waste

(Scrap steel)

1. Scrap steel is a valuable resource and should be separated from the general waste stream for recycling. Scrap steel is to be stored on the laydown area until there is a sufficient quantity for recycling. At this stage the Site Manager will contact licenced scrap steel recyclers to remove the material.

5.0 Workforce Awareness

These procedures are available to all members of the workforce on site, particularly those responsible for waste management. The responsible workforce will be made aware of the procedures through inductions prior to any relevant activities. A copy of this Environmental Management Plan will be retained on site and will be available to all employees / contractors.

6.0 Responsibility and Accountability

The ultimate responsibility for this procedure is the Site Manager.

The following positions are also accountable.

Position	**Accountable Task**
All employees (including contractors)	To ensure they dispose of waste appropriately.
All visitors	To ensure they dispose of waste appropriately.
Site Manager / Mine Contractor	Contacting the appropriate waste management / recycling contractors to collect stored wastes / recyclables.

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Hera Deposit

Environmental Management Plan 5

WATER, EROSION AND SEDIMENT MANAGEMENT

Revision	Written by:	Date	Managerial Approval	Reason for Change	Next Review due:
0	R.W. Corkery & Co. Pty. Limited	May 2006		New Site Management Plan	May 2007
1	R.W. Corkery & Co. Pty. Limited	Feb 2007		Update of Appendix 1	Feb 2007

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PLAN: WATER, EROSION AND SEDIMENT MANAGEMENT

1.0 Applicability of Procedure

This procedure relates to all disturbance areas related to the exploration decline activities.

2.0 Objective

To meet all legal obligations and landowner responsibilities with respect to water, erosion and sediment management and ensure that the exploration works do not adversely impact water quality outside of the boundary of "The Peak".

To minimise the interaction of clean and 'dirty' water and to minimise the creation of dirty water.

3.0 Process

3.1 Sediment and Erosion Control

1. All areas to be disturbed will have their footprint clearly defined on the ground to ensure that the minimal area is disturbed, hence available to create sediment laden runoff.
2. Where possible, cleared vegetation will be stockpiled downslope of the individual areas of disturbance to act as a natural sediment trap.
3. Where possible with minimal vegetation disturbance, wide and shallow drains will be formed with a grader upstream of the areas of disturbance to divert clean water run on from the area of disturbance (**Figure 2.5**). Similarly, diversion drains will also be constructed where possible to ensure that all potentially "dirty" water runoff is directed to the sediment basin structures and clean water is diverted to Three Gates Dam.
4. All water management structures will be constructed to the specifications as designed by the Department of Lands Soil Conservation Service (Attachment 1).
5. If required, contingency sediment controls to be installed will include one or more of the following.
   - Silt fence.
   - Hay bales.
   - Additional retention basins.

Water slowing basins such as 'S' shaped drains.

6. All upstream and downstream structures installed are to be inspected by the Site Manager / Mine Contractor to ensure they are installed correctly, eg. silt fencing to be dug into the ground, hay bales to be appropriately anchored and drains draining to the appropriate sediment basin.

7. All surface water management structures, ie.:
   - settling ponds;
   - sediment basins;
   - silt fence;
   - hay bales;
   - retention basins;
   - diversion bunds;
   - catch drains; and
   - pipelines;

   are to be visually inspected on a monthly basis, prior to predicted, and after the occurrence of, large heavy or prolonged rainfall events to ensure they are still working effectively. Any required remedial works will be recorded and undertaken as soon as possible to minimise the opportunity for sediment-laden water to leave the site.
8. Sediment basins and drains are to be cleaned out on a regular basis, with the removed sediment used as additional cover material for the waste trench or placed on the waste rock dump.
9. Newly created soil stockpiles are to be stabilised as quickly as possible to minimise the opportunity for sediment creation and erosion.

3.2 Hydrocarbon Contaminated Water Control

Water that could potentially be contaminated with hydrocarbons includes that from the fuel storage area and the workshop. The following controls are to be implemented at each location.

1. All drainage in the workshop area is to be directed to the oil/water separator.
2. All drainage in the fuel storage area is to be directed to the lined sump, which will be periodically inspected and pumped to the oil/water separator at the work shop on an as needs basis.
3. The oil/water separator is to be visually inspected on a weekly basis to ensure that the baffles are working correctly and that the separator maintains its capacity.
4. Waste oil from the oil/water separator is to be regularly removed along with waste oil stored in the waste oil tank located in the workshop by a licenced contractor.
5. All appropriate hydrocarbon management measures (EMP 3) are to be employed to minimise the potential for hydrocarbons to enter the surface water system.

3.3 Water Monitoring

Monitoring	Location	Parameters	Frequency	Who
Surface water management structures	Various	Visual inspection for stability, capacity, erosion	Monthly	Site Manager / Mine Contractor
Surface water quality	SS01 (Pete's Dam) SS02 (House Dam) SS03 (off property) SB1 (adjacent ore pad)	pH , EC, TDS, Oil & Grease, As, Cd, Cr, Cu, Ni, Pb and Zn	Monthly	Site Manager / Mine Contractor
	SS04 (Settling Ponds) SS05 (Three Gates Tank)	pH , EC, TDS, Oil & Grease	Monthly	Site Manager / Mine Contractor
Rainfall	Rain gauge located at office	Rainfall (mm)	Daily	Site Manager / Mine Contractor

6. Should discharge monitoring results indicate water quality exceeding reasonable levels (ie. within 20% of background – Pete's Dam), all surface water management structures are to be inspected and remedial action taken. Records of inspections and remedial action are to be kept.

4.0 Workforce Awareness

These procedures are available to all members of the workforce on site, particularly those responsible for surface water management. The responsible workforce will be made aware of the procedures through inductions prior to any relevant activities. A copy of this Environmental Management Plan will be retained on site and will be available to all employees / contractors.

5.0 Responsibility and Accountability

The ultimate responsibility for this procedure is the Site Manager / Mine Contractor.

The following specific positions are also accountable.

Position	Accountable Task
Site Manager / Mine Contractor	Inspecting upstream and downstream surface water control structure installation. Ensuring any remedial actions required are undertaken and recorded. Monthly visual inspection of surface water management structures.
All employees / contractors	Reporting any surface water control structure issues / deficiencies.

6.0 Attachments

Attachment 1 – Surface Water Management Plan (Department of Lands Soil Conservation Service, 2006).

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Attachment 1
Surface Water Management Plan
Hera Deposit – Mining Exploration Proposal

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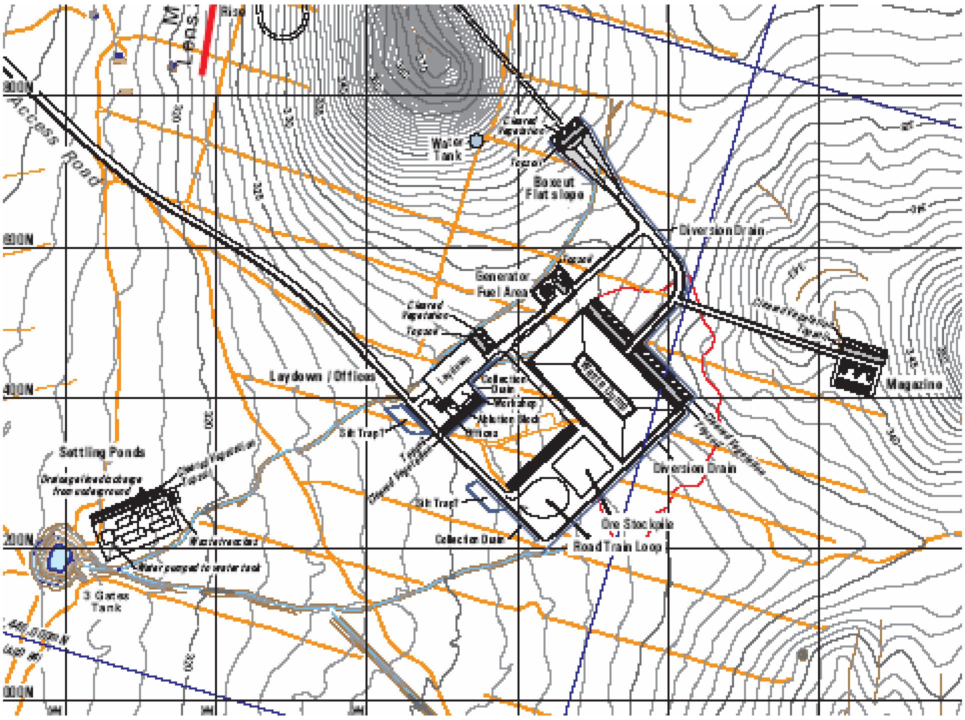
Department of Lands

SOIL CONSERVATION SERVICE

SURFACE WATER MANAGEMENT PLAN

HERA DEPOSIT – MINING EXPLORATION PROPOSAL



Client - R.W. Corkery & Co. Pty Limited on behalf of Triako Resources Limited

Initial Date – April 2006
Current Report Date – February 2007

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TRIAKO RESOURCES LIMITED
HERA DEPOSIT – PROPOSED MINING EXPLORATION

This limited Surface Water Management Plan (SWMP) and has been produced by the Soil Conservation Service, a Division of the NSW Department of Lands for R.W. Corkery & Co. Pty Limited on behalf of Triako Resources Limited. This document is to form part of the Review of Environmental Factors for the proposed mining exploration works (Hera Deposit) on the property “The Peak” approximately 5 km south of Nymagee in Western NSW.

Soil Services was commissioned to determine the best methodology in managing runoff water from the project. This report breaks up the management into clean water management and dirty water management. Some best management practices for this area are suggested as a summary for the report.

1. CLEAN WATER MANAGEMENT

Diversion, collection and storage of clean water will be achieved using a series of diversion banks (prefix DB) which will be constructed prior to surface disturbance activities within the adjacent upslope water catchments. The diversion banks that are described here are additional to those already shown on **Figure 2.5**. It is assumed that the perimeter diversion bank shown on **Figure 2.5** will be constructed.

1.1 Diversion Banks

Each diversion bank will exhibit the features identified below, with the dimensions for each diversion bank based on the upslope catchment area and slope.

- Trapezoidal channel.
- Bank batters between 1:3 to 1:6 (V:H).
- Channel batters are to be 1:6 (V:H).
- Channel grade 1 : 400 (5cm/20m) if channel is bare.
- Channel grade > or = 1 : 200 (10cm/20m) if channel is to be kept well grassed.
- Level sill outlet to each channel.
- Stable grass cover to be maintained below sill outlets.
- Sill width to be constructed with minimum 1.5 x channel base width.

Table 1.1 presents the specifications of the diversion banks illustrated on **Figure 2.5**.

Table 1.1
Diversion Bank Specifications

Diversion Bank ID	Catchment Area (ha)	Channel Bottom Width (m)	Channel Grade (%)	Bank Height (m)	Sill Width (m)	Slope Below Sill (%)
DB1	Will require a 450mm pipe or greater to run diverted waters under road					
DB2[1]	4	3	0.25	0.8	6	1.8
DB3	8	4	0.25	0.8	8	1.6
[1] Diversion bank 2 may need to be constructed if too much water is pond against the perimeter diversion bank						

2. DIRTY WATER MANAGEMENT

Catchment banks/drains (prefix CB) will be constructed to divert potentially sediment-laden waters into sediment basins (prefix SB) constructed downstream of these areas of disturbance. The size and storage capacity of the sediment basins have been determined based on the settlement time requirements of the most common soil type. The soil type for the area was determined from information provided and from existing soils information available for the area. This information characterises the soil as a sandy clay loam. Given the soils characterisation and the areas climatic characteristics the sediment basins have been design to suit a Type C soil (Landcom 2004).

2.1 Catch Banks/Drains

The general features for each of the catch banks/drains presented on **Figure 2.5** will be the same as for the diversion banks. **Table 1.2** provides the specifications for each catch identified bank/drain.

Table 1.2
Catch Bank Specifications

Catch Bank ID	Catchment Area (ha)	Channel Bottom Width (m)	Channel Grade (%)	Bank Height (m)	Sill Width (m)
CB1	6	3	1.2	0.6	6
CB2	5	3	1.3	0.6	6

2.2 Sediment Basins (SB)

The sediment basins have been designed to allow for settling and storage of "dirty" water collected on site. It is anticipated that the dirty zone will be broken into 2 section so that approximately 5 ha will flow into SB1 with the remaining 6 ha flowing into SB2. **Table 1.3** presents the specifications for each sediment basin identified on **Figure 2.5** .

Table 1.3
Sediment Basin Specifications

Sediment Basin ID	Catchment Area (ha)*	Volume (m^3)	Dimensions length *x* width *x* depth (m *x* m *x* m)	Outlet Width (m)	Sill Width (m)
SB1	5	800	50 x 20 x 1	3	6
SB2	6	800	50 x 20 x 1	3	6

The sediment basins will be constructed before any disturbance or other drainage control or water management structures are constructed. This way they are usable for any subsequent disturbance and rainfall event.

Basin management will include the following steps, as required.

a. Basins will be emptied of water within 20days of cessation of a rainfall event;

b. Basins will be cleared of accumulated sediment once 25% of a basin's capacity has been reduced;

c. In the event that the suspended sediment concentration in any discharged water exceeds 50mg/L or as prescribed by DEC:

    i. DEC will be advised and salient preceding weather information will be provided;

    ii. the upstream structures will be inspected and cleaned of consolidated sediment as required; and/or

    iii. the sediment basin(s) will be emptied of accumulated sediment or will be enlarged to provide greater settlement time for the sediment containing water; and/or

    iv. an additional storage dam will be constructed downstream with this becoming the new site discharge point and monitoring location. DEC will be advised to enable amendment to the Environment Protection Licence; and/or

    v. a flocculant will be added to the water contained within the sediment basin or storage dam increase the efficiency of sediment settlement.

Table 1.3 Identifies two sediment basins to be installed, each of which will exhibit the following features.

- Excavation and dam bank batters to be at least 1:3 (V:H).
- Crest width to be a minimum 3m wide.
- Freeboard to be a minimum 1m above top water level up to a wall height of 3m. Above 3m there will be an increase in freeboard of 0.1m for every 1m increase in wall height.
- Inlet and outlet channel batters are to be 1:6 (V:H).
- Outlet channel grade 1 : 400 (5cm/20m) if channel is bare.
- Outlet channel grade 1 : 200 (10cm/20m) if channel is to be kept well grassed.
- Level sill outlet to each outlet channel.
- Stable grass cover to be maintained below sill outlets.
- Sill width to be constructed with minimum 1.5 x channel base width.

3. BEST PRACTICE MANAGEMENT

Table drains and catch drains will have to constructed and maintained such that erosion along their channel is minimal. It may be necessary to rock line some areas of these drains where water velocities are high or water quantity is large. Additionally as will all structures it will be critical to save whatever topsoil is available to cover all banks and particularly any bank channels.

It is suggested that the grades of the diversion banks be no more then 0.25% (ie. 1:400 (V:H)). Where these banks discharge into a flow depression it will be critical to keep the drop into the depression minimal. It may be necessary to rock line or concrete line the inlet into the depression if erosion becomes a concern. Similarly, the catch drains that discharge into the sediment basins may need similar treatment.

It is critical that any spillway from either a bank or sediment basin is not disturbed by machinery as this will destroy any vegetation that has established in that area. It would be advisable to seed these areas as with all banks, channels, basins and other disturbed areas. Do not disturb any flow depression or construct any structure or building within 15 to 20 m of it.

4. REFERENCES/BIBLIOGRAPHY AND DESIGN INFORMATION

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Soil Conservation Service (SCS) (1990). *Design Manual for Soil Conservation Works. Technical Handbook No. 5*. Soil Conservation Service of NSW.

Run-off Estimation and Catchment Yields
Peak discharges were calculated using both the deterministic and statistical rational method. As described in the design manual by the SCS (1990) and the Institution of Engineers (1987). An Intensity/Frequency/Distribution (IFD) table for the Project Site was created using the rainfall information from SCS (1990) and the Rainer computer program. The design storms for all channels and structures with outlet channels, unless stated, are for a 1 in 10 Average Recurrence Interval (ARI). Catchment yields were determined by utilising Bureau of Meteorology web site (http://www.bom.gov.au/climate/averages/tables/ca_nsw_names.shtml) and design information within SCS (1990).

Diversion, Catch Bank and Storage Dam Design
The design of diversion and catch banks was undertaken by using the procedures within SCS (1990) and Soil Conservation Services' design computer.

Sediment Basin Design
The sediment basins were designed according to the procedures within Landcom (2004) and SCS (1990). Soil information for the area was obtained from the web site operated by the Department of Natural Resources (http://spade.dlwc.nsw.gov.au/).

Hera Deposit

Environmental Management Plan 6

REHABILITATION

Revision	Written by:	Date	Managerial Approval	Reason for Change	Next Review due:
0	R.W. Corkery & Co. Pty. Limited	May 2006		New Site Management Plan	May 2007

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PLAN: REHABILITATION

1.0 Applicability of Procedure

This procedure only relates to those areas that are nominated for disturbance for the exploration decline related activities.

2.0 Objective

Short Term Objectives

- Creation of a stable landform.
- Appropriate surface water management.
- Replacement of soil and revegetation of disturbed areas with appropriate pasture species.

Long Term Objectives

- Create a safe and stable landform with land use potential compatible with that of the surrounding area.

3.0 Process

Exploration decline / box cut portal

1. Remove all surface infrastructure from the area, including any concrete slabs.
2. Backfill the portal area with waste rock to seal the entry.
3. Construct a security bund around the perimeter of the box cut in accordance with the Western Australian Department of Industry and Resources *Safety Bunds Around Abandoned Open Pit Mines Guidelines* (1997).
4. The box cut area bunded with an adequate security bund and access to the ramp blocked by the continuous bund.

Ventilation Rises

1. Remove all surface infrastructure from the area.
2. Cover the rise with a concrete slab extending at least 300mm beyond the edge of the rise.

Waste Rock Dump

1. Reprofile batters to create final batters of 1:4(V:H).
2. Spread any available topsoil over the batters and the top surface of the WRD.
3. Contour rip if required (ie. if soil is available) to minimise erosion opportunities.
4. The native vegetation cleared for the WRD and stockpiled adjacent to it will be scattered over the surface to provide micro-climates to encourage the establishment of vegetation.
5. Seed with appropriate pasture species.

Laydown Area and Ore Stockpile

1. Contour rip to loosen compacted earth.
2. Replace any available topsoil over the area.
3. The native vegetation cleared for the laydown area and stockpiled adjacent to it will be scattered over the surface to provide micro-climates to encourage the establishment of vegetation.
4. Seed with appropriate pasture species.

Offices, workshop, generator area and fuel bay

1. Remove all surface infrastructure from site.
2. Break or bury concrete pads. If DPI(MR) requires them to be broken, the broken concrete will be buried at least 2m deep within WRD.
3. Profile the remaining disturbance footprint to a relatively flat surface as required.
4. Contour rip to loosen compacted earth.
5. Replace any available topsoil.
6. The native vegetation cleared from each area and stockpiled adjacent to it will be scattered over the surface to provide micro-climates to encourage the establishment of vegetation.
7. Seed with appropriate pasture species.
8. Any potentially hydrocarbon contaminated material from the fuel bay area will be spread over the disturbance footprint and regularly scarified to encourage bioremediation of the hydrocarbons prior to it being deep ripped to blend it with the in-situ weathered material to dilute any potential hydrocarbons prior to topsoil application and revegetation.

Magazine

1. Remove all surface infrastructure from site.
2. Break or bury concrete pads. If DPI(MR) requires them to be broken, the broken concrete will be buried at least 2m deep within WRD.

3. Profile the remaining disturbance footprint to a relatively flat surface as required.
4. Contour rip to loosen compacted earth.
5. Spread any available topsoil over the area.
6. The native vegetation cleared from each area and stockpiled adjacent to it will be scattered over the surface to provide micro-climates to encourage the establishment of vegetation.
7. Seed with appropriate pasture species.

Roads

1. Roads required for general access around the property will be retained.
2. Roads not required for future access will be ripped (on the contour where possible).
3. Replace topsoil where it exists for replacement.
4. Spread cleared vegetation over area of disturbance.
5. Leave to naturally regenerate from surrounding vegetation.

Settling Ponds

1. Push in banks to recreate the relatively flat landform.
2. Contour rip to minimise the opportunity for erosion. Spread any available topsoil over the area.
3. The native vegetation cleared from each area and stockpiled adjacent to it will be scattered over the surface to provide micro-climates to encourage the establishment of vegetation.
4. Seed with appropriate pasture species.

Monitoring

The Manager is to visually inspect areas of rehabilitation on a regular (at least every six months) basis to ensure vegetation is becoming established and there is no active erosion. Remedial work should be taken on an as needs basis following these inspections.

Any such inspections and remedial works will be recorded appropriately.

5.0 Workforce Awareness

These procedures are available to all members of the workforce on site, particularly those responsible for rehabilitation. The responsible workforce will be made aware of the procedures through inductions prior to any relevant activities. A copy of this Environmental Management Plan will be retained on site and will be available to all employees / contractors.

6.0 Responsibility and Accountability

The ultimate responsibility for this procedure is the Site Manager.

The following positions are also accountable.

Position	**Accountable Task**
Site Manager	• Approving final landforms including batter slopes. • Ordering pasture seed mixes. • Visually monitoring of rehabilitation and directing remedial works as required. • Recording monitoring observations and remedial works.

Hera Deposit

Environmental Management Plan 7

BUSHFIRE CONTROL

Revision	**Written by:**	**Date**	**Managerial Approval**	**Reason for Change**	**Next Review due:**
0	R.W. Corkery & Co. Pty. Limited	May 2006		New Site Management Plan	May 2007

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PLAN: BUSHFIRE CONTROL

1.0 Applicability of Procedure

This procedure relates to the entire "The Peak" property.

2.0 Objective

To ensure the exploration activities undertaken do not pose a fire risk nor hinder local fire fighting efforts.

3.0 Process

1. No employee / contractor is to throw cigarette butts from any vehicle or piece of equipment on site, including private vehicles when on the site.
2. All earthmoving equipment on site is to be equipped with adequate and working fire suppression equipment, in accordance with AS 1841 and AS 1851.
3. All fire extinguishers and fire fighting equipment, whether in buildings or on earthmoving equipment, are to be appropriately signed.
4. All fire extinguishers and fire fighting equipment is to be maintained, tested and certified in accordance with legislative and Australian Standard requirements.
5. Employees are to be trained (with regular refreshers) on the proper use of fire fighting equipment.
6. Fire tracks / breaks on site are to be maintained in accordance with Council's requirements.
7. Any fires that cannot be effectively controlled are to be reported to the local fire brigade immediately.

4.0 Workforce Awareness

These procedures are available to all members of the workforce on site. The responsible workforce will be made aware of the procedures through inductions prior to any relevant activities. A copy of this Environmental Management Plan will be retained on site and will be available to all employees / contractors.

5.0 Responsibility and Accountability

The ultimate responsibility for this procedure is the Site Manager. The following positions are also accountable.

Position	Accountable Task
Site Manager	– Ensuring all mobile equipment is fitted with appropriate and working fire suppression equipment. – Ensuring all fire suppression equipment is tested in accordance with Australian Standard requirements.

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Hera Deposit

Environmental Management Plan 8

COMPLAINTS MANAGEMENT

Revision	Written by:	Date	Managerial Approval	Reason for Change	Next Review due:
0	R.W. Corkery & Co. Pty. Limited	May 2006		New Site Management Plan	May 2007

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PLAN: COMPLAINTS MANAGEMENT

1.0 Applicability of Procedure

This procedure is applicable to the receival of complaints as they relate to matters arising from the exploration activities on "The Peak".

2.0 Objective

To ensure that all complaints are recorded and dealt within a consistent, thorough and professional manner.

3.0 Process

- When a complaint is received, record it in the dedicated complaints register recording:
  - (a) the date and time of the complaint;
  - (b) the method by which the complaint was made;
  - (c) any personal details of the complainant which were provided by the complainant or, if no such details were provided, a note that that effect;
  - (d) the nature of the complaint;
  - (e) the action taken by the licensee in relation to the complaint, including any follow-up contact with the complainant; and
  - (f) if no action was taken by the licensee, the reasons why no action was taken.
- Ensure actions are signed off once completed.
- Keep all complaints registers for at least four years after the complaint is received.

4.0 Workforce Awareness

These procedures are available to all members of the workforce on site, particularly those responsible for recording complaints. The responsible workforce will be made aware of the procedures through inductions prior to any relevant activities. A copy of this Environmental Management Plan will be retained on site and will be available to all employees / contractors.

5.0 Responsibility and Accountability

The ultimate responsibility and accountability for ensuring this procedure is followed lies with the Site Manager. In general, it is the responsibility of the person who receives the complaint to ensure the complaint register is completed.

'The Peak" Complaint Register

Date of Complaint	Complainant	Nature of Complaint	Corrective Actions Required (Y/N)	Actions Completed	
				Y/N	Date

"The Peak" Deposit Complaint Record

Complaint Number:..

Date: .... Time: ....

Complaint Receival Method: ☐ Telephone ☐ Letter ☐ Other ....

Complainant Name: ....

Complainant Address: ....

Nature of Complaint:

....

....

....

....

....

Person Recording Complaint:

Name: .... Date: ....

Signature: ....

Corrective Actions Required: ☐ Yes ☐ No

If Yes, detail:

....

....

....

If No, why not?: ....

Responsibility of Corrective Actions: Name: ....

Position: ....

Notification Date: ....

Corrective Actions Completed:

Name: .... Date: ....

Signature: ....

Complainant Notified (if appropriate): ☐ Yes ☐ No

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FIGURES

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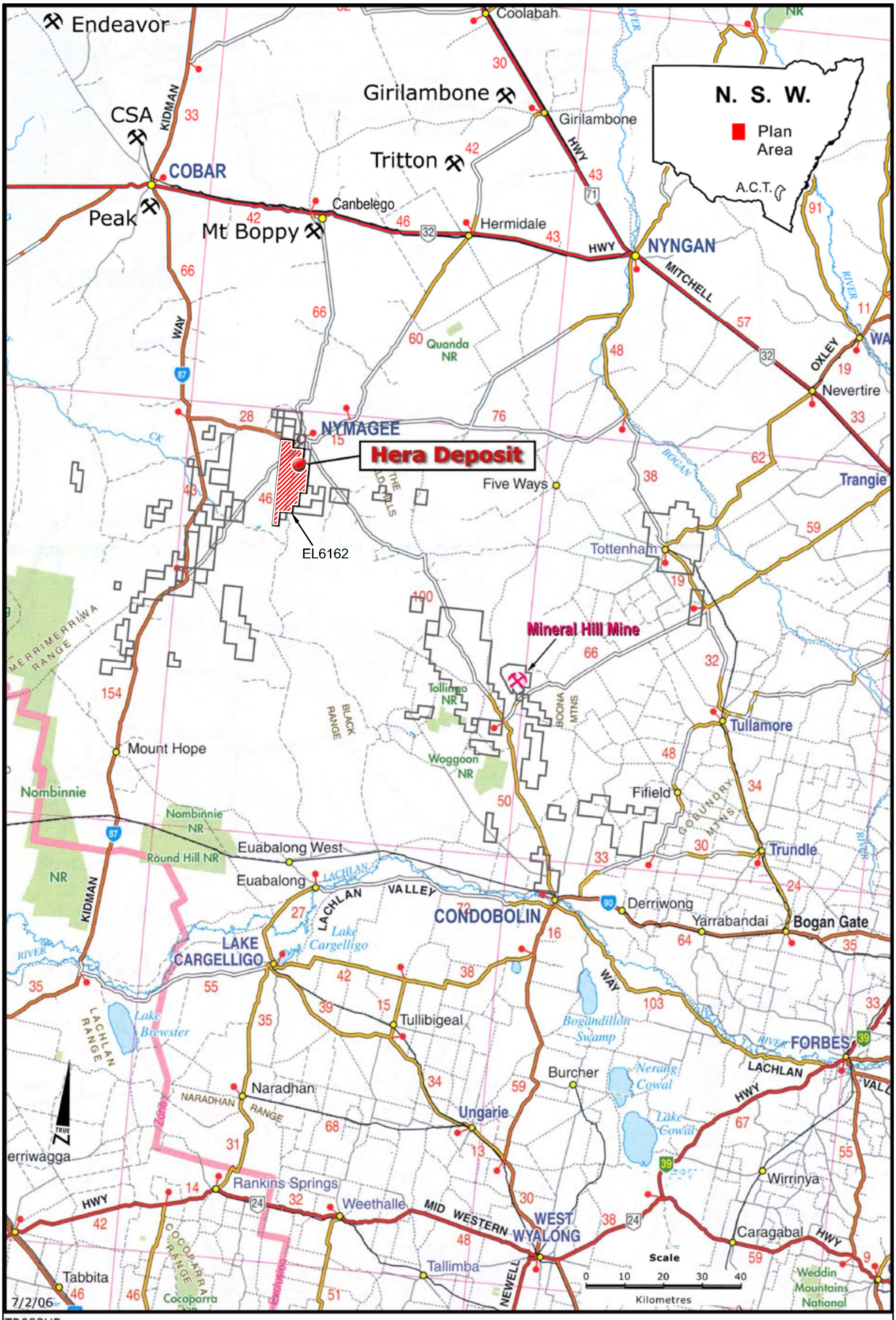

Figure 1.1

Hera Deposit - Locality

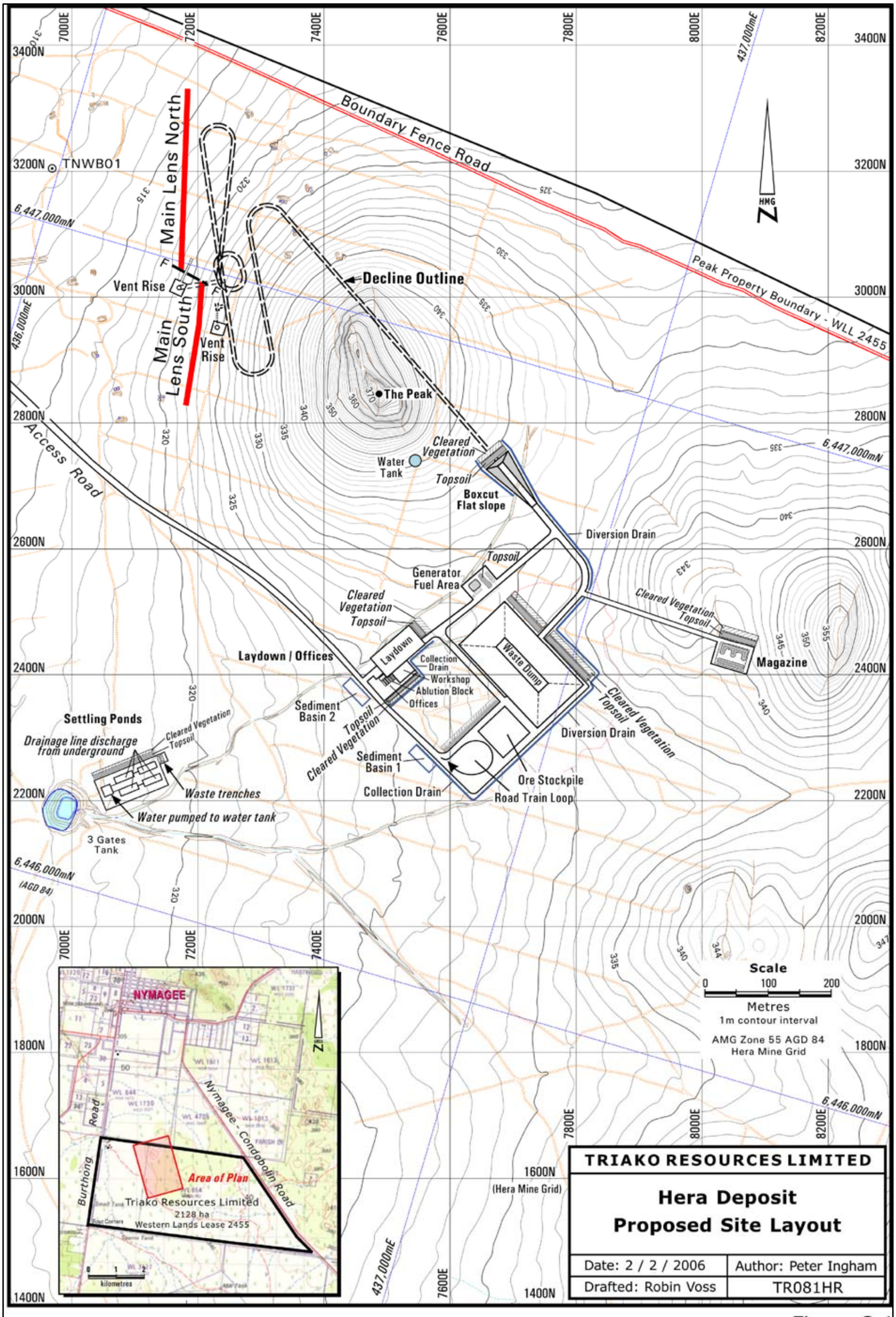
Boundary Fence Road
Peak Property Boundary - WLL 2455
Main Lens North
Main Lens South
Vent Rise
Vent Rise
Decline Outline
The Peak
TNWB01
Access Road
Water Tank
Cleared Vegetation
Topsoil
Boxcut Flat slope
Diversion Drain
Generator Fuel Area
Laydown / Offices
Laydown
Collection Drain
Workshop
Ablution Block
Offices
Waste Dump
Magazine
Sediment Basin 2
Sediment Basin 1
Collection Drain
Ore Stockpile
Road Train Loop
Settling Ponds
Drainage line discharge from underground
Waste trenches
Water pumped to water tank
3 Gates Tank
Scale
Metres
1m contour interval
AMG Zone 55 AGD 84
Hera Mine Grid
(Hera Mine Grid)
NYMAGEE
Nymagee - Condobolin Road
Burthong Road
Area of Plan
Triako Resources Limited
2128 ha
Western Lands Lease 2455
kilometres
TRIAKO RESOURCES LIMITED
Hera Deposit
Proposed Site Layout
Date: 2 / 2 / 2006
Author: Peter Ingham
Drafted: Robin Voss
TR081HR

Figure 2.1

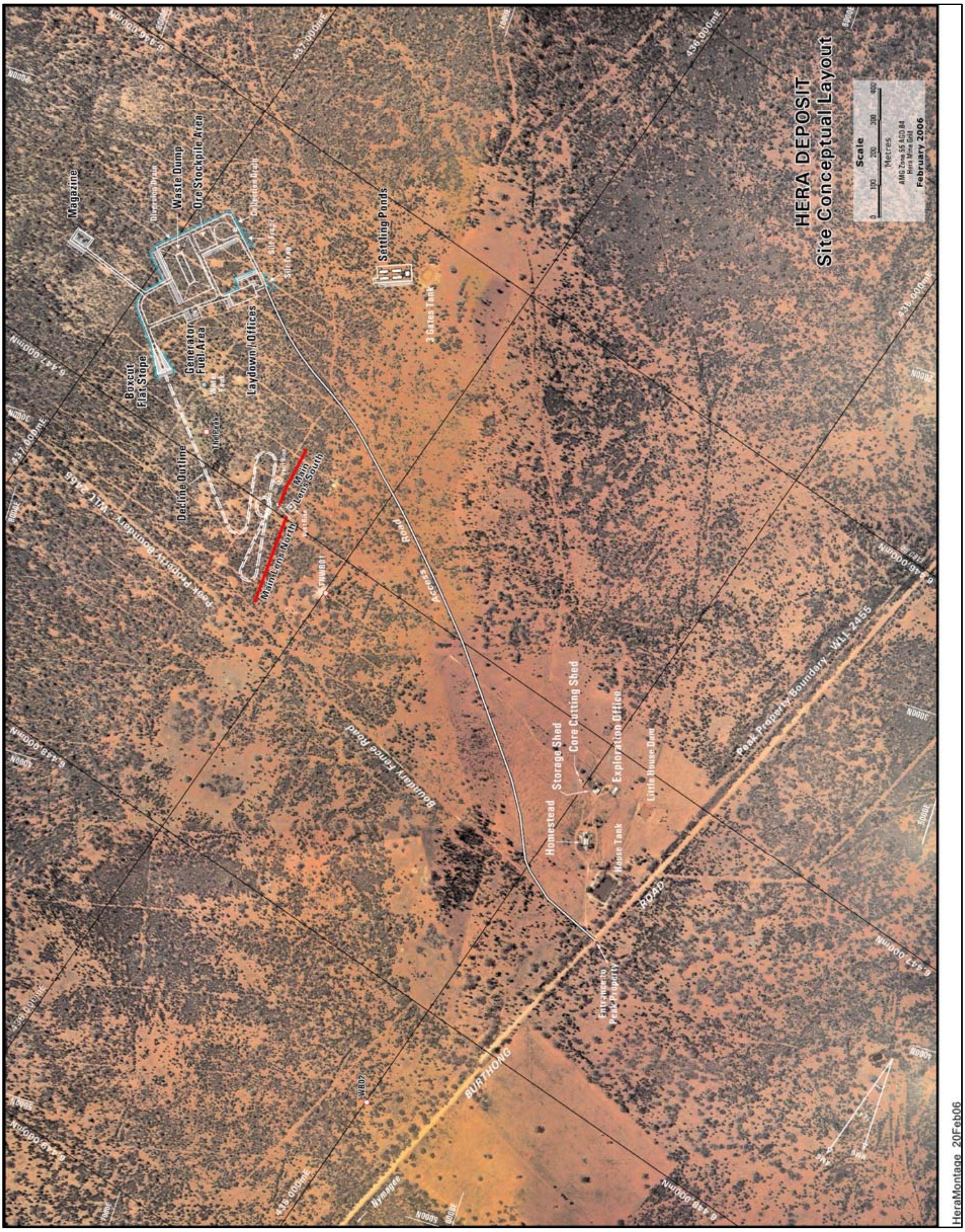
HERA DEPOSIT
Site Conceptual Layout
Scale
Metres
February 2006
Magazine
Waste Dump
Ore Stockpile Area
Settling Ponds
3 Gates Tank
Boxcut
Flat Stope
Generator
Fuel Area
Laydown / Offices
Decline Outline
Main Lens North
Main Lens South
Access Road
Peak Property Boundary - WLL 2455
Boundary Fence Road
Storage Shed
Core Cutting Shed
Exploration Office
Homestead
House Tank
Little House Dam
Entrance to Peak Property
BURTHONG ROAD
HeraMontage 20Feb06

Figure 2.2

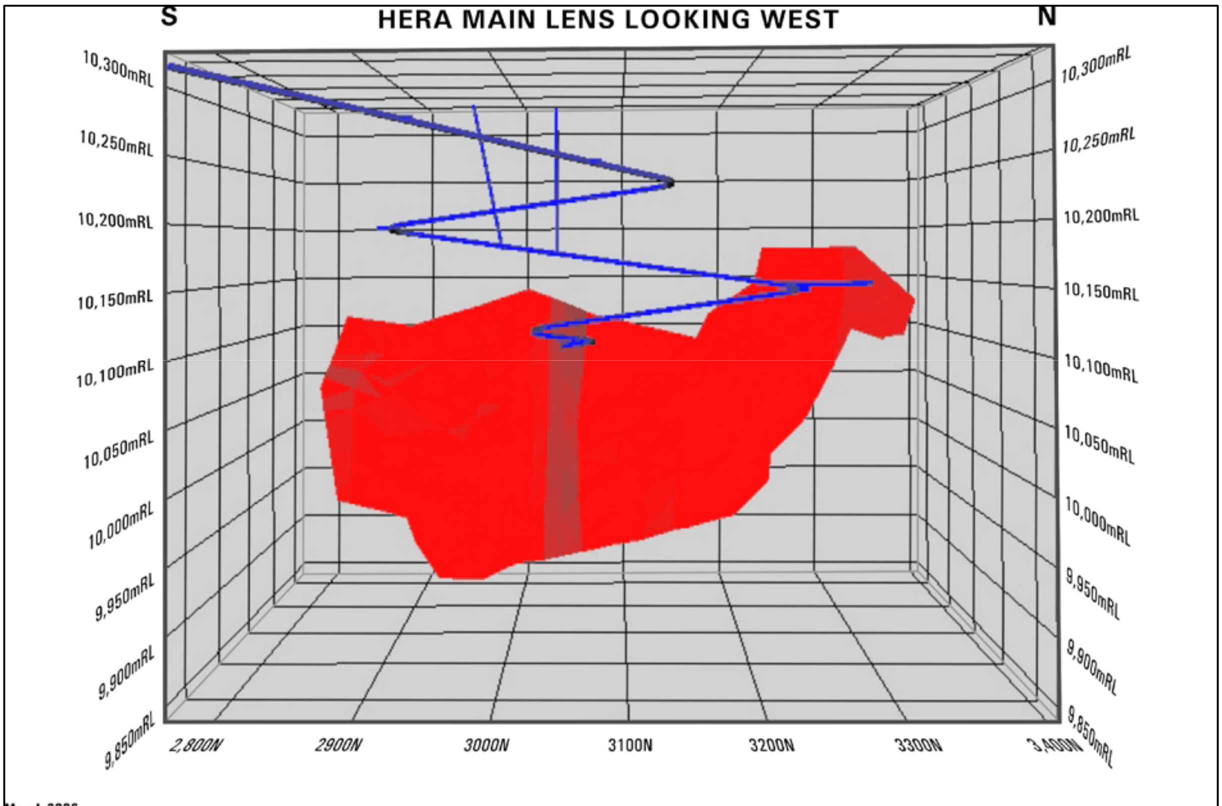

Figure 2.3

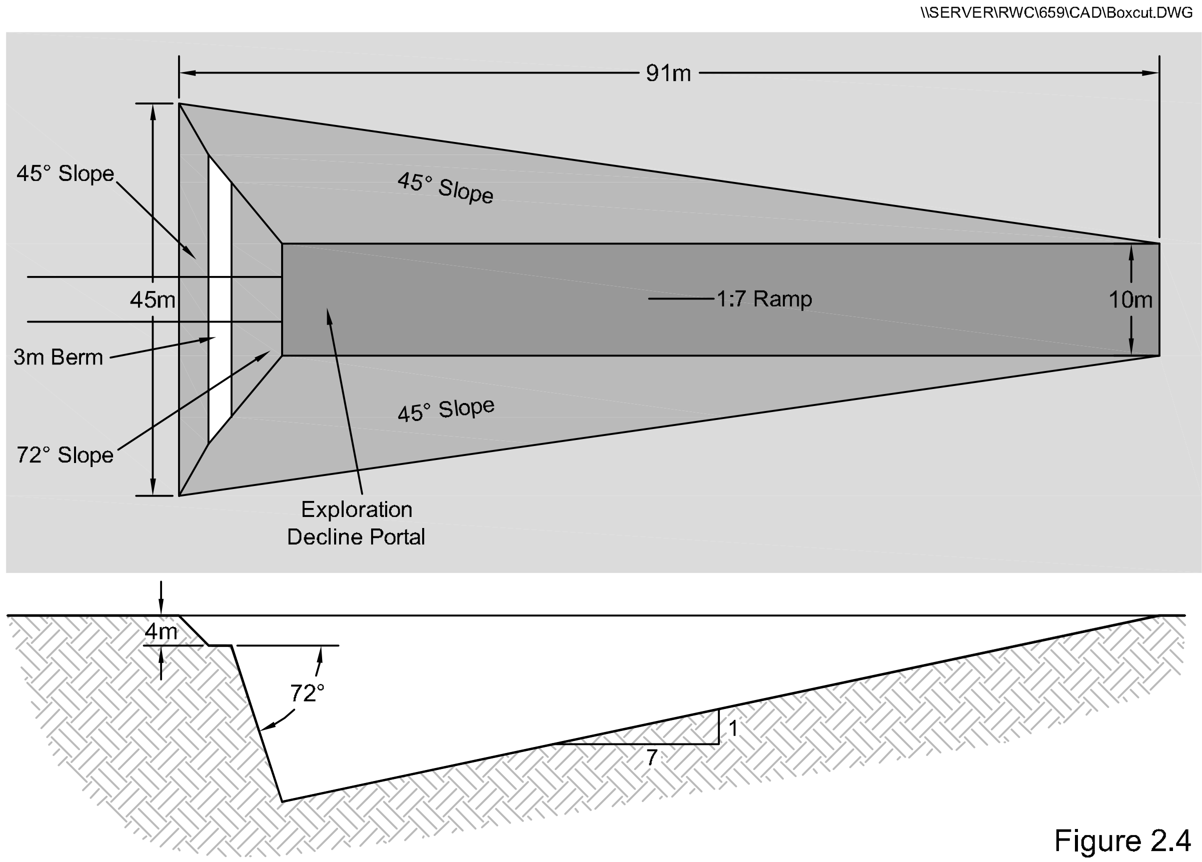

Figure 2.4
INDICATIVE BOX CUT DETAIL

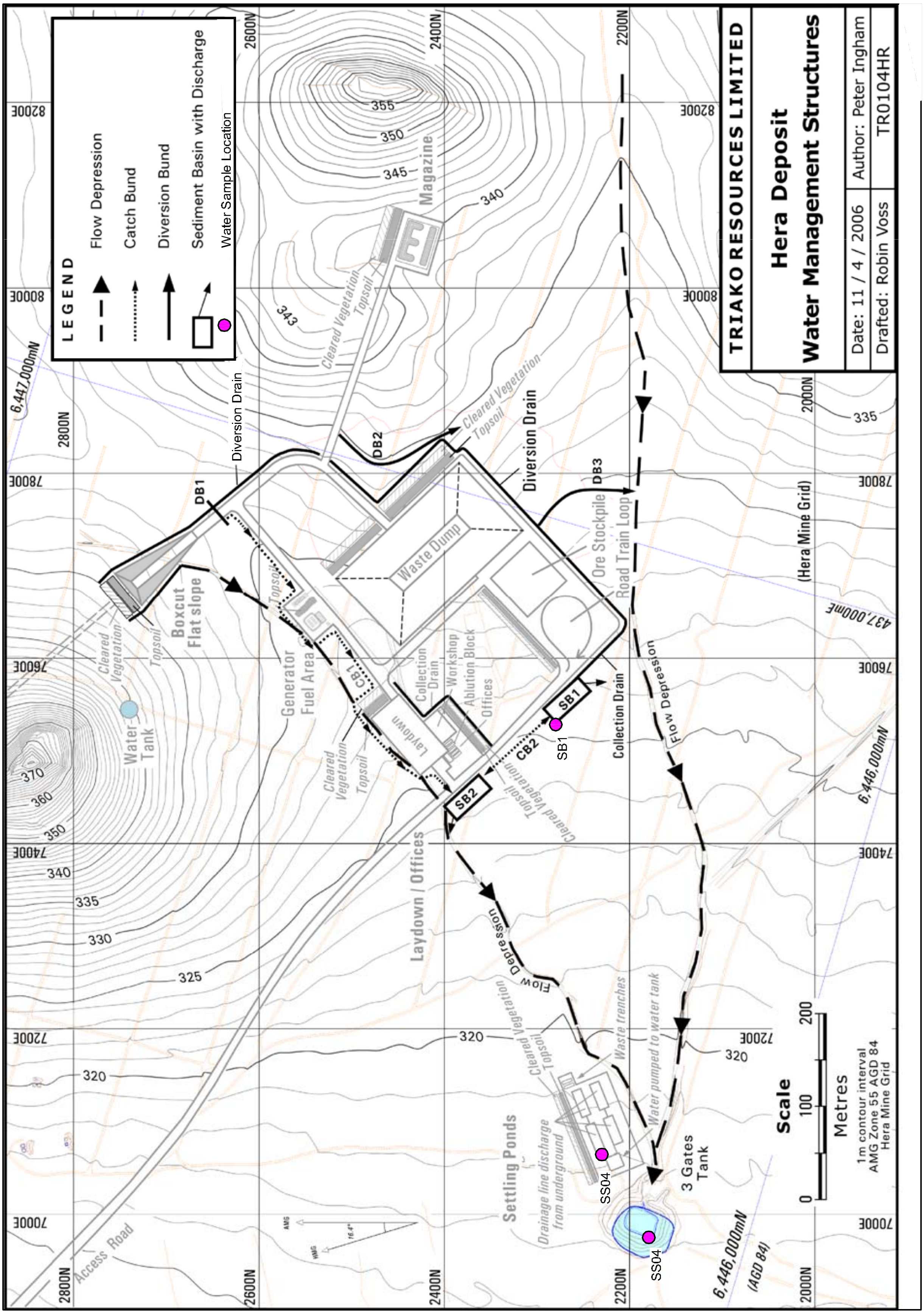
TRIAKO RESOURCES LIMITED
Hera Deposit
Water Management Structures
Date: 11 / 4 / 2006
Author: Peter Ingham
Drafted: Robin Voss
TR0104HR
LEGEND
Flow Depression
Catch Bund
Diversion Bund
Sediment Basin with Discharge
Water Sample Location
Magazine
Cleared Vegetation
Topsoil
Diversion Drain
DB1
DB2
DB3
Waste Dump
Ore Stockpile
Road Train Loop
Boxcut
Flat slope
Generator
Fuel Area
CB1
CB2
SB1
SB2
Collection Drain
Workshop
Ablution Block
Offices
Laydown
Laydown / Offices
Water Tank
Flow Depression
Waste trenches
Water pumped to water tank
Settling Ponds
Drainage line discharge from underground
3 Gates Tank
SS04
Access Road
(Hera Mine Grid)
437,000mE
6,447,000mN
6,446,000mN
(AGD 84)
Scale
Metres
1m contour interval
AMG Zone 55 AGD 84
Hera Mine Grid

Figure 2.5

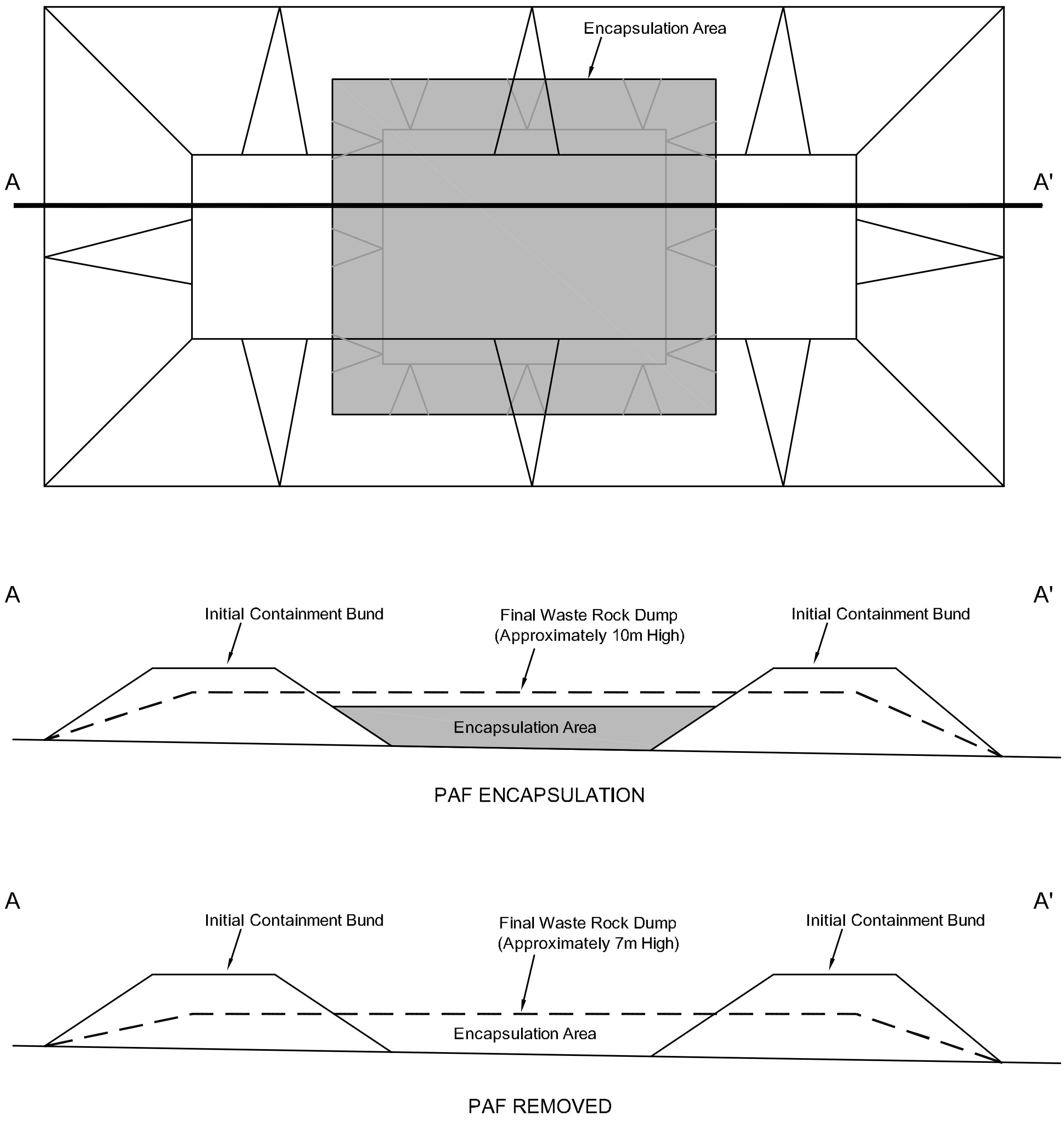
Encapsulation Area
A
A'
A
A'
Initial Containment Bund
Final Waste Rock Dump
(Approximately 10m High)
Initial Containment Bund
Encapsulation Area
PAF ENCAPSULATION
A
A'
Initial Containment Bund
Final Waste Rock Dump
(Approximately 7m High)
Initial Containment Bund
Encapsulation Area
PAF REMOVED

Figure 2.6

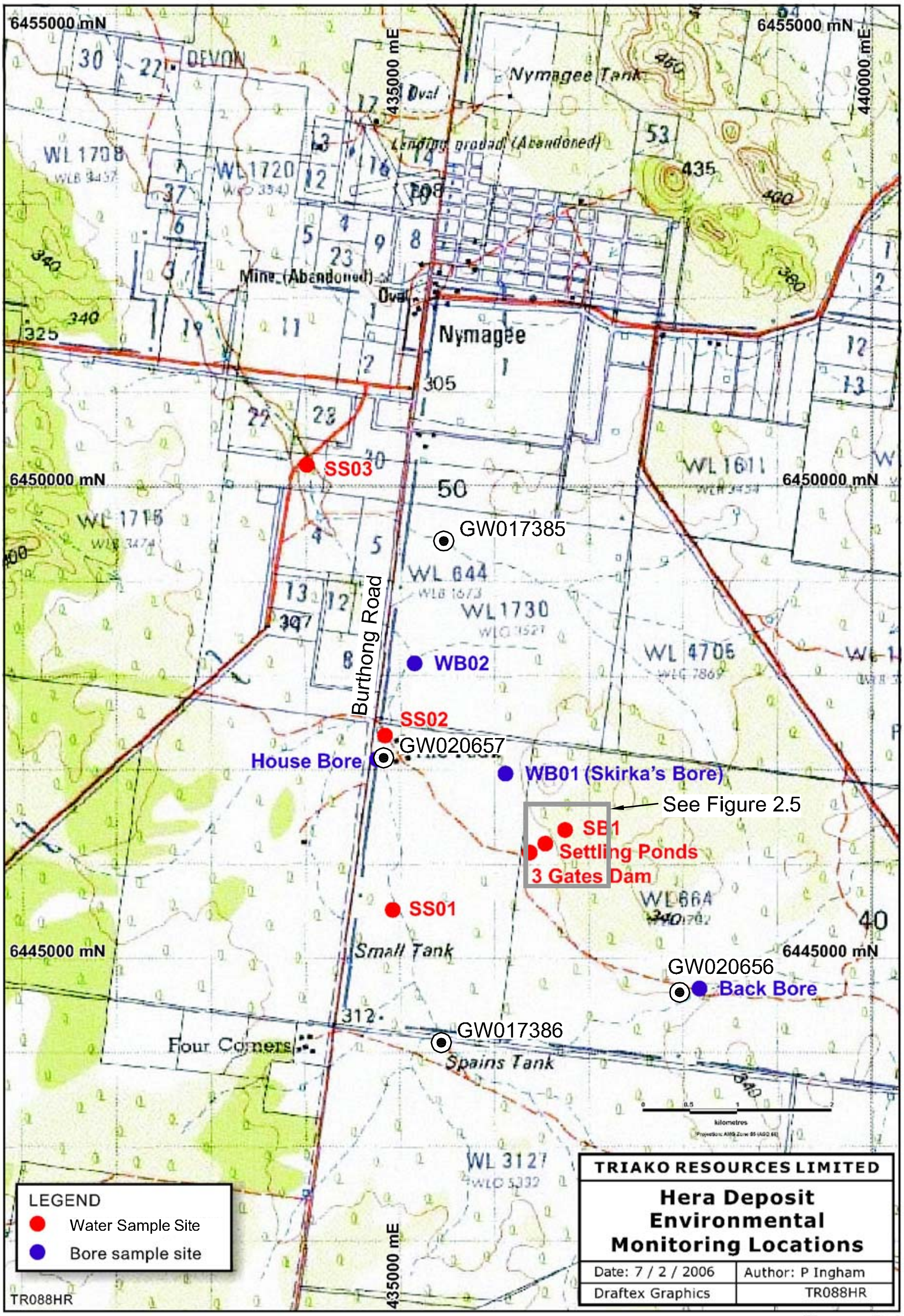
6455000 mN
6450000 mN
6445000 mN
435000 mE
440000 mE
Nymagee Tank
Landing ground (Abandoned)
Mine (Abandoned)
Nymagee
Burthong Road
SS03
SS02
SS01
GW017385
GW020657
GW020656
GW017386
WB02
House Bore
WB01 (Skirka's Bore)
See Figure 2.5
SB1
Settling Ponds
3 Gates Dam
Back Bore
Small Tank
Spains Tank
Four Corners
LEGEND
Water Sample Site
Bore sample site
TR088HR
TRIAKO RESOURCES LIMITED
Hera Deposit Environmental Monitoring Locations
Date: 7 / 2 / 2006
Author: P Ingham
Draftex Graphics
TR088HR

Figure 3.1

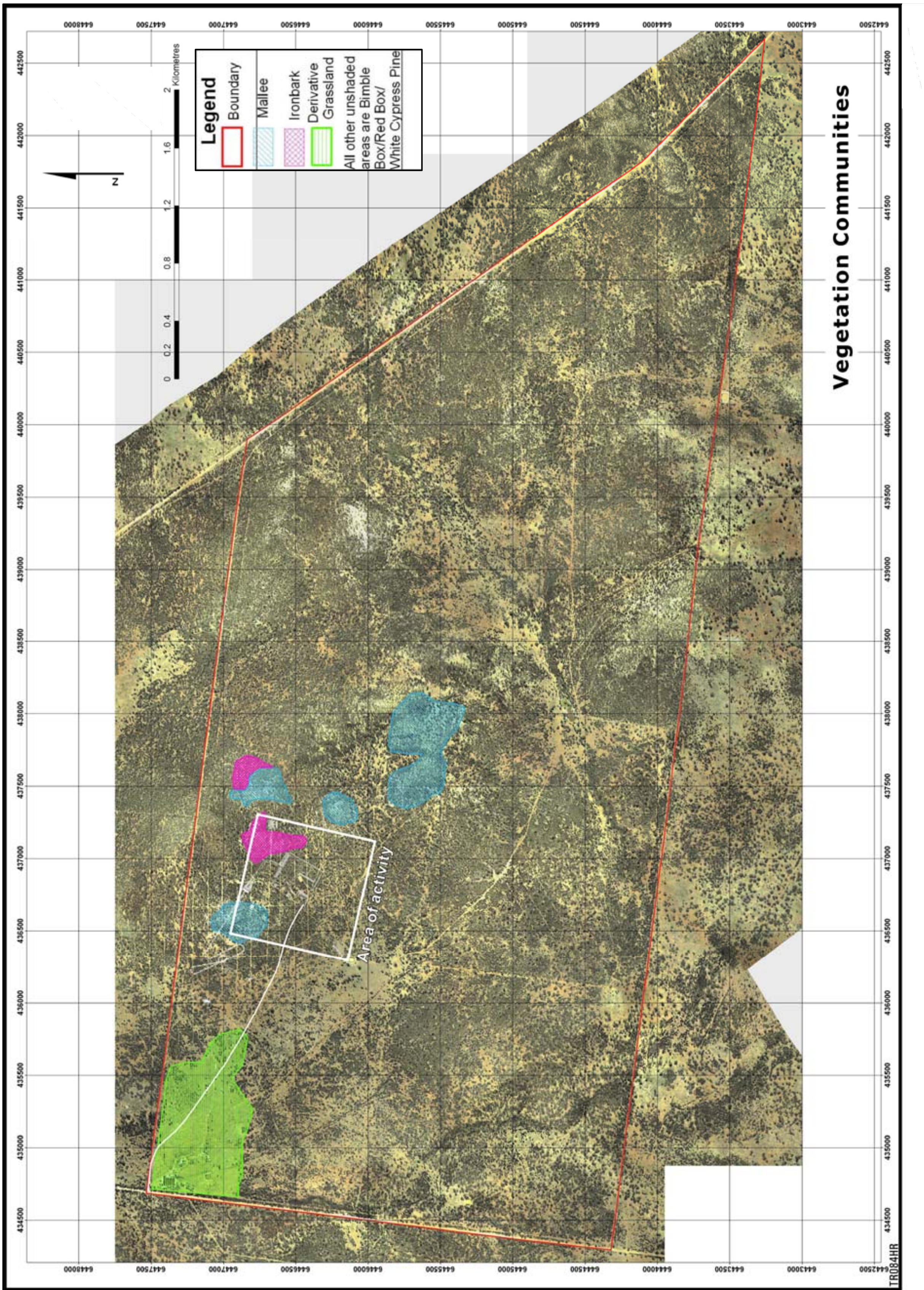
Vegetation Communities
Legend
Boundary
Mallee
Ironbark
Derivative Grassland
All other unshaded areas are Bimble Box/Red Box/ White Cypress Pine
Kilometres
0 0.2 0.4 0.8 1.2 1.6 2
N
Area of activity
TR084HR

Figure 3.2

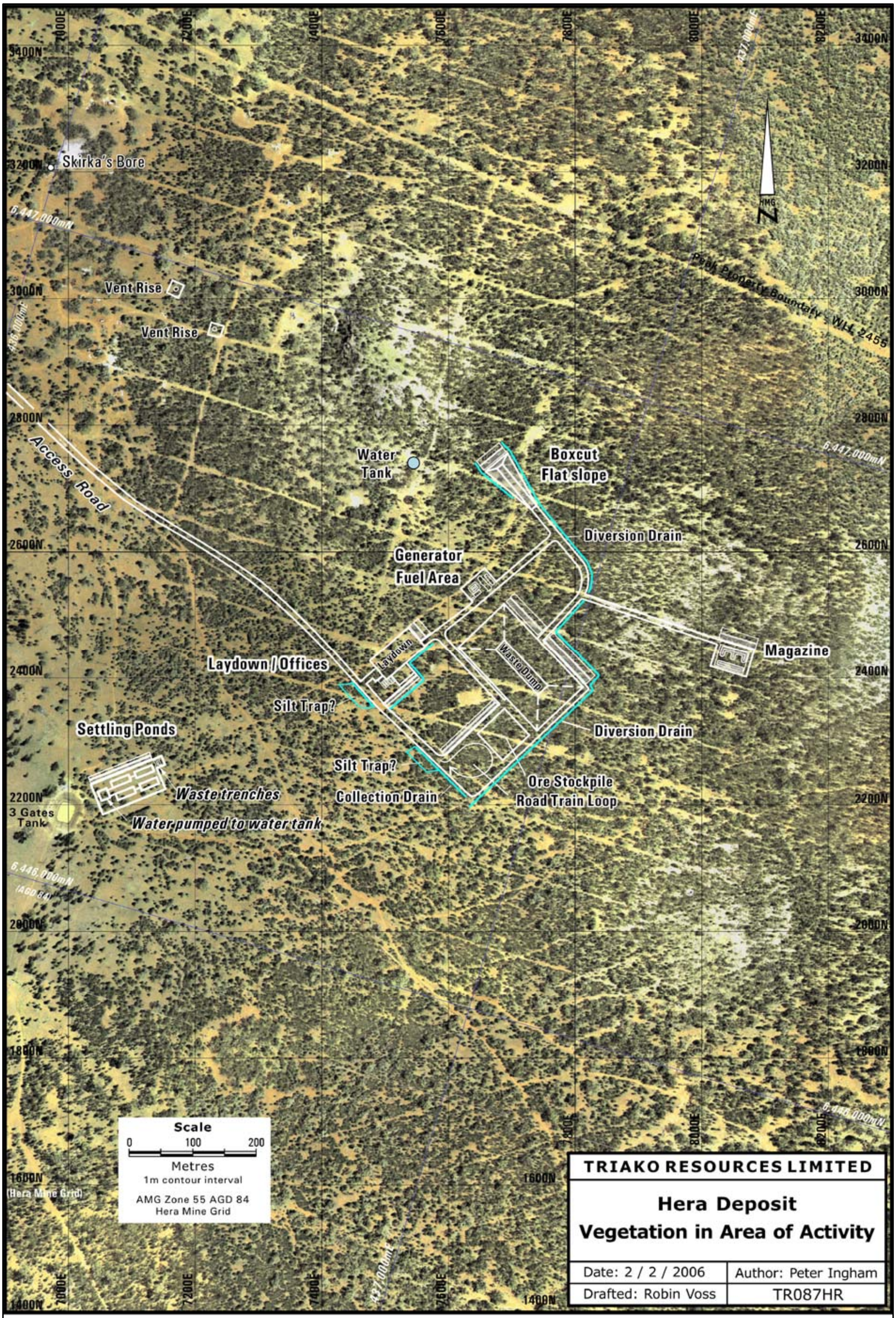
Skirka's Bore
Vent Rise
Vent Rise
Access Road
Water Tank
Boxcut Flat slope
Diversion Drain
Generator Fuel Area
Magazine
Laydown / Offices
Laydown
Waste Dump
Silt Trap?
Settling Ponds
Diversion Drain
Silt Trap?
Ore Stockpile
Road Train Loop
Collection Drain
Waste trenches
Water pumped to water tank
3 Gates Tank
Peak Property Boundary - WLE 2455
Scale
0 100 200
Metres
1m contour interval
AMG Zone 55 AGD 84
Hera Mine Grid
(Hera Mine Grid)
TRIAKO RESOURCES LIMITED
Hera Deposit
Vegetation in Area of Activity
Date: 2 / 2 / 2006
Author: Peter Ingham
Drafted: Robin Voss
TR087HR

Figure 3.3

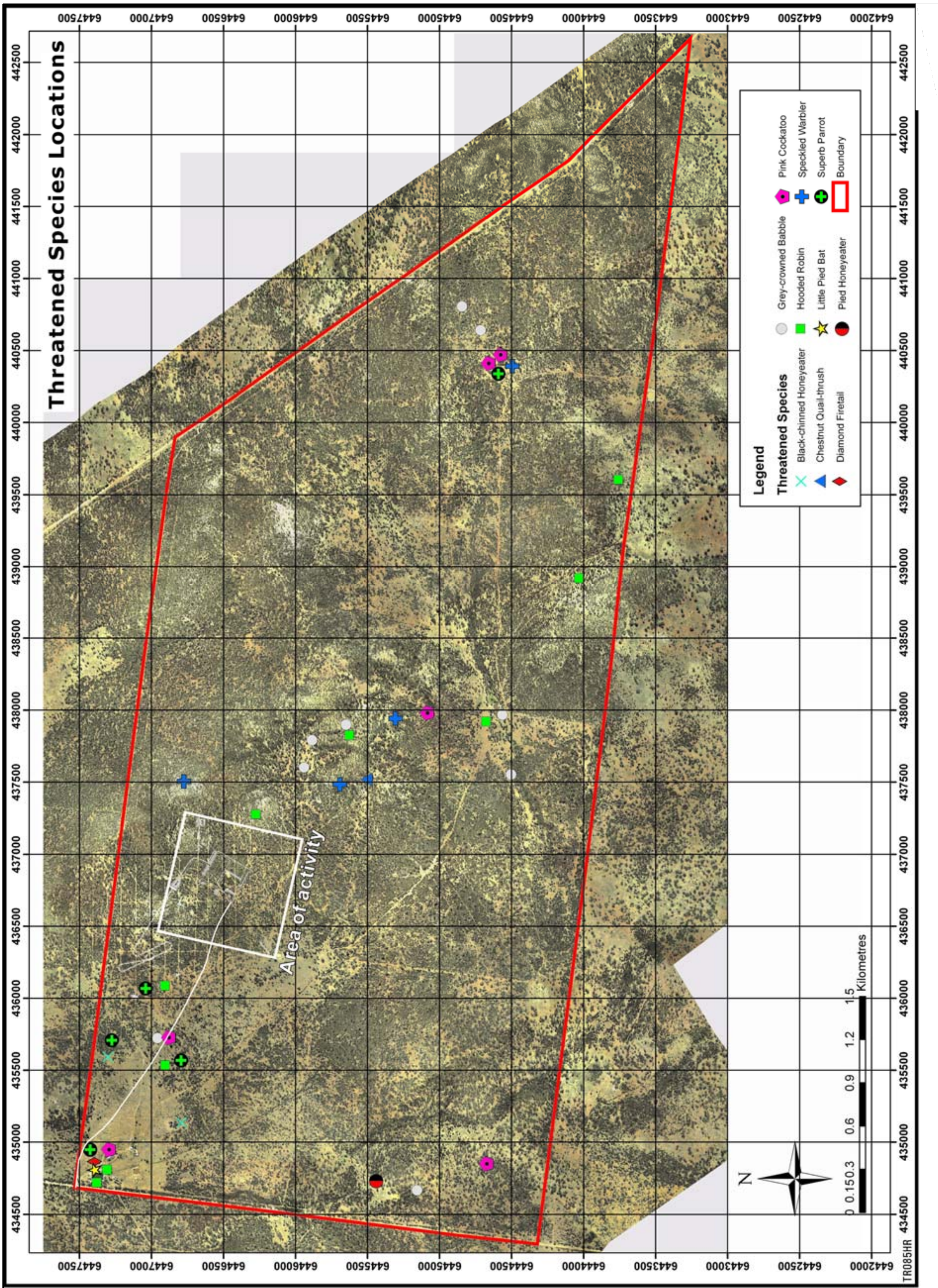
Threatened Species Locations
Legend
Threatened Species
Black-chinned Honeyeater
Chestnut Quail-thrush
Diamond Firetail
Grey-crowned Babble
Hooded Robin
Little Pied Bat
Pied Honeyeater
Pink Cockatoo
Speckled Warbler
Superb Parrot
Boundary
Area of activity
N
0 0.15 0.3 0.6 0.9 1.2 1.5
Kilometres
TR085HR

Figure 3.4

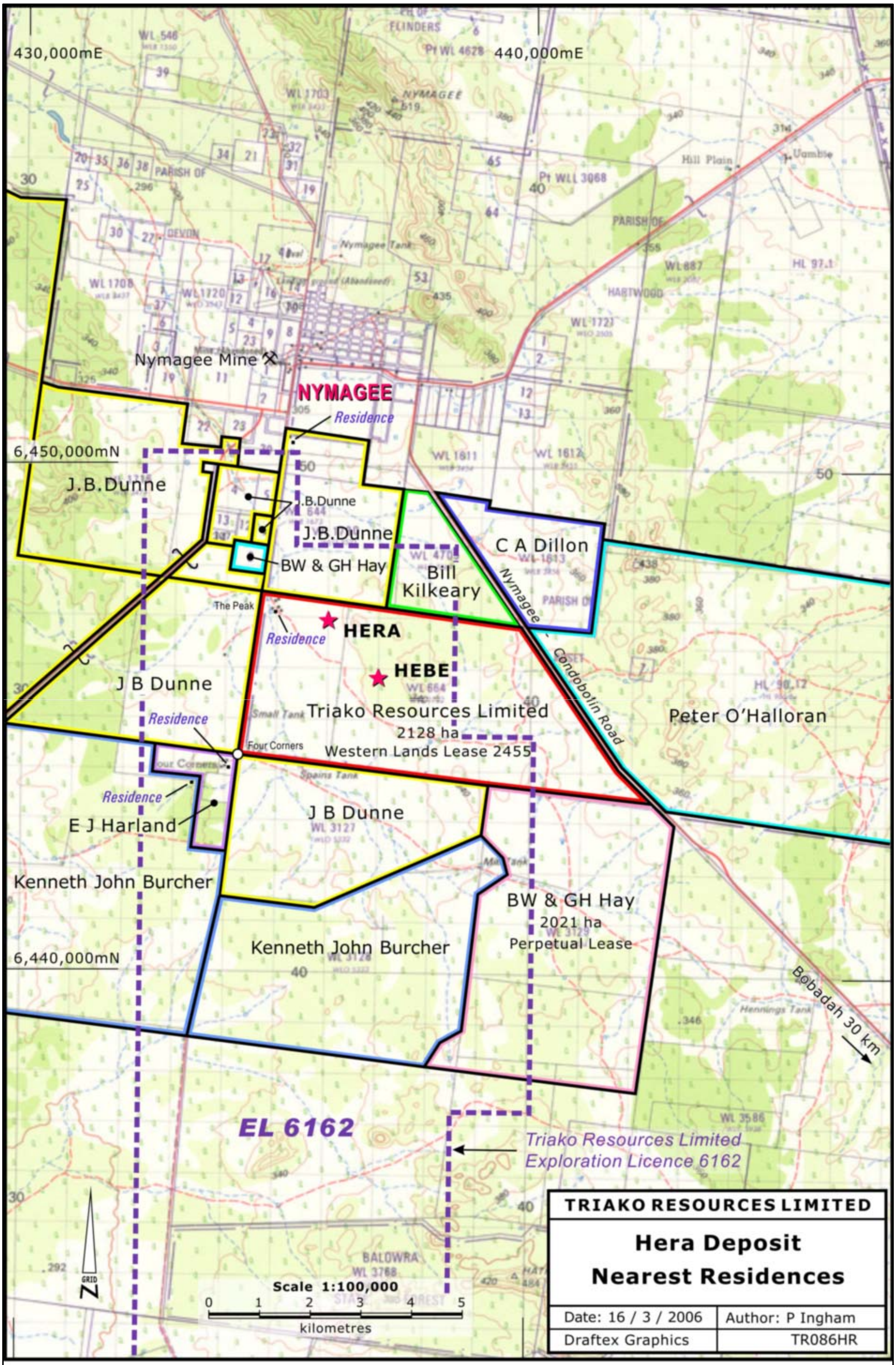
430,000mE
440,000mE
6,450,000mN
6,440,000mN
Nymagee Mine
NYMAGEE
Residence
J.B.Dunne
J.B.Dunne
J.B.Dunne
BW & GH Hay
Bill Kilkeary
C A Dillon
Nymagee
Condobolin Road
The Peak
Residence
HERA
HEBE
J B Dunne
Residence
Triako Resources Limited
2128 ha
Western Lands Lease 2455
Four Corners
Peter O'Halloran
Residence
E J Harland
J B Dunne
Kenneth John Burcher
BW & GH Hay
2021 ha
Perpetual Lease
Kenneth John Burcher
Bobadah 30 km
EL 6162
Triako Resources Limited
Exploration Licence 6162
GRID N
Scale 1:100,000
0 1 2 3 4 5
kilometres
TRIAKO RESOURCES LIMITED
Hera Deposit
Nearest Residences
Date: 16 / 3 / 2006
Author: P Ingham
Draftex Graphics
TR086HR

Figure 3.5

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SECTION 7
REFERENCES

Archaeological Surveys and Reports Pty Ltd (2004) *The archaeological investigation for sites of Indigenous cultural significance on gold mining prospects at 'Hera', south of Nymagee, 'Overflow Prospect at Bobadah, Fountain Dale northwest of Mineral Hill Central West NSW,* prepared for Triako Resources Limited.

CSU Johnstone Centre – Environmental Consulting (2006) *Assessment of Significance for Threatened Species, Populations and Ecological Communities on the Hera deposit, via Nymagee*, prepared for Triako Resources Ltd.

Department of Lands Soils Conservation Service (2006) *Surface Water Management Plan, Hera Deposit – Mining Exploration Proposal*, prepared for Triako Resources Ltd.

GeoTerra (2005) *Hydrogeological Assessment of Skirka's Bore at "The Peak" Station Nymagee NSW,* prepared for Triako Resources Limited.

GeoTerra (2006) *Hera Decline and Ore Acid Rock Investigations,* prepared for Triako Resources Limited.

R.W.Corkery & Co. Pty Limited (2005) *Review of Environmental Factors for the Category 3 Exploration of the Hera Polymetallic Deposit,* prepared for Triako Resources Limited.

Thompson. D. F. (1973) *Western Lands Lease Management Plan,* Head Office File No. 73/738 Soil Conservation Service, NSW

Unidentified (undated) *Review of Environmental Factors – The Peak* (for clearing of 200ha)

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ANNEXURES

(No. of pages excluding this page = 220)

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ANNEXURE 1

(No. of pages excluding this page = 5)

Notification of Exploration Activities

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NOTICE OF PROPOSED EXPLORATION ACTIVITIES

If an additional specific determination is required, inclusion of a Review of Environmental Factors (REF) with this notice may expedite approval. The final page of this notice lists factors that must be reviewed in a REF.

1: Licence Particulars

Licence Holder: TRIAKO RESOURCES LIMITED ____

Manager: TRIAKO RESOURCES LIMITED EL No: ______ 6162 DMR File No: _
(if known)

Site Supervisor: STUART JEFFREY ___________ Tel: 02-68373689__ Fax: 02-68373660 __

2: Location Details

Topo Map Sheet(s) NYMAGEE 8133 _______ Boundary/point Grid ref: 6446900Mn 436200mE (AGD84)

A map showing location of activities must be attached ☒

Area of disturbance of the program/activity described 11.5 _______ (ha)

3: Surface Tenure and Land Use

Exempted Area*		**Land Use**		**Tenure**	
State Forest	☐	Pastoral	☐	Freehold	☐
Reserve	☐	Agricultural	☐	Pastoral lease	☐
Common	☐	Irrigation	☐	Western land lease	☒
Road reserve	☐	Urban/suburban	☐	Other leasehold	☐
Stock Route	☐	Forestry	☐	Crown Land	☐
Other (describe)	☐	Other (describe)	☐	Other (describe)	☐

4: Notification of and Agreements with Land Holders

Property Name	**Land holder/Contact**	**Phone**	**Access Agreement** Verbal	Written
THE PEAK	TRIAKO RESOURCES LTD	02-99250110	☐	☒
			☐	☐
			☐	☐
			☐	☐

5: List of Sensitive Land

This list is based on List 2 of 'Is an EIS Required, (Department of Urban Affairs and Planning 1996). It provides examples of locations that are considered sensitive in terns of the Environmental Planning and Assessment Act. And has been expanded to include SEPPs introduced since publication of the list, and Forestry Management Zones,

Areas sensitive because of physical factors

- coastline and dune fields, alpine areas, deserts, caves or other unique landforms
- land with high agricultural capability
- natural waterbodies, riparian zones, wetlands, drinking water catchments or flood prone areas
- areas where ground water is at risk, for instance, recharge areas or areas with high water table
- erosion prone areas, slope greater than 18^{o,} subsidence or slip areas
- areas where there are acid sulphate, sodic or highly permeable soils or areas with salinity or potential salinity problems
- areas with degraded air quality, degraded or contaminated soil or degraded or contaminated water (ground or surface)

Areas sensitive because of biological factors

- corals and sea-grass beds, wetland communities (coastal, peat-lands or inland), native forests, urban bushlands, arid and semi-arid communities
- habitat of endangered terrestrial or aquatic fauna species and of species listed under Japan-Australia Migratory Birds Agreement (JAMBA) and China-Australia Migratory Birds Agreement (CAMBA)
- wildlife corridors and remnant vegetation
- inadequately reserved plant communities
- areas which are bushfire prone
- fishing grounds and fish breeding or nursery areas
- Land mapped as "Forestry Management Zone" 1, 2 or 3

Areas allocated or proposed to be allocated for conservation purposes

- National Parks and other areas reserved or dedicated under part 4 of the National Parks and Wildlife Act 1974
- land reserved or dedicated within the meaning of the Crown Lands Act (1989) for preservation or other environmental protection purposes
- world heritage areas
- environmental protection zones in environmental planning instruments or lands protected under SEPP 14 - Coastal Wetlands, SEPP 26 Littoral Rainforests, SEPP 44 Koala Habitat Protection
- land declared as wilderness under the Wilderness Act 1987
- aquatic reserves dedicated under the Fisheries Management Act 1994
- wetlands areas dedicated under the Ramsar Wetlands Convention
- areas listed on the Register of National Estate, under the NSW Heritage Act 1977 for which a plan of management has been prepared
- land subject to a 'conservation agreement' under the NP&W Act 1974
- land declared as critical habitat under the Threatened Species Conservation Act 1995

Note: *While new exploration licences are not granted on many of the areas in the above group, exploration activities can generally be conducted. On pre-existing licences and areas proposed to be allocated*

Areas sensitive because of community factors

- Declared Aboriginal places under the NP&W Act 1974
- Aboriginal communities or areas subject to Aboriginal land right claims
- communities with a strong sense of identity
- disadvantaged communities (reduced economic, social or cultural indicators)
- areas with degraded amenity from noise, traffic congestion or odour
- area or items of high anthropological, architectural, cultural, heritage, historical, recreational, or scientific value
- areas or items of high aesthetic or scenic value

6: Nature and sensitivity of land to be disturbed (continued)

Based on consideration of the above list, might the activity affect environmentally sensitive land? Include possible effects on sensitive land adjacent to or downstream of the proposed activity.

Yes ☐, No ☒, If yes, please specify the nature of the sensitivities

7: Categories of Activities

CATEGORY 1 ☐ Stream sediment and soil sampling (hand held equipment) ☐ Gossan or rock sampling (hand held equipment) ☐ Geological mapping ☐ Magnetic, Electromagnetic, Gravity, Radiometric Induced Polarisation, Resistivity, and Self Potential Surveys ☐ Auger, reverse circulation and rotary air blast drilling (of a reconnaissance level including access clearing in non-sensitive areas). ☐ Percussion and diamond drilling (of a reconnaissance level including access clearing in non-sensitive areas). ☐ Geophysical downhole logging ☐ Survey gridding (axe cut line clearing only) **CATEGORY 2** ***Category 2 activities need not be notified unless the activity might affect environmentally sensitive land (yes in section 6)*** ***The Department will assess whether or not an additional specific Part 5 Assessment is required.*** ☐ Costeaning and trenching provided any trench or costean does not exceed 50 metres length or, if longer, 60 cubic metres volume. ☐ Surface bulk sampling provided disturbance or removal of greater than 60 cubic metres of material is not exceeded in any one year	Category 2 (cont) ☐ Access, tracks or line clearing involving formed construction or significant native vegetation disturbance (*including access clearing associated with drilling activities)* ☐ Large diameter boreholes, calweld drill holes (greater than 360 millimetres diameter) ☐ Seismic Surveys **CATEGORY 3** ***Category 3 activities must be notified and will generally require a "Review of Environmental Factors" and an additional specific Part 5 assessment by the Department. Inclusion of a REF with this notice will expedite approval*** ☐ Costeaning or trenching (in excess of 60 cubic metres volume) ☐ Surface bulk sampling (in excess of 60 cubic metres disturbance/removal in any one year) ☐ Shaft Sinking ☒ Adit Driving ☐ Operations within or from the surface of natural water bodies including dredging/suction operations ☐ Closely spaced percussion, reverse circulation, rotary air blast or diamond drilling or Cumulative activities from Category 1 or Category 2 of a concentrated nature. ☐ All petroleum exploration activities.

8: Description of Activities or Program of Activities

The nature and type of activity **BOXCUT AND EXPLORATION DECLINE DEVELOPMENT**

Equipment used **SURFACE DRILL, HYDRAULIC EXCAVATOR, SURFACE TRUCKS, GRADER, DEVELOPMENT JUMBO, LHD UNITS, UNDERGROUND TRUCKS, ANCILLIARY UNDERGROUND UNITS**

Details of likely maximum disturbances including area cleared, activity spacing/intensity **BOXCUT, EXPLOSIVE MAGAZINE, WASTE DUMP, LAYDOWN AREA, FUEL STORAGE AREA, WATER TANK, ORE STOCKPILE, INTERNAL ROADS WITH TOTAL AREA DISTURBANCE ~11.5HA**

Impact mitigation strategies/management protocols (description of ad hoc strategies/protocols or reference to relevant pre-existing ones) **INSPECTION AND REMOVAL OF FAUNA PRIOR TO DISTURBANCE, TOPSOIL AND VEGETATION IS PILED SEPARATELY. DRAINAGE WILL BE MANAGED WITH SILT TRAPS**

Impact mitigation strategies and management protocols should focus on the disturbance caused by the activity and the nature of the sensitivity of the land affected. Proposal of appropriate strategies and protocols to limit disturbance and ensure likely impact is minimal will be taken into account in the Department's assessment of whether or not an additional specific determination is required.

9: Licence Holder Signature

Print Name **P.D.INGHAM** Position **CONSULTANT MINING ENGINEER**

Signed. P.D. Ingham

Date 13 March 2006

MATTERS FOR INCLUSION IN A REVIEW OF ENVIRONMENTAL FACTORS

1. A statement of the objectives or purpose for the activity.

See Review of Environmental Factors for details.

2. A full description of the location of the proposed activity, including a description of the effects of any relevant planning instruments.

See Review of Environmental Factors for details.

3. An outline of any feasible alternatives to achieving the objective and justify the selection of the preferred options.

See Review of Environmental Factors for details.

4. A description of the proposal including operation methods and equipment. If relevant, include an outline of any existing activities on site, their relationship to the proposal and a review of their environmental performance including relevant approvals or environmental management plans.

See Review of Environmental Factors for details.

5. An overview of the aspects of the environment likely to be affected by the proposal, in particular any aspects considered to be particularly sensitive. For instance, air, dust, noise, sediment runoff, water use and discharge, flora, fauna, aboriginal or archaeological sites.

See Review of Environmental Factors for details.

6. An assessment of the potential impacts - the level of assessment should reflect the likely environmental significance of impacts. The assessment should consider the extent and nature of the potential impacts, including their size, scale, intensity and duration. Information that supports the confidence with which impacts can be predicted and the reliance of the environment to cope with the change should also be included.

See Review of Environmental Factors for details.

7. An outline of the proposed mitigation strategies to manage the impacts and an indication of how effective the mitigation is likely to be. This should include site rehabilitation and restoration.

See Review of Environmental Factors for details.

8. An outline of pollution licences or other approvals required or obtained.

None required

9. An outline of the results of consultation undertaken in preparing the REF eg with other agencies, councils, Aboriginal organisations and community representatives and landowners.

See Review of Environmental Factors for details.

10. A conclusion as to whether the impacts are likely to be significant, taking into consideration the proposed mitigation strategies.

See Review of Environmental Factors for details.

11. Justification for undertaking the proposal having regard to biophysical, social and economic factors.

See Review of Environmental Factors for details.

12. Any supporting statements providing additional technical information.

See Review of Environmental Factors for details.

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ANNEXURE 2

(No. of pages excluding this page = 2)

Matters for Inclusion in a Review of Environmental Factors

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MATTERS FOR INCLUSION IN A REVIEW OF ENVIRONMENTAL FACTORS (REF)

	Matters for Inclusion in a REF	Relevant REF Section
1	A statement of the objectives or purpose for the activity.	2.1.3
2	A full description of the location of the proposed activity, including a description of the effects of any relevant planning instruments.	Section 3
3	An outline of any feasible alternatives to achieving the objective and justify the selection of the preferred options.	2.2.3 and Section 4
4	A description of the proposal including operation methods and equipment. If relevant, include an outline of any existing activities on-site, their relationship to the proposal and a review of their environmental performance including relevant approvals or environmental management plans.	Section 2
5	An overview of the aspects of the environment likely to be affected by the proposal, in particular any aspects considered to be particularly sensitive (e.g. air, dust, noise, sediment runoff, water use and discharge, flora, fauna, Aboriginal heritage or archaeological sites).	Section 3
6	An assessment of the potential impacts - the level of assessment should reflect the likely environmental significance of impacts. The assessment should consider the extent and nature of the potential impacts, including their size, scale, intensity and duration. Information that supports the confidence with which impacts can be predicted and the reliance of the environment to cope with the change should also be included.	Section 3
7	An outline of the proposed mitigation strategies to manage the impacts and an indication of how effective the mitigation is likely to be. This should include site rehabilitation and restoration.	Section 3 and Section 5
8	An outline of pollution licences or other approvals required or obtained.	Section 2.3
9	An outline of the results of consultation undertaken in preparing the REF (e.g. with other agencies, councils, Aboriginal organisations and community representatives and landowners).	1.4
10	A conclusion as to whether the impacts are likely to be significant, taking into consideration the proposed mitigation strategies.	Section 4
11	Justification for undertaking the proposal having regard to biophysical, social and economic factors.	Section 4
12	Any supporting statements providing additional technical information.	Annexure 3 and 4

Source: Department of Primary Industries (Mineral Resources) (2005) *EDG09 Sample Contents of a Review of Environmental Factors* Now superseded by ESB18 *Guidelines for Review of Environmental Factors* (DPI(MR), March 2006)

Reference should also be made to Clause 111 which sets out the factors that Mineral Resources must take into account when assessing the impact of an activity under Part 5 of the *Environmental Planning and Assessment Act 1979*.

Factors to be taken into account during assessment by Mineral Resources	Relevant REF Section
The effect of the activity on any conservation agreement entered into under the *National Parks and Wildlife Act 1974* and applying to the whole or part of the land to which the activity relates	Not Applicable
The effect of the activity on any plan of management adopted under that Act for the conservation area to which the agreement relates	Not Applicable
The effect of the activity on any joint management agreement entered into under the *Threatened Species Conservation Act 1995*.	Not Applicable
The effect of an activity on any wilderness area (within the meaning of the *Wilderness Act 1987*) in the locality in which the activity is intended to be carried on.	Not Applicable
The effect of the activity on critical habitat	Not Applicable
In the case of threatened species, populations and ecological communities, and their habitats, whether there is likely to be a significant effect on those species, populations or ecological communities, or those habitats.	Section 3.3.4, Annexure 4
The effect of the activity on any other protected fauna or protected native plants within the meaning of the *National Parks and Wildlife Act 1974*.	Section 3.3.4, Annexure 4

ANNEXURE 3

(No. of pages excluding this page = 13)

Hera Decline and Ore Acid Rock Investigations

Prepared by

GeoTerra

and incorporating an

Updated Review of ARD Data

Compiled by

S. Jeffrey – Senior Mine Geologist

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TR3-L1 (15 MARCH 2006)

Triako Resources Ltd
PO Box 1048
NORTH SYDNEY NSW 2059

Attention: Peter Ingham

RE: Hera Decline and Ore Acid Rock Investigations

Peter,

The supplied Hera Decline / Boxcut and Ore ARD / leachate analyses have been tabulated, plotted and interpreted as outlined below.

The location and weathering of selected samples is shown in **Table 1**.

TABLE 1 Sample Description

SAMPLE	DESCRIPTION	HOLE
DECLINE	**WEST**	
56	Fresh Siltstone	TNYGT01
DECLINE	**EAST**	
57	Trans. Siltstone	TNYGT02
58	Trans. Siltstone + qtz	TNYGT02
59	Fresh Silt/Sandstone + qtz + sulfides	TNYGT05
60	Fresh Siltstone	TNYGT06
BOXCUT		
61	Trans. Siltstone	TNYGT04
62	Fresh Siltstone	TNYGT04
ORE		
1	sulfide/carbonate components?	-
2	sulfide/carbonate components?	-
3	sulfide/carbonate components?	-

The **Table 2** and **Figure 1** acid base account and NAPP results indicate that the;

- Decline, Boxcut and ore samples have low acid neutralisation potential, and that
- the decline samples are non acid producing whilst the ore samples are acid producing.

TR3-L1 (15 MARCH 2006)

GeoTerra

TABLE 2 Acid Base Account

SAMPLE	Tot S	Tot $S0_4$	Tot $S0_4$ S	Tot $S^{-}S$	ANC $_{Tot\ S}$
	%	mg/kg	mg/kg	%	kg H_2SO_4/t
DECLINE	**WEST**				
56	0.12	190	63.5	0.113	5.4
DECLINE	**EAST**				
57	0.01	<100	<100	0.01	6.2
58	<0.01	<100	<100	<0.01	8.3
59	0.18	680	227.1	0.157	7.2
60	0.17	500	167	0.164	8.3
BOXCUT					
61	<0.01	<100	<100	<0.01	7.0
62	<0.01	<100	<100	<0.01	7.2
ORE					
1	4.42	8290	0.276	4.14	0.6
2	4.59	9790	0.327	4.26	0.9
3	4.51	9670	0.323	4.19	1.9

Assessment of Total S and SO_4-S indicates that S^{-}-S is the predominant species, ranging from 87% to 96% for the decline / box cut and 93% to 94% for the ore. There is a low possible overestimation of the NAPP using Total S as opposed to correcting it to total sulfide S.

It should also be noted that sphalerite is non acid producing, galena is acid consuming, whilst there is a lower relative acid production potential for arsenopyrite, pyrrhotite and chalcopyrite compared to pyrite.

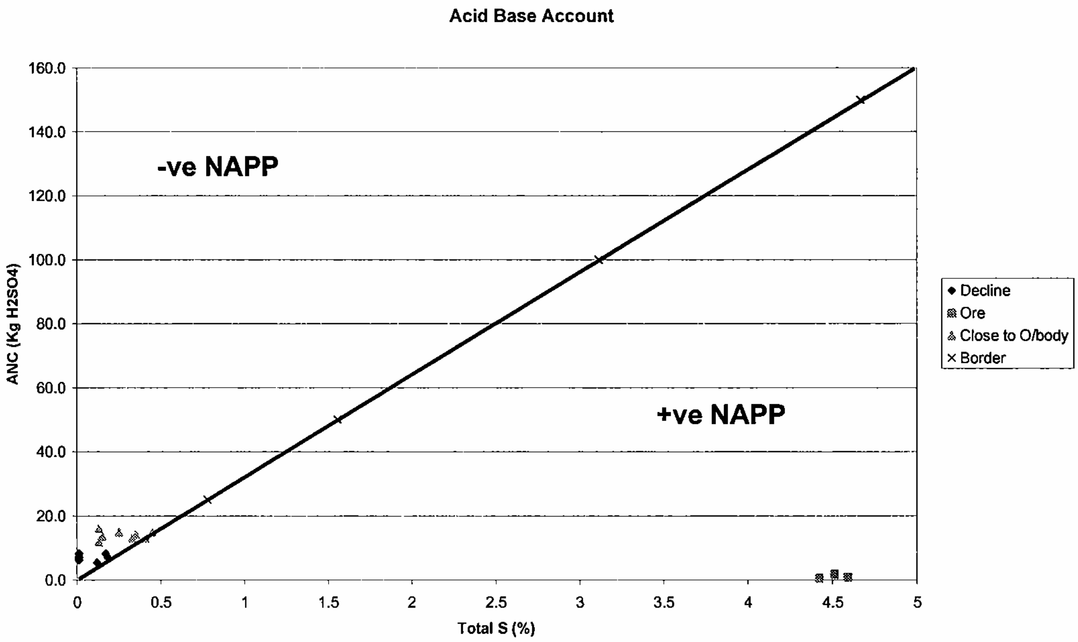


FIGURE 1 NAPP Results

TR3-L1 (15 MARCH 2006) **GeoTerra**

TABLE 3 NAPP / NAG Geochemical Classification

SAMPLE	DESCRIPTION	NAPP (kg H_2SO_4/t)	NAG pH
DECLINE			
56	Fresh Siltstone	-1.7	4.6
57	Trans. Siltstone	-5.9	7.2
58	Trans. Siltstone + qtz	-8.3	7.1
59	Fresh Silt/Sandstone + qtz + sulfides	-1.7	**3.7**
60	Fresh Siltstone	-3.1	**4.1**
61	Trans. Siltstone	-7	6.8
62	Fresh Siltstone	-7.2	6.4
ORE			
1	sulfide/carbonate components?	**135**	**2.2**
2	sulfide/carbonate components?	**140**	**2.3**
3	sulfide/carbonate components?	**136**	**2.2**

The combined assessment of both NAPP and NAG results in **Table 3** and **Figure 2** indicate the decline / box cut samples can be classified as "non acid forming" to "uncertain", whilst the ore samples are "potentially acid forming", apart from the Decline East samples 59 (fresh siltstone/sandstone + qtz + sulfides) and 60 (siltstone) which are within the criteria range assumed for acid generation (pH 4.5).
This indicates that samples 59 and 60 are potentially marginally acid forming, whilst all three ore samples are acid potentially forming

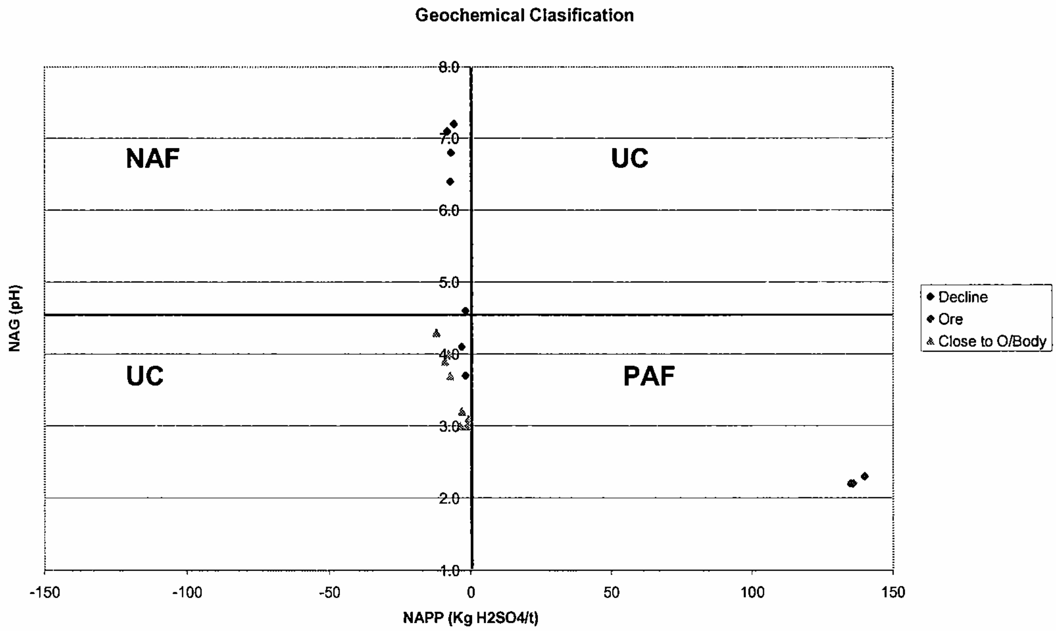


FIGURE 2 NAPP / NAG Combined Results

The NAG pH 4.5 / pH 7.0 results shown in **Table 4** and **Figure 3** indicate that;

- samples 59 to 62 acidity is mostly due to metallic ions precipitating as hydroxides between pH 4.5 and 7, and that the
- ore sample acidity is dominantly due to metallic ions precipitating as hydroxides

TABLE 4 NAG pH 4.5 / 7 Geochemical Classification

SAMPLE	NAG 4.5 (kg H_2SO_4/t)	NAG 7 (kg H_2SO_4/t)	rock pH	EC (uS/cm)	Fizz
DECLINE					
56	<0.1	<0.1	8.7	147	0
57	<0.1	<0.1	8.1	138	0
58	<0.1	<0.1	8.4	85	0
59	1	2.5	7.0	290	0
60	0.3	2.2	7.6	266	0
61	<0.1	0.3	7.8	207	0
62	<0.1	2.5	8.2	116	0
ORE					
1	4.3	26.7	6.8	135	0
2	4.4	30.9	5.6	140	0
3	4.3	27.5	7.1	136	0

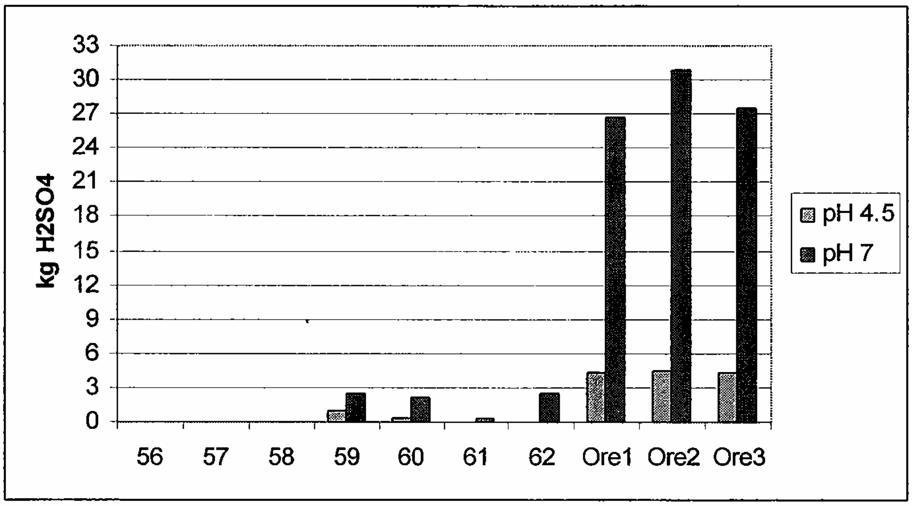


FIGURE 3 pH 4.5 / pH 7.0 Results

Leachate results in **Table 5** indicate the ore exceeds trigger values for further investigation in regard to potential toxicant effects on freshwater aquatic species for cadmium, lead (Ore 3), manganese and zinc.

The Decline West (56) exceeds the same triggers for nickel, whilst the Decline East (59, 60) exceed the nickel trigger and zinc is exceeded in (59).

TR3-L1 (15 MARCH 2006) **GeoTerra**

TABLE 5 Decline and Ore Leachate Analysis (mg/L)

ELEMENT	ANZECC 2000	56	57	58	59	60	61	62	ORE 1	ORE 2	ORE 3
Aluminium	0.055 (>pH6.5)	-	-	-	-	-	-	-	<0.10	<0.10	<0.10
Antimony	-	0.002	0.002	0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.01	<0.01
Arsenic	0.024 (III) 0.013 (V)	<0.001	0.003	0.003	<0.001	<0.001	0.002	0.002	<0.01	<0.01	<0.01
Barium	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1
Beryllium	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01
Boron	0.37	-	-	-	-	-	-	-	<0.1	<0.1	<0.1
Cadmium	0.0002	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	0.941	0.9	0.947
Calcium	-	-	-	-	-	-	-	-	4	1	1
Chromium	0.00001 (VI)	0.009	0.007	0.004	0.002	0.006	0.007	0.005	<0.01	<0.01	<0.01
Cobalt	-	<0.001	<0.001	<0.001	0.026	0.004	<0.001	<0.001	0.06	0.06	0.06
Copper	0.0014	0.003	<0.001	0.001	0.002	0.003	<0.001	0.002	<0.01	<0.01	<0.01
Iron	-	<0.05	0.21	0.11	<0.05	<0.05	0.17	0.08	<0.01	<0.01	<0.01
Lead	0.0034	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	0.12	0.14	0.44
Magnesium	-	-	-	-	-	-	-	-	<1	<1	<1
Manganese	1.9	0.098	0.096	0.043	0.481	0.332	0.058	0.027	2.21	2.21	2.22
Molybdenum	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01
Nickel	0.011	0.015	<0.001	<0.001	0.071	0.026	<0.001	<0.001	0.11	0.1	0.1
Phosphorus	-	-	-	-	-	-	-	-	<1	<1	<1
Potassium	-	-	-	-	-	-	-	-	7	7	7
Selenium	0.011	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Silver	0.00005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.01	<0.01
Sodium	-	-	-	-	-	-	-	-	112	135	112
Strontium	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1
Tin	(IV) -	-	-	-	-	-	-	-	<0.01	<0.01	<0.01
Titanium	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01
Vanadium	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01
Zinc	0.008	<0.005	<0.005	<0.005	0.021	<0.005	<0.005	<0.005	164	140	184
Gold	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

NOTE: ANZECC 2000 trigger values for toxicants at 95% protection of freshwater species
III, V, VI indicate valence states for selected elements

CONCLUSIONS

Combining the above mentioned results indicates that;

- All samples have low acid neutralisation potential
- The Decline and Boxcut samples (excluding 59, 60) have low Net Acid Production Potential (NAPP) and Net Acid Generation (NAG)
- The Decline East (59 and 60) have a low potential for net acid generation (NAG), with the combined NAPP / NAG results indicating the Decline East (59,60) is uncertain to potentially acid forming. The acid produced is mainly due to precipitation of metallic hydroxides between pH 4.5 and 7, whilst the leachate

can exceed the ANZECC 2000 95% protection level for freshwater aquatic species trigger levels for nickel and zinc

- The Ore samples (Ore 1,2,3) are potentially acid forming based on the combined NAPP / NAG tests, with the acidity predominantly generated by precipitation of metallic hydroxides, and the leachate exceeding the ANZECC 2000 95% protection level for freshwater aquatic species trigger levels for cadmium, lead, manganese and zinc.

RECOMMENDATIONS

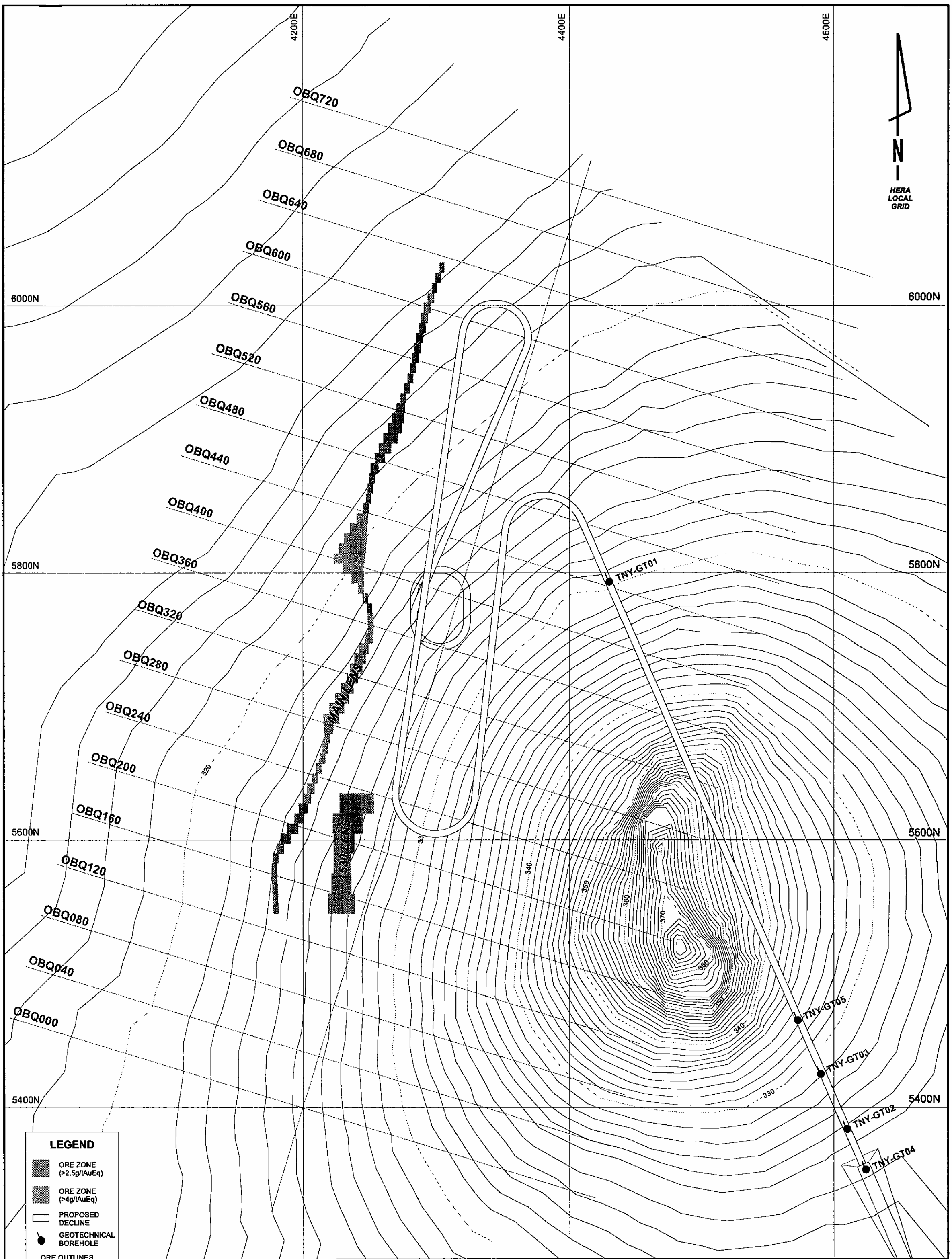
Waste rock from the Decline East (59, 60) area has a low potential for acid and (Ni / Zn) leachate generation, with waste rock from the representative area requiring separate stockpiling after mining and further bulk ARD / leachate assessment in order to assess whether waste management procedures are required to minimise the production of acidic and metallic leachate.

The ore samples have a high potential for acid and metallic leachate generation, with the mined ore requiring temporary bunding and clean / dirty water separation management procedures on stockpiling.

It is proposed to remove the ore for off site treatment, and therefore no long term management measures are required.

Yours faithfully
GeoTerra

Andrew Dawkins
Managing Geoscientist (AuSIMM CP-Env)



REFERENCE: Information provided by Triako Resources Limited

TRIAKO RESOURCES LIMITED	GENERAL LAYOUT			Fig. 1
Kevin Rosengren & Associates Pty Ltd CONSULTING MINING ENGINEERS	Job No: 25036	Scale 1:2500	Date: Dec 05	

TRIAKO RESOURCES LIMITED

A.B.N. 46 008 498 119
NYMAGEE EXPLORATION OFFICE
c/- "The Peak", Nymagee NSW 2831, Telephone : (02) 6837 3689 Facsimile : (02) 6837 3660
Email: nymagee@triako.com.au Website: www.triako.com.au

MEMORANDUM

DATE: 12th December 2006

TO: Agi Patrikios

ATTENTION:

FROM: Stuart Jeffrey

SUBJECT: Updated Review of ARD data at Hera and the Proposed Exploration Decline

CC:

Executive Summary

A geological review of the proposed Hera exploration decline combined with existing ARD data for the Hera deposit estimates that 30% of the material to be excavated will be PAF (Potentially Acid Forming) and 70% NAF (Not Acid Forming).

Background

To date there have been 3 sets of samples from Hera submitted for ARD testwork.

- A series of near mineralization samples in July 2005,
- A series of samples collected in or near the decline position in holes TNYGT001 to TNYGT006A in January 2006, and
- 3 composite ore samples from TNY023, TNY030 and TNY032 that was tested in October 2005.

All the near mineralization samples were classified as Uncertain (UC) to Potentially Acid Forming (PAF). These samples are from holes that are below the proposed exploration decline development. Most of the TNYGT series of samples were classified as Non Acid Forming (NAF) with two samples being classified as UC to PAF. The 3 ore samples were clearly classified as PAF.

Table 1 summarises the Hera ARD sample data and includes assay results where possible. The Total S% data is derived from the GeoTerra reports. Observations/comments are:

- The transition from NAF to PAF occurs somewhere between a Total S value of 1200 and 1300 ppm (Sample 56 from TNYGT001 is in the NAF field but close to the PAF boundary)
- Not all samples have been routinely assayed, and complete S and Fe data would have been preferred
- The increase in Total S can be considered due to iron sulfides such as pyrite and pyrrhotite.
- For the purposes of this study, any sample that was considered UC to PAF was considered to be PAF (the worst case scenario). This conservative approach was taken so that there would be no later surprises in the planning process for the proposed development activity.

Analysis of the Proposed Hera Exploration Decline

The proposed Hera exploration decline has been broken into a series of components as per Figure 1. The locations of the NAF/PAF samples relative to the decline position are shown in Figure 2. At this point it must be noted that the core from holes TNYGT01-06 was classified as either fresh rock, transitional, transitional with quartz etc (Table 1). This classification was used to create samples for the ARD test work, which is why the samples shown in Figure 2 do not always match up with the decline position. The rock type classification combined with the ARD classification was then used to derive the NAF/PAF split in the decline.

Volumes for each of the components of the decline have been estimated knowing that the decline dimensions are 5.5m by 5.0m. Using the NAF/PAF data in Table 1 as a guide combined with a geological interpretation of where various mineralised zones are, each component part of the decline has been subdivided into NAF and PAF sub domains. The results are summarised in Table 2, which estimates that 30% of the material in the decline will be PAF and 70% will be NAF. It should be noted that the amount of PAF is estimated to increase in the lower parts of the proposed decline due to the proximity of the development to low grade mineralization and the Offset Fault.

The downside to this approach is that Iron rich areas (pyrite and pyrrhotite dominant) are not accounted for owing to the fact that not all holes are routinely reporting sulphur and iron. There may also be areas of high pyrrhotite and pyrite content that have not been sampled, and hence do not appear in the assay database.

It is suggested that in future all samples submitted for ARD analysis also be assayed for Fe and S.

Stuart Jeffrey
Senior Mine Geologist
Hera Project

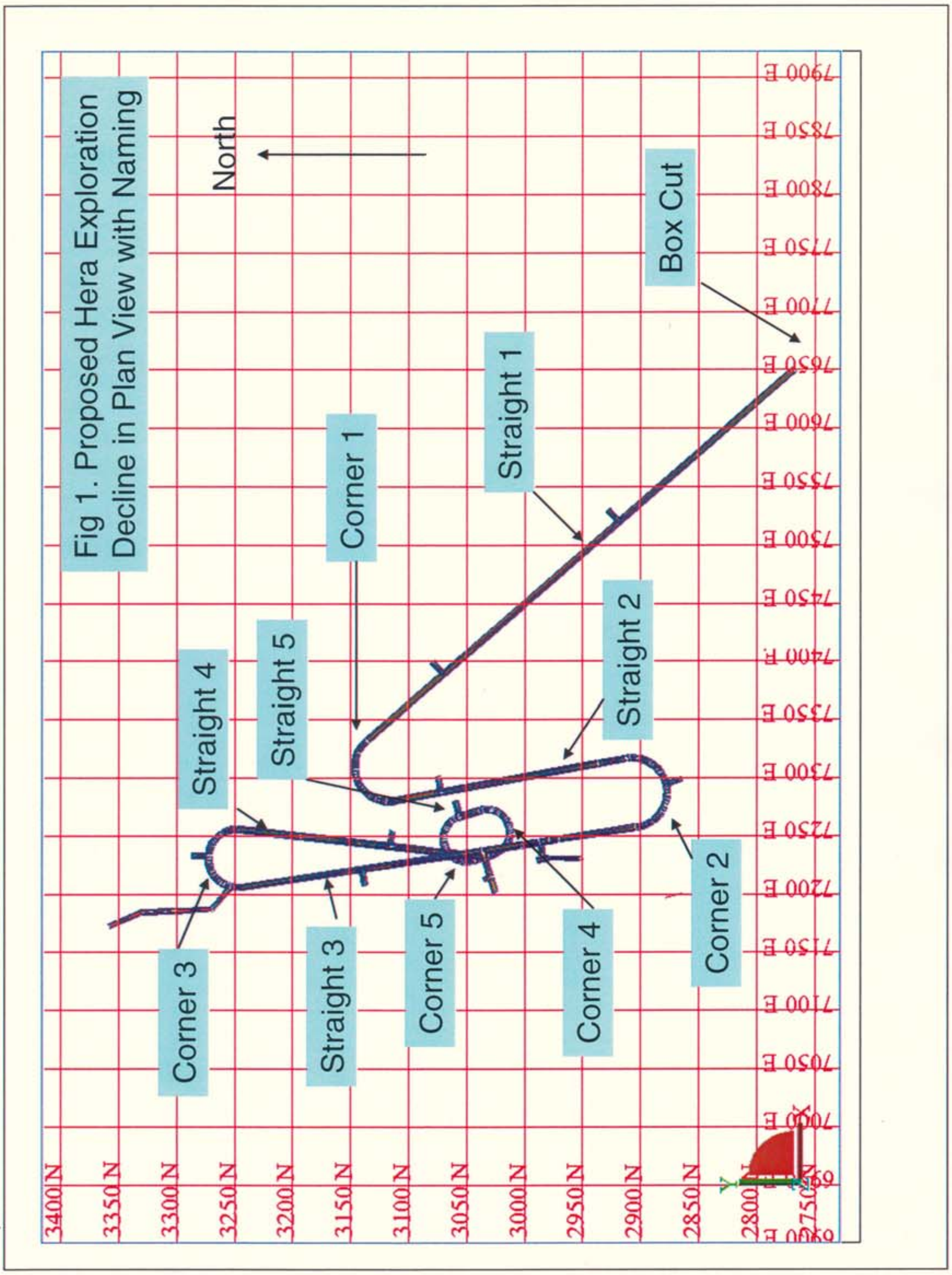


Fig 1. Proposed Hera Exploration Decline in Plan View with Naming

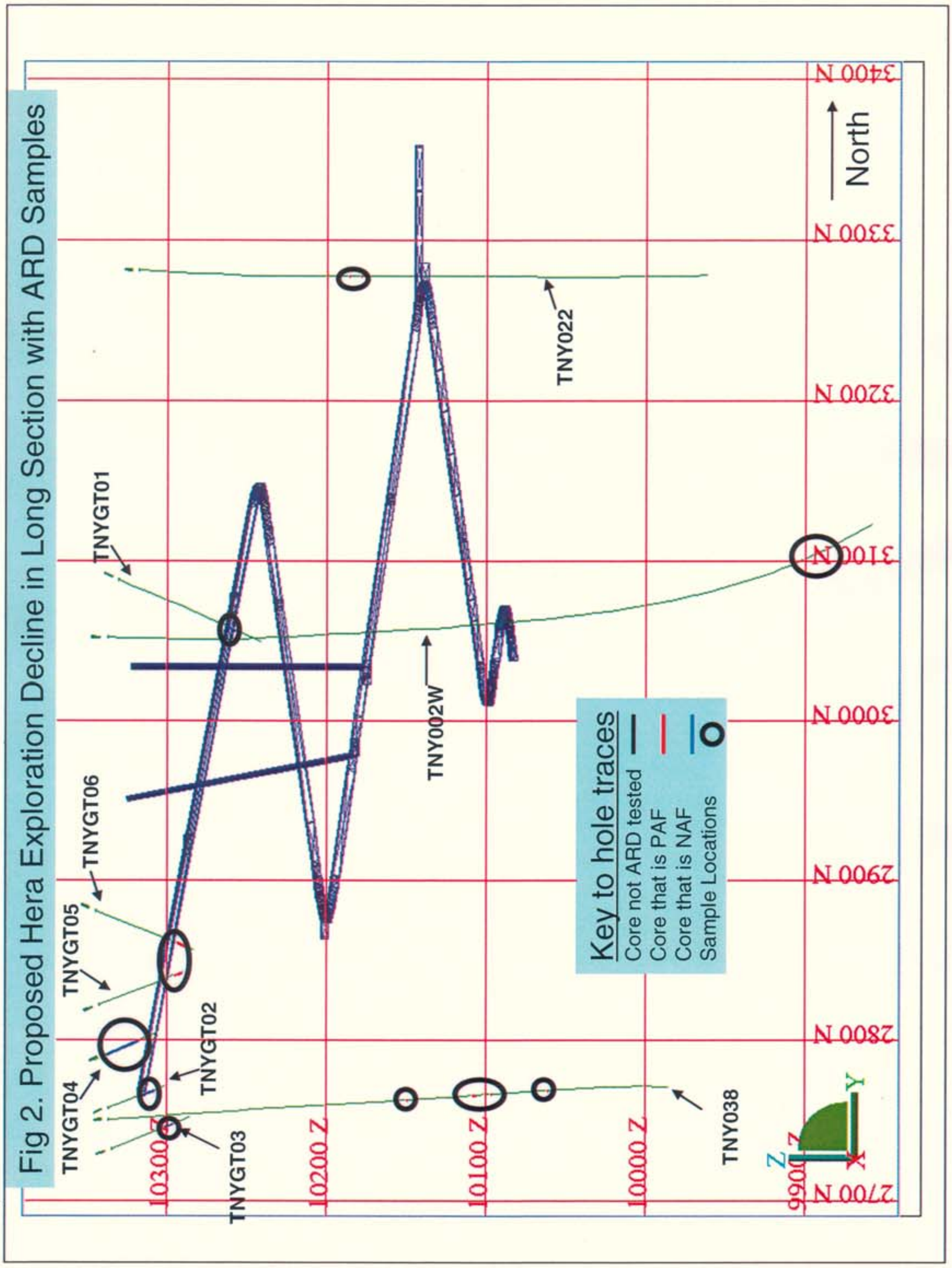


Fig 2. Proposed Hera Exploration Decline in Long Section with ARD Samples

Table 1. A summary of current Hera ARD Data and Assay Values

Hole No or Sample ID	From	To	Geochem Class.	Final Geochem Class.	Rock Class.	Sample No.	Date	Comment	Cu ppm	Pb ppm	Zn ppm	S ppm	Fe %	Total S ppm*
TNYGT001	78.0	84.0	NAF	NAF	Fresh Siltstone	56	Jan-06							1200
TNYGT002	26.0	31.0	NAF	NAF	Transitional Siltstone	57	Jan-06							100
TNYGT002	31.0	31.6	NAF	NAF	Transitional Siltstone + quartz	58	Jan-06		6	220	208	80	?	<100
TNYGT002	31.6	33.0	NAF	NAF	Transitional Siltstone	57	Jan-06		6	359	571	100	?	100
TNYGT003	39.0	43.0	NAF	NAF	Transitional Siltstone	57	Jan-06							100
TNYGT003	43.0	45.0	NAF	NAF	Transitional Siltstone + quartz	58	Jan-06		60	279	358	20	?	<100
TNYGT004	1.8	2.5	NAF	NAF	Transitional Siltstone	61	Jan-06							<100
TNYGT004	2.5	11.4	NAF	NAF	Fresh Siltstone	62	Jan-06							<100
TNYGT004	11.4	25.0	NAF	NAF	Transitional Siltstone	61	Jan-06		23	38	86	70	?	<100
TNYGT005	53.0	56.8	NAF	PAF	Transitional Siltstone	57	Jan-06							100
TNYGT005	56.8	59.0	UC to PAF	PAF	Fresh Silstone/Sandstone + quartz + silfides	59	Jan-06		29	33	84	2263	?	1800
TNYGT006	58.0	64.0	UC to PAF	PAF	Fresh Siltstone	60	Jan-06		33	50	120	1760	?	1700
TNY002W	545.0	546.0	UC to PAF	PAF			Jul-05	assumed 1m of core used						4500
TNY002W	528.0	529.0	UC to PAF	PAF			Jul-05	assumed 1m of core used						1300
TNY038	217.0	218.0	UC to PAF	PAF			Jul-05	assumed 1m of core used						2500
TNY038	324.0	325.0	UC to PAF	PAF			Jul-05	assumed 1m of core used	73	339	620	?	3.25	1300
TNY038	267.0	270.0	UC to PAF	PAF			Jul-05	assumed 1m of core used						4100
TNY038	281.0	282.0	UC to PAF	PAF			Jul-05	assumed 1m of core used	42	218	474	?	3.09	1500
TNY022	151.0	152.0	UC to PAF	PAF			Jul-05	assumed 1m of core used						3300
TNY022	159.3	160.3	UC to PAF	PAF			Jul-05	assumed 1m of core used						3500
ORE 1			PAF	PAF			Oct-05	Composite ore						44200
ORE 2			PAF	PAF			Oct-05	sample from						45900
ORE 3			PAF	PAF			Oct-05	TNY023/030/032						45100

* Note: The Total S ppm values are from the reports by GeoTerra. All other assay results are from the Hera database.

Table 2. PAF/NAF Breakdown for the Proposed Hera Exploration Decline

Exploration Decline Area	Horiz Length	1 in 7 length	vol (m3)	Horiz NAF Length	1 in 7 NAF Length	NAF Vol	Horiz PAF Length	1 in 7 PAF Length	PAF Vol	PAF Commentary
Box Cut			20000.0			20000.0			0.0	
Straight 1	490	494.9	13609.8	300	303.0	8332.5	190	191.9	5277.3	Area influenced by TNYGT005 and TNYGT006
Corner 1	80	80.8	2222.0	65	65.7	1805.4	15	15.2	416.6	Sulfides in TNY020, TNY034, TNY004/4/4W, PNDD6, TNY043
Straight 2	200	202.0	5555.0	150	151.5	4166.3	50	50.5	1388.8	Continuation of sulfides in corner 1 zone and near Offset Fault
Corner 2	95	96.0	2638.6	75	75.8	2083.1	20	20.2	555.5	Continuation of zone in PNDD4 south under BUKA2 and KW2
Straight 3	340	343.4	9443.5	250	252.5	6943.8	90	90.9	2499.8	70m related to sulfides in TNY001 and TNY062 trending south to Offset Fault. 20m extra allowed.
Corner 3	90	90.9	2499.8	70	70.7	1944.3	20	20.2	555.5	10m related to zone in TNY047A, 10m additional.
Straight 4	210	212.1	5832.8	45	45.5	1249.9	165	166.7	4582.9	Continuous sulfide intersections in holes between 3200N and 3050N
Corner 4	75	75.8	2083.1	0	0.0	0.0	75	75.8	2083.1	Continuation of sulfide zone from Straight 4 and sulfides near Offset Fault
Straight5	17.5	17.7	486.1	0	0.0	0.0	17.5	17.7	486.1	Sulfides in TNY017, PNDD2, TNY053A/AW1
Corner 5	70	70.7	1944.3	0	0.0	0.0	70	70.7	1944.3	Sulfides in TNY017, PNDD2, TNY053A/AW2
TOTALS	1667.5	1684.2	66314.8			46525.1			19789.7	
						70.2 %			29.8 %	

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ANNEXURE 4

(No. of pages excluding this page = 150)

Assessment of Significance for Threatened Species, Populations and Ecological Communities on the Hera Deposit

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research FOR A SUSTAINABLE FUTURE

INSTITUTE FOR
LAND, WATER AND SOCIETY

Johnstone Centre – Environmental Consulting
ILWS Report No. 12

Assessment of significance for proposed exploration decline at the Hera Deposit, via Nymagee NSW

Prepared for
Triako Resources Ltd
March 2006

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Executive Summary

The Johnstone Centre Environmental Consulting (JC-EC), Charles Sturt University, was engaged by Triako Resources Ltd (TRL) to undertake a Section 5A assessment of significance for threatened species, populations and ecological communities on the Hera deposit. TRL propose to establish and operate an exploration decline into the Hera deposit near Nymagee, NSW. The aims of this assessment were to:

- conduct a literature review and database search to identify all threatened biota which could potentially occur within the study area;
- assess the significance of potential impacts arising from the proposed activities on these threatened biota known or that could potentially occur within the study area, with respect to Section 5A (8 part test) of the NSW *Environmental and Planning Assessment Act 1979*; and
- provide recommendations, which will mitigate the effects of the proposed activity on any threatened biota and their habitats.

The proposed activity as described in Section 2 of the Draft REF (R.W. Corkery & Co. 2006) would take up to 14 months to complete and would disturb a total area of approximately 12 hectares across an area of 25 - 30 hectares (less than 1% of the study area of approximately 200,000 hectares).

Approximately 10 - 12 hectares (less than 1%) of approximately 100,000 hectares of native vegetation of the study area would be removed as a result of the proposed activity. The vegetation to be removed and/or modified would consist of Mugga Ironbark Woodland, Mallee Woodland and largely White Cypress Pine, co-dominated by Red Box and Bimble Box. As part of this process, all vegetative layers and habitat features in the areas of the proposed activity would be removed. Despite the Mugga Ironbark and Mallee woodland vegetation types being poorly represented within the study area it was determined that removal of this vegetation and associated habitat would not constitute a significant portion of any habitat type for any threatened biota.

Flora and fauna surveys were undertaken during 1 – 5 December of 2004, 25 & 26 June 2005 and 19 – 23 September 2005. A list of threatened biota was compiled from a literature review and database search and, as a result, 12 threatened flora, 54 threatened fauna, one threatened population and one threatened ecological community are known to occur within the region of the property.

The flora survey revealed 171 species of flora from 58 families. Of these species, 16% were exotics with the remaining being native species (including cosmopolitan species). No threatened flora, or flora of conservation concern were recorded during the survey. Approximately 95% of the study area is covered by native vegetation. White Cypress Pine, Red

Box and Bimble Box are the dominant canopy species. Diversity of ground cover was characterised by past and present disturbance history, with diversity generally poorer in areas heavily grazed. Native species generally dominated the ground cover of woodland and forested areas.

The fauna survey revealed that the study area supports a high diversity of native fauna, particularly given the survey effort employed and timing of surveys. A total of 145 vertebrate fauna (139 native and six introduced) species were recorded within the study area during surveying times and incidental observations comprising:

- 23 reptile species (no threatened or species of conservation concern);
- 7 frog species (no threatened or species of conservation concern);
- 95 bird species including nine threatened and 13 species of conservation concern; and
- 20 mammals including one threatened and one species of conservation concern.

Threatened species recorded within the study area as a result of the flora and fauna survey are:

1. Pink Cockatoo (*Cacatua leadbeateri*)
2. Grey-crowned Babbler (*Pomatostomus temporalis temporalis* (eastern subspecies)
3. Hooded Robin (*Melanodryas cucullate*)
4. Chestnut Quail-thrush (*Cinclosoma castanotus*)
5. Speckled Warbler (*Chthonicola sagittate*)
6. Pied Honeyeater (*Certhionyx variegates*)
7. Diamond Firetail (*Stagonopleura guttata*)
8. Superb Parrot (*Polytelis swainsonii*)
9. Black-chinned Honeyeater (*Melithreptus gularis gularis (*eastern subspecies)
10. Little Pied Bat (*Chalinolobus picatus*).

The likelihood of additional threatened species previously recorded within the region to occur within the subject site was also assessed. As a result of a review of the ecology, habitat requirements and historical records for each threatened biota it was determined that one reptile; 14 birds; nine mammals (including ground dwelling, arboreal and microchiropteran bats) and two plants could potentially occur within the study area.

The significance of the potential impacts of the proposed activity on threatened biota known from the study area or other threatened biota that could potentially occur within the study area was assessed. The *EP&A Act 1979* includes in Section 5A, eight factors which are to be considered when determining if the proposed activity "*is likely to have a significant effect on the threatened species, populations or ecological communities, or their habitats"*. Consequently as a result of conducting an Assessment of Significance for each species known to occur or that could potentially occur within the study area it is considered that the proposed activity is "*unlikely*" to impose a "*significant effect*". It is determined that the proposed activity is "*unlikely*" to have a "*significant effect*" only in concurrence with the proposed impact amelioration measures as outlined below.

The lack of targeted surveys of the subject site dictates that a precautionary approach must be taken. Considering the nature and extent of the proposed activity, the amelioration measures include:

1. General land management amelioration measures (e.g. pest animal control);
2. Amelioration measures to be undertaken prior to commencement of proposed activity (e.g. pre-clearance survey);
3. Amelioration measures to be undertaken during the proposed activity (e.g. clearly marking areas to be cleared); and
4. Amelioration measures to be undertaken after the proposed activity has been completed (e.g. rehabilitation, monitoring of the subject site).

Given that it is likely mining operations will eventuate as a result of the exploration activities TRL should be considering the preparation and implementation of a property management plan (PMP) for the entire study area. It is unlikely that a PMP or equivalent management plan could be implemented prior to the commencement or completion of the proposed activities, therefore the following two components (pest animal strategy and weed control program) should be implemented prior to the completion of the proposed activity to ensure that no *'significant effect'* would occur upon any threatened biota, or their habitats that are known to occur or could potentially occur within the study area.

Amelioration measures to be undertaken prior to commencement of proposed activity

Given the lack of targeted flora and fauna surveys of the subject site it is essential that a pre-clearance survey be conducted by a qualified ecologist. A site inspection should be conducted to identify vegetation which may harbour fauna (e.g. habitat trees) and mark this vegetation accordingly. The extent and location of any threatened flora or significant vegetation would be mapped and recorded. This information should be documented and provided to TRL prior to commencement of clearing. Pending the outcomes of the pre-clearance survey it may be necessary to relocate and monitor fauna within the subject site during clearing operations.

Amelioration measures to be undertaken during the proposed activity.

- Areas to be cleared must be clearly marked to ensure no accidental clearing occurs;
- Any infrastructure required should be positioned to avoid retained native vegetation;
- Mature seed from native trees and shrubs felled should be collected and used for the rehabilitation of the site;

- Where mature and old growth trees are removed (e.g. any tree with a dbh of > 40 cm), any trees/limbs could be placed in adjacent vegetation to provide important habitat;
- Noxious weed and other weed material encountered during the activities, should be destroyed and/or removed from the site using appropriate methods;
- Drainage and runoff should be controlled in such a way as that no foreign substrates or materials leave the site;
- Sediment and erosion control structures, which conform with the relevant guidelines, should be installed; and
- Exposed surface soil should be stabilised as soon as possible to avoid potential erosion.

Amelioration measures to be undertaken after the proposed activity has been completed.

- Rehabilitation should include the use of cleared vegetation and seed bank from redistributed topsoil;
- Reduce or avoid the disturbance of tank sites and drainage lines;
- Exposed surface soil should be stabilised as soon as possible to avoid potential erosion;
- Rehabilitation of the subject site should be monitored to ensure native vegetation regeneration is successful and to control weed invasion. If rehabilitation of sites is unsuccessful, appropriate offsets should be implemented to ensure "no net loss' of native vegetation and habitat is the outcome.

These measures should be implemented to ensure that no *'significant effect'* would occur upon any threatened biota, or their habitats that are known to occur or could potentially occur within the study area. These measures would also ensure that the impacts upon other native flora and fauna and the general environment of the study area would also be minimised.

The definitions given below are relevant to these requirements and will be used in this report.

activity - has the same meaning as in the *Environmental Planning and Assessment Act 1979* (*EP&A Act*). The nature of the proposed activity is described in Section 3.

endangered population - population specified in Part 2 of Schedule 1 of the *TSC Act 1995.*

endangered ecological community - an ecological community specified in Part 3 of Schedule 1 of the *TSC Act 1995.*

likely - taken to be a real chance or possibility (NPWS 1996).

locality - means the area within a 50 km radius of the subject site.

local population - the population that occurs within the study area, unless the existence of contiguous or proximal occupied habitat and the movement of individuals or exchange of genetic material across the boundary can be demonstrated (NPWS 1996).

region - means a biogeographical region that has been recognised and documented such as the Interim Biogeographical Regions of Australia (IBRA). The region which the study area falls within is the Cobar-Peneplain bioregion.

subject site – although only up to 12 hectares will be cleared as a result of the proposed activity, this will occur across an area of between 25 – 30 hectares. The subject site is therefore the area to be directly affected by the proposed activities of 25 - 30 ha of which 12 ha which will be cleared (see **Figure 2**).

study area – the subject site and any additional areas which are likely to be affected by the proposal, either directly or indirectly (NPWS 1996). The study area incorporates the property known as “The Peak” (approximately 22km^2) and adjoins land within 5km of the subject site. TRL are the owners of the “The Peak”, therefore either directly or indirectly influence the land management decisions which may or may not impact upon threatened biota which are known from or have potential habitat within the study area.

threatened biota - means those threatened species, endangered populations or endangered ecological communities which are considered known or likely to occur in the study area.

threatened species – a species specified in Schedule 1 Part 1 (endangered species), Part 4 (presumed extinct) and Schedule 2 (vulnerable species) of the *TSC Act 1995.*

Table of Contents

1 Introduction

R.W. Corkery & Co. are preparing a Review of Environmental Factors (REF) for Triako Resources Limited (TRL) to obtain approval from the Department of Primary Industries Mineral Resources (DPI MR) to establish and operate an exploration decline into the Hera deposit near Nymagee, NSW. The exploration decline would enable a bulk sample to be taken for metallurgical testing. The REF is subject to a Part 5 assessment by DPI (MR) under the *Environment Planning and Assessment Act 1979*. Part of the DPI (MR) requirements for the REF is the inclusion of a *Threatened Species Conservation Act 1995* Section 5A assessment of significance for threatened species on the site.

The Johnstone Centre Environmental Consulting (JC-EC), Charles Sturt University, was engaged by TRL to undertake the Section 5A assessment of significance for threatened species, populations and ecological communities on the Hera deposit.

The aims of this assessment are to:

- conduct a literature review and database search to identify all threatened biota (including any threatened, flora, fauna, populations and ecological communities) which could potentially occur within the study area:
- assess the significance of potential impacts arising from the proposed activities on threatened biota, which are known to or that could potentially occur within the study area, with respect to Section 5A (Assessment of Significance) of the NSW *Environmental and Planning Assessment Act 1979* (EP&A Act 1979), as modified by the NSW *Threatened Species Conservation Act 1995* (TSC Act 1995); and
- provide recommendations, which would mitigate the effects of the proposed work on any threatened biota and their habitats.

This report presents the findings of flora and fauna surveys undertaken by the JC-EC of "The Peak", property during December 2004, June and September 2005 and incorporates findings from other surveys/assessments previously undertaken of the property and from the broader region. Field surveys were not undertaken of the subject site for this project.

1.1 Background

The JC-EC was engaged by Triako Resources Limited (TRL) to undertake a flora and fauna survey of “The Peak”, a property located south of Nymagee, central NSW. Surveys were undertaken during 1 – 5 December of 2004, 25 & 26 June 2005 and 19 – 23 September 2005.

The purpose of the flora and fauna survey was to conduct baseline studies to determine the presence/absence of flora and fauna within the Hera property based upon desktop analysis and field surveys. Flora and fauna of conservation significance including locally and regionally significant species were targeted during the surveys. Specific objectives of the flora and fauna survey are outlined in the full report. **Table 1** provides a summary of the survey methods and effort employed to date for the three survey periods.

A summary of the survey findings is provided in the following sections.

1.2 Previous flora and fauna surveys

Although there have been a number of flora and fauna surveys within the Cobar Peneplain, there have been no targeted flora and fauna surveys within the study area in the past. A Western Lands Lease Management Plan for ‘The Peak’ was prepared by the Soil Conservation Service in 1972 that described the vegetation in various land classes similar to the vegetation community types described in this report. However this report described dominant species only and did not clarify to any extent the type or distribution of fauna within the study area.

In addition, an early Review of Environmental Factors (REF) was conducted by Ede (n.d.) of the Soil Conservation Service in Condobolin some time in the 1990’s though no date is provided on this report. This report was completed as a requirement to conduct chaining on the property. Although this is not a comprehensive flora and fauna survey of this site, consideration is given to the threatened fauna species that have the potential to occur within the study area, with dominant flora described briefly for the entire study area.

The subject site falls within the Western Catchment Management Authority (WCMA). Currently there is no Regional Vegetation Management Plan (RVMP) or equivalent vegetation data available for the WCMA that covers the Nymagee area. The closest RVMP to the study area is the Mid Lachlan RVMP (within the Lachlan CMA), which has a north eastern boundary at Condobolin, more than 100 kilometres south of the study area.

Table 1 Combined flora and fauna survey effort employed during the three survey periods.

Survey Method	Stratification unit					
	BB/RB/WCP (~2000 ha)	MALL (~40 ha)	MI/WCP (~20 ha)	CG/SB (~65 ha)	Tanks/drainage lines	Total survey effort
Flora - (20 x 20m) quadrats	7	2	1	1	1 (inBB/RB/WCP)	11 quadrats – full floristic
Flora – (50m x 20m) quadrats	16	4	1	1	2 (inBB/RB/WCP)	11 quadrats – dominant species
Flora - (100 x 20 m) traverses	3	3	2	1	1	9 transects – new species added
Flora – random traverse (30 min)	4	2	2	1	1	Ongoing – over 5 day period New species added to list
Dedicated habitat, animal sign search (random 1 ha/30 min)	4 sites	Opp.	Opp.	Opp.	Opp.	2 hours + opportunistic
Elliott trapping (25 traps per site)	2 sites (1 site 2 nights, 1 site 3 nights)	10 sites (1 site 2 nights, 9 sites 3 nights)	-	-	-	12 sites 850 trap nights
Wire cages - 1 small and 1 large cage placed at each Elliott site	2 sites (1 site 2 nights, 1 site 3 nights	10 sites (1 site 2 nights, 9 sites 3 nights)	-	-	-	12 sites 68 trap nights
Nocturnal bird call playback (each session 30 min)	3 sites	2 sites	-	2 sites	-	7 sessions for 3.5 hrs
Spotlighting (foot, 20 min 1 ha search)	6 sites	6 sites	1 site	2 sites	Opp. tanks & drainage lines	15 sessions for 5 hrs + opp.
Car based spotlighting 30 minutes for approx 1.5 km	2 hrs (1 person for 4 transects each 30 mins)	-	-	1 hr (1 person for 2 transects each 30 mins)	Opp. tanks & surrounding vegetation	3 hrs for at least 6 km
Harp trapping	-	-	-	-	3 sites (all tanks two repeated diff survey periods) 2 traps each site	3 sites) 10 trap nights
Anabat Recording - 1 night each site for 10 hours	1 site	2 sites	-	-	4 sites (all tanks)	7 sites 70 hours +

Survey Method	Stratification unit					
	BB/RB/WCP (~2000 ha)	**MALL (~40 ha)**	**MI/WCP (~20 ha)**	**CG/SB (~65 ha)**	**Tanks/drainage lines**	**Total survey effort**
Trip line – dam/watercourse	-	-	-	-	1 tank (SE corner of subject site) for 4 hours.	1 site for 4 hours
Diurnal herpetofauna (2 ha search)	8 sites (2 sites with 2 people for 2 hrs, & 6 sites with 3 people for ½ hr) + opp.	9 sites (2 sites with 4 people for 2 hrs, 5 sites with 3 people for ½ hr & 2 sites @ 2 people for 1 hr) + opp.	Opp.	1 site 2 people for 1 hr + opp.	Opp.	18 sites 46.5 hrs + opp.
Pitfall traps (1 site only)	3 buckets in dry creek bed for 3 nights only in BB/WCP	-	-	-	3 buckets in dry creek bed for 3 nights only in BB/WCP	9 nights
Nocturnal herpetofauna (foot based spotlighting for frog and reptiles)	Opp.	Opp.	-	Opp.	5 sites 3 people for 30 mins each site (all tanks) + opp. of flooded roadways	7.5 hours + opportunistic
Diurnal Bird (10 min spot searches)	7 sites + opp.	9 sites + opp.	Opp.	Opp.	1 + opp.	17 sites for 2.5 hrs + opportunistic
Diurnal Bird (20 min 1 ha search)	20 sites + opp.	8 sites + opp.	2 sites + opp.	2 sites + opp.	6 sites + opp.	38 sites for 12.5 hrs + opportunistic

NOTES:
- Stag watching was conducted as a precursor to spotlighting where suitable habitat was available.
- Anabat units were placed alongside earth tanks in order to maximise the opportunity of recording species. Anabat surveys were replicated for 3 sites.
- All survey sites and routes are marked on aerial photograph **Appendix 6**.

LEGEND to table heading (Table 1)
- BB/RB/WCP: Bimble Box/Red Box/White Cypress Pine Vegetation
- MALL: Mallee Vegetation
- MI/WCP: Mugga Ironbark/White Cypress Pine Vegetation
- CG/SB: Cleared Grassland/Shrubland Vegetation
- Opp. opportunistic surveys.

1.3 Existing environment

The study area ("The Peak") is located approximately five kilometres south-east of Nymagee in central NSW (Figures 1) and encompasses approximately 21 square kilometres (2,128 ha). Located within the local government area (LGA) of Cobar, the study area is situated on the south-eastern border of the Western Catchment Management Authority. The locality of the study area overlaps with at least one other catchment area, the Central West Catchment Management Authority, although the locality is entirely within the Cobar Peneplain Bioregion.

The Cobar Penneplain Bioregion lies within the Central West of New South Wales, occupying over 73,000 square kilometres, or approximately one-tenth of the area of New South Wales. It includes parts of the Western and Central Divisions, extending from near Bourke in the north, through to Griffith in the south, and includes the towns of Nymagee, Cobar, Nyngan, Condobolin, and Lake Cargelligo.

Sheep gazing is the dominant land use of the study area. Mining, as evident by two abandoned shafts, occurred within the last 80 years and more recently category one and two explorations by TRL.

Approximately 95% of the study area is covered by native vegetation. White Cypress Pine, Red Box and Bimble Box are the dominant canopy species. Ground cover diversity was characterised by past and present disturbance history (e.g. feral goats), with diversity generally poorer in areas heavily grazed (e.g. peak areas). Native species generally dominated the ground cover of woodland and forested areas. Woodland areas recorded high ground cover diversity and were dominated by native species, whereas areas of dense White Cypress Pine regrowth recorded poorer ground cover diversity. Highly modified areas were characterised by higher diversity of introduced species. Five main vegetation communities were identified during the field surveys (see Section 1.4).

Six earth tanks (dams) and three registered bores are located throughout the study area and are fed by natural and modified drainage lines throughout the property.

The buildings within property are located at the north-west corner. There is a main homestead, small house, two portable office blocks, a shearing shed and small core cutting shed. There is a single wire earth return electrical power line which provides power to the buildings in the north-west corner of the property and runs south into the property.

The property is fenced on all four boundary lines with two internal fence lines. There is a network of tracks/roads throughout the property accessing fence lines, tanks, bores and exploration activity.

Triako purchased the exploration licence from Pasminco in October 2003 and have been exploring on the Hera deposit and surrounding area since this date.

During the recent exploration period (since 1970) there have been approximately 90 drill pads established for diamond and reverse circulation drill holes. Each drill pad site is approximately $630m^2$ (35m x 18m) with the actual drill pad being $45m^2$. There have been over 900 aircore/ rotary air blast holes drilled during this same period but the drill sites have been limited to the grid lines previously established.

There are approximately 50km of small tracks/roads within "The Peak" property. In addition there are approximately 26km of cleared grid lines from earlier exploration activity.

Existing exploration activities

It is important to also consider that TRL are conducting Category 3 exploration west of the area known as the Peak involving:

- 17 diamond drill holes. The drill holes are approximately 100m apart over an area of approximately 21 hectares
- Each drill pad is approximately 45 square metres (each drill site is expected to be $630m^2$), resulting in a total area of disturbance in the vicinity of 2 hectares (maximum).
- Where possible, large trees are to be avoided and only small diameter Cypress Pines are to be felled if they cannot be avoided (the drill holes need to be precisely located based on the deposit geology).
- Drill sumps at each site and as they may be required in the future, are not planned to be filled in but will be fenced to exclude fauna.
- Vegetation is cleared and topsoil stripped from each drill pad and stockpiled separately.
- Rehabilitation of disturbance as appropriate.
- Use of existing exploration tracks where possible.

The proposed mining operations are to take up to four months. It is proposed that one drill hole will be completed at a time.

The area west of the Peak (highest point in the study area) has been extensively drilled as part of the earlier exploration process. At least 40 drill pads are located across this part of the property. The proposed drill holes are to be located within the mosaic of the existing drill holes.

It is likely that the total area of disturbance including all new drill pads and potential exploration tracks will be approximately 2 hectares, across an area of approximately 21 hectares (less than 0.3 km^2).

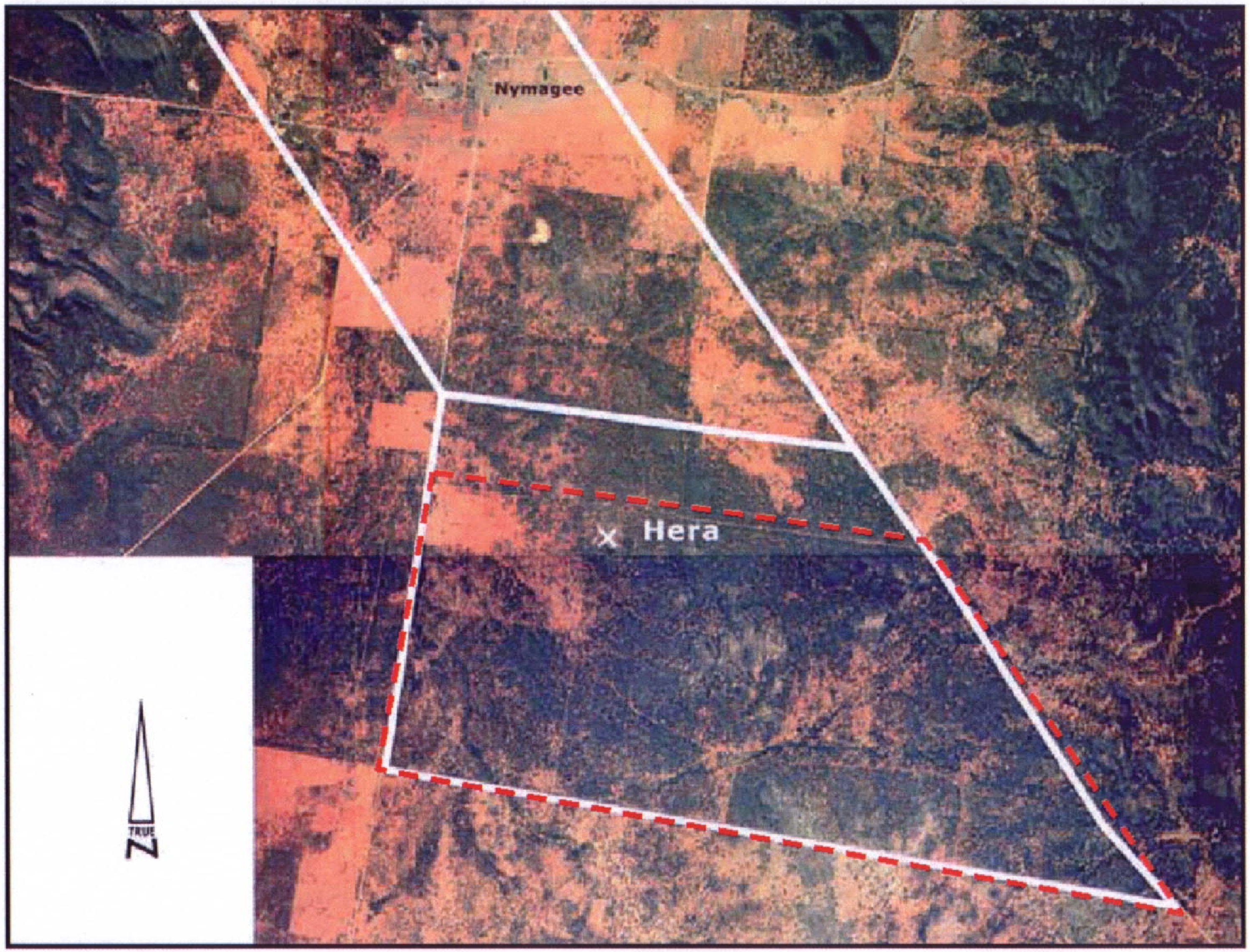

Figure 1. Aerial photograph displaying Hera property (red broken line) and Nymagee township. White X denotes approximate location of proposed activity (source Triako Resources Limited 2004).

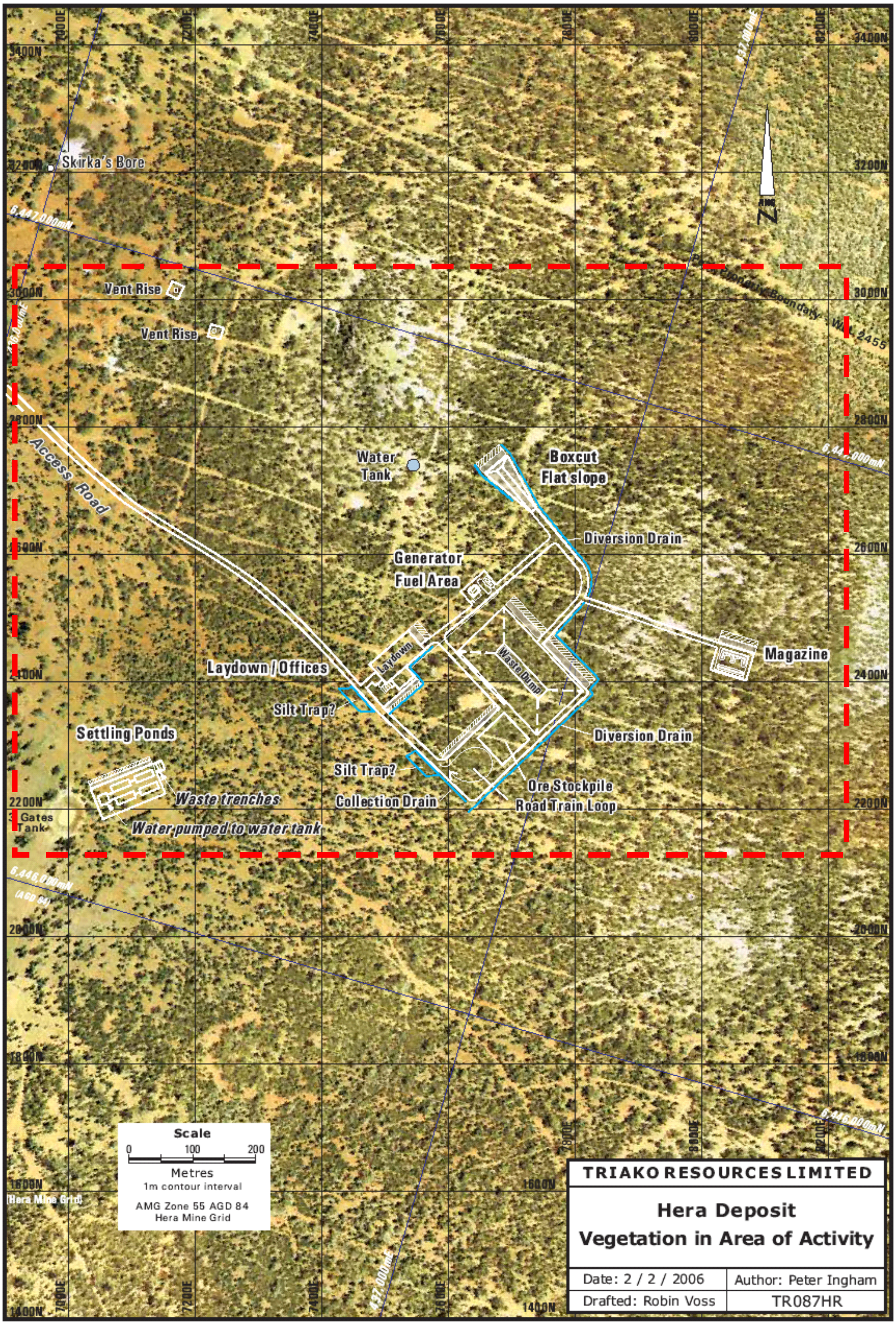

Figure 2.Subject site depicted by red broken line (approx. 12 ha of disturbance across an area of approx. 25 ha).

1.4 Vegetation of the study area

Overall, 171 species of flora from 58 families was recorded during the field investigations. Of these species, 16% were exotics with the remaining being native species (including cosmopolitan species).

One noxious weed Bathurst Burr (*Xanthium spinosum)* as declared by the NSW Department of Agriculture for the Cobar Control Area was recorded on site. A full flora species list can be found in **Appendix 1**.

Approximately 95% of the subject site is covered by vegetation. White Cypress Pine, Red Box and Bimble Box are the dominant canopy species. Ground cover diversity was also characterised by past and present disturbance history (feral goats), with diversity generally poorer in areas heavily grazed (e.g. rocky outcrops, elevated areas). Native species generally dominated the ground cover of woodland and forested areas, and included a large number of native forbs with fewer native grasses. It is likely an autumn survey would have identified more native grasses but these were not recorded in the spring surveys.

Woodland areas recorded high ground cover diversity and were dominated by native species, whereas areas of dense White Cypress Pine regrowth recorded poorer ground cover diversity. Highly modified, disturbed areas were characterised by higher diversity of introduced species, especially the area surrounding the house, machinery sheds, track, road verges and areas heavily grazed by feral goats.

Five main vegetation communities were identified during the field surveys. For the purposes of this report and to keep current nomenclature, vegetation communities have been named according to plants of Western NSW and Cobar Peneplain bioregional assessment study (per Masters & Foster 2000).

The main vegetation communities include:

1. Bimble (Poplar) Box/White Cypress Pine woodland
2. Red Box/White Cypress Pine woodland
3. Mallee (Eucalyptus spp.)
4. Mugga Ironbark/White Cypress Pine woodland
5. Cleared grassland/shrubland

However, Bimble Box and Red Box were often co-dominant species with intergrades of these two species within communities. There was no distinct difference between these two vegetation community types within the subject site and for the purposes of this report Bimble Box/White Cypress Pine woodland and Red Box/White Cypress Pine woodland have been described as the one community. A map of the vegetation types of the study area is displayed as **Figure 3**.

Table 2. Extent of vegetation communities within the study area.

Vegetation type	Approx. extent (ha)	Approx. proportion of study area (%)
Bimble Box/Red Box/White Cypress Pine woodland	1900	90
Mallee woodland	40	2
Mugga Ironbark woodland	20	1
Cleared shrubland/grassland	65	3

Note. Extent and proportions based upon GIS mapping and are approximate figures only.

Table 3 Extent of vegetation communities within the subject site (numbers in brackets represent approximate extent of vegetation to be cleared).

Vegetation type	Approx. extent (ha)	Approx. proportion of vegetation communities within study area (%)
Bimble Box/Red Box/White Cypress Pine woodland	20 (5)	< 1.5 (<0.5)
Mallee woodland	6 (3)	15 (7.5)
Mugga Ironbark woodland	5 (3)	25 (15)
Cleared shrubland/grassland	0	0

Note. Extent and proportions based upon GIS mapping and are approximate figures only.

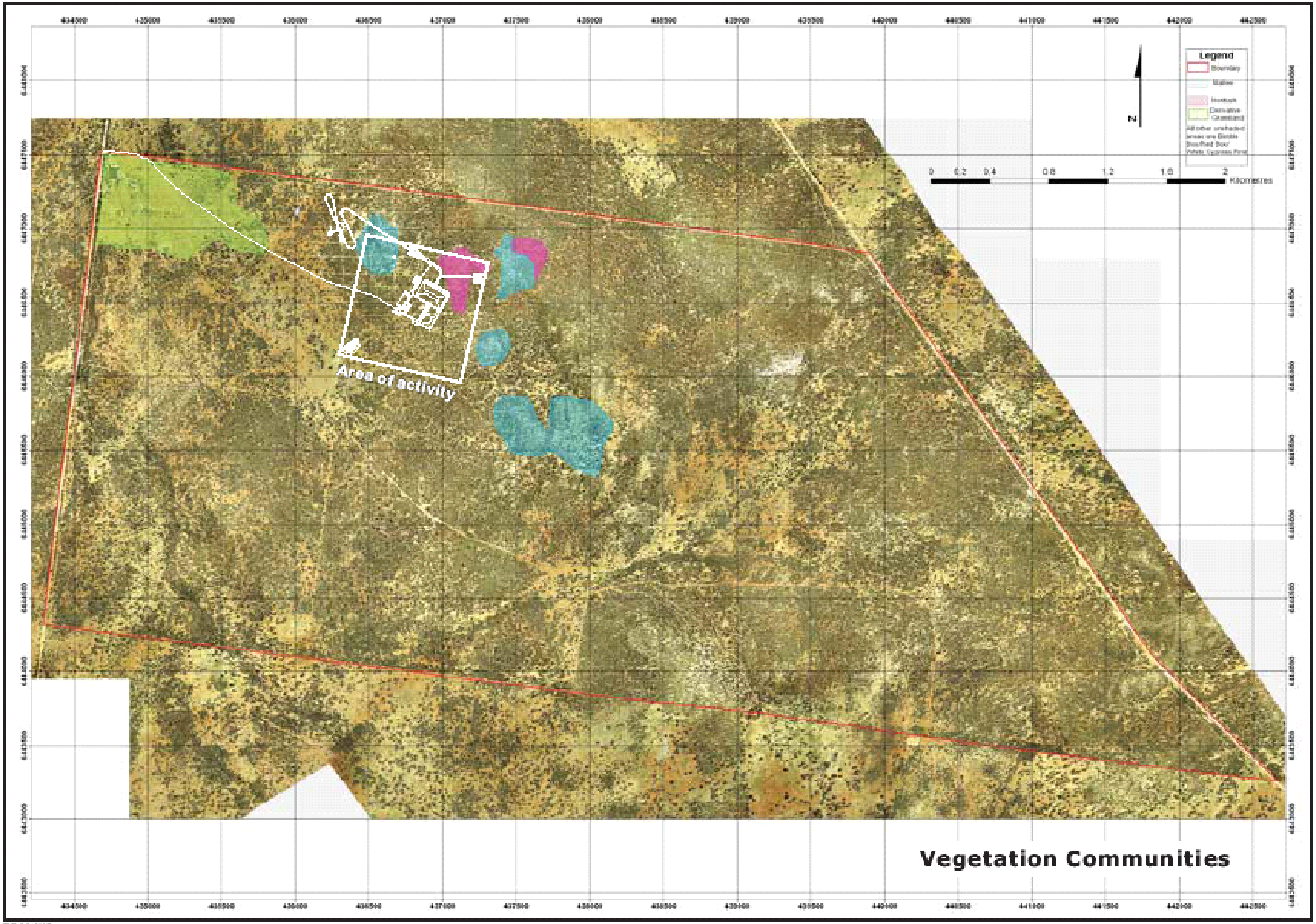

Figure. 3 Vegetation communities of the study area with proposed area of activity (includes subject site).

1.5 Habitat types of the study area

The survey details the type and quality of fauna habitat features and resources present within the study area. General fauna attributes were noted and habitat features specific to threatened species were targeted. Four main vegetation/habitat types were identified within the subject site that are likely to be affected by the project. These habitats offer resources for a range of native flora and fauna.

Table 4. Summary of the key characteristics of the major fauna habitats occurring within vegetation communities in the study area (habitat types recorded within the subject site are marked with an *)

Habitat type	Features	Species associations
Bimble Box /Red Box /White Cypress Pine woodland*	Continuous throughout study area. well connected to adjoining vegetation. Diverse age structure, containing old growth (habitat trees), stags & mature hollow bearing trees, localised ground layers (e.g. fallen timber). Structurally diverse.	High faunal diversity. All threatened bird species recorded within site associated with this habitat type and other declining woodland birds. Important for hollow dependent fauna.
Mallee woodland*	Rocky outcrops. Sparse and loosely connected by Mugga Ironbark communities. Ground diversity poor due to feral goat grazing.	Valuable for ground dwelling animals, particularly the declining Yellow-footed Antechinus and reptiles. Threatened and declining woodland bird habitat.
Mugga Ironbark / White Cypress Pine woodland*	Mugga Ironbark important feed trees when flowering. Shedding bark provides refuge, important ground layer components and diverse age structure in shrub layer. Rocky outcrops on lower slopes. Often codominant with other vegetation communities.	Valuable for ground dwelling animals, particularly the declining Yellow-footed Antechinus and reptiles. Declining woodland bird habitat. Litter layer valuable for reptiles and some Orchidaceae species.
Cleared grassland and shrubland	Important foraging area for native bird species (e.g. parrots) and honeyeaters. Hollow bearing stags common.	*Eremophila* species when in flower may attract threatened bird species (e.g. Pied Honeyeater). Important for hollow dependent fauna.
Tanks (earth dams), drainage lines*	Important drought refuge. Important source of water.	High faunal diversity, particularly during drought. Important habitat for frogs. All species recorded at or nearby tanks/drainage lines.

1.6 Fauna of the study area

The fauna survey revealed that the study area supports a high diversity of native fauna. A total of 145 vertebrate fauna (139 native and six introduced) species were recorded within the subject site during surveying times and incidental observations comprising:

- 23 reptile species (no threatened or other species of conservation concern);
- 7 frog species (no threatened or other species of conservation concern);
- 95 bird species including nine threatened and 13 species of conservation concern; and
- 20 mammals including one threatened and one species conservation concern.

Table 7 provides a summary of all threatened fauna records within the study area to date by the JC-EC. **Figure 8** displays these records in context of the study area.

Not all species recorded during this assessment have been previously recorded within the locality or region. The survey revealed at least 11 additional species, all of which are native and considered to be secure. A full fauna species list can be found in **Appendix 2**.

Additional species have been recorded in the Nymagee region as a result of previous studies and database searches (e.g. NSW NPWS Wildlife Atlas & Masters & Foster 2000). These records are from an extensive area and it is possible that some of these species, including threatened species and species of conservation concern, could use the subject site on occasions (see **Appendix 2**).

Species profiles have been prepared for each threatened species (**Appendix 4**) where information was available. Species profiles provide detailed information on ecological requirements and other characteristics; state wide, regional, and local abundance and conservation status; habitat requirements, including home range, feeding, roosting and breeding requirements.

1.6.1 Avifauna

A total of 95 species (93 native and two introduced) were recorded within the study area across the three survey periods. The majority of species were revealed during diurnal bird surveys. In comparison the Cobar Peneplain study of faunal distributions (Masters & Foster 2000) recorded 132 bird species from a much larger area. The study area is considered to have a high bird diversity given the limited survey effort and timing of the survey.

Diurnal bird surveys revealed 86 species (nine species recorded as incidental observations or during nocturnal surveys). Generally, bird species recorded within the study area were characteristic of the assemblages found in similar habitat types (e.g. White Cypress Pine/Bimble Box woodland) within the region. Species associated with woodland type environments were most abundant, given that approximately 90% of the subject site was occupied by this vegetation/habitat type. Species more often associated with Mallee were rare-uncommon or completely absent from the study area (e.g. Mallee Fowl). This is most likely the result of the small extent and fragmented nature of the required habitat available within the study area for these Mallee dependent species.

Nocturnal surveys revealed the presence of three nocturnal bird species; the Australian Owlet Nightjar, Tawny Frogmouth and Spotted Nightjar.

Threatened bird species

Nine species listed as threatened under the NSW *TSC Act 1995* and/or the *EPBC Act 1999* were recorded during the surveys. **Appendix 4** provides a detailed species profile for each species.

Additional threatened species have been recorded in the region from previous studies (see **Appendix 3**). As a result of this field investigation and preliminary research it has been found that the study area does provide potential resources for at least 14 additional threatened bird species listed under the *TSC Act 1995*. It was determined that each species has the potential to occur within the study area on occasions or may actually use the subject site as part of their overall habitat.

Birds of conservation concern

Fourteen bird species of conservation concern (Smith *et al.* 1995; Robinson 1994; Reid 1999 and 2000) not listed under the *TSC Act 1995* were recorded within the subject site as a result of the surveys (see Table 4.3). Although not listed under the *TSC Act 1995*, most are listed as of some conservation concern and/or near threatened and likely to become threatened if appropriate management of remaining habitat is not undertaken. Furthermore, many of these species share similar habitat requirements (e.g. declining woodland birds as per Robinson 1994; Reid 1999 and 2000) with listed threatened species and provide us with an indication of the habitat quality and hence potential habitat for threatened species with similar habitat requirements.

Of these, 11 species are described as declining woodland birds by Reid (1999 and 2000) and The Action Plan for Australian Birds (Garnett and Crowley 2000). Woodland birds have declined significantly in the wheat/sheep belt of New South Wales over the past 50 years. Woodland birds rely on the habitat found in bushland remnants for their continued survival. The area, condition and isolation of those remnants are important factors in the survival of bird populations, as is the total amount of habitat remaining in the landscape (Bennett 1999; Ford *et al*. 2001).

It is likely that a number of other bird species from the region may frequent the site, particularly during different seasons and when different plant species are in flower.

1.6.2 Ground dwelling and arboreal mammals

The surveys revealed the presence of 20 mammal species within the study area (16 native and 4 introduced species) including:

- Eight ground mammals;
- One arboreal mammal; and
- Nine microchiropteran bat species.

Elliot trapping in December 2004 resulted in the capture of the Yellow-footed Antechinus, a species of conservation concern with the Cobar Peneplain and Western Division of NSW (Dickman *et al. 1993*). Four individuals were trapped within the rocky outcrop of the Peak area. This species was restricted to the rocky outcrops of the Peak area. Trapping was also conducted in other areas of suitable habitat with only one House Mouse (September 2005) being captured.

Tracks and scats of the Fox and to a lesser extent the Cat were frequently recorded within the study area in all habitat types. The Rabbit was most commonly recorded in cleared areas dominated by grassland. The Feral Goat was frequently recorded throughout the site, with most records from the north-central portion of the site, particularly amongst the rocky outcrops of the Peak area and other rocky outcrops east of the Peak.

1.6.3 Microchiropteran bats

Microchiropteran bats comprised 45% of the mammal species recorded during the survey. Harp trapping and Anabat surveys revealed the presence of nine bat species from the subject site including one threatened species (Little Pied Bat *Chalinolobus picatus*).

<u>Harp trapping</u>

Forty-five individuals comprising at least seven species were trapped over three nights from two locations during the December 2005 survey period. Eighteen individuals comprising five species were trapped over three nights from two locations during the September 2005 survey period. The identity of four female *Vespadelus* species was uncertain due to the lack of obvious diagnostic features. These four individuals could have been the threatened Inland Forest Bat (*V. baverstocki*) or *V. vulturnus*, however no voucher specimens were collected, therefore positive identification could not be undertaken. It is considered likely that the threatened Inland Forest Bat occurs within the study area. This species was tentatively identified as a result of the Anabat analysis. It is likely that with more survey effort and the aid of reference calls this species would be recorded within the subject site.

One threatened sub-adult female *C. picatus* was captured during the December 2004 survey at a tank located between the homestead and main entrance to the property. This species is listed as Vulnerable under the *TSC Act 1999.* The *C. picatus* was nulliparous (never given birth) but not pregnant suggesting that it was a sub-adult.

Anabat surveys conducted during December 2004 September 2005 revealed eight species. Anabat analysis was conducted by Craig Grabham of the JC-EC. Given that only a sample of bat files have been analysed (approximately 40%) it is likely that additional species could be recorded for different sites as a result of the complete analysis of all files. Analysis concentrated on the first few hours after sunset in an attempt to capture the greatest species diversity for each site. Emphasis was placed on scanning files for threatened species calls.

1.6.4 Reptiles and amphibians

Information collected on the distribution of reptiles and frogs on the Cobar Peneplain has been limited to a few scattered surveys, quantitative data collection and a review of herpetofauna of conservation concern (Caughley 1985; Henle 1987; Hallinger 1993; Sadlier & Pressey 1994). A field guide for reptiles of New South Wales indicates sites of collection for specimens in the Australian Museum reference collection many of these in the Cobar Peneplain (Swan et al. 2004).

Systematic surveys recorded a total of twenty-three species of reptile and seven species of amphibian. In considering that the study area was in a period of extreme drought during these surveys, these results are higher than expected.

Three additional species are also considered to be distributed across the study area as a result of landholder/farm worker interviews (*Acanthophis antarcticus, Morelia spilota metcalfei, Vermicella annulata*). These three species are easily identifiable by persons unfamiliar with reptiles by their distinguishing features and for the purposes of this report, this anecdotal evidence should be considered.

Museum records and habitat data from Swan, Shea and Sadlier (2004), a search of the NSW Atlas of Wildlife database within 60 kilometres of the study area and distributional and habitat data from Robinson (1993) indicate that 38 species of reptile and nine species of amphibian are likely to inhabit the study area. This survey found four species, Death Adder (*Acanthophis antarcticus)*, *Ctenotus allotropis,* Inland Carpet Python (*Morelia spilota metcalfei*) and Bandy-Bandy (*Vermicella annulata*) being new records for the Nymagee district.

There is one discrepancy with records from the NSW Atlas of Wildlife. The Atlas records the Western Hooded Scaly-foot (*Pygopus nigriceps*). The Western Hooded Scaly-foot does not occur in NSW, and is confined to WA, NT, SA and Qld. The NSW individuals previously known as Western Hooded Scaly-foot are now designated as Eastern Hooded Scaly-foot. We have assumed the anomaly in the Atlas is merely as omission in correcting the name. With the removal of *Pygopus nigriceps* the total number of species for the Cobar Peneplain is 55 species of reptile and 12 species of amphibian.

The Inland Carpet Python and the Death Adder are regarded as regionally significant species and are of conservation concern in western NSW (Sadlier & Pressey 1994). The inland Carpet Python is believed to have declined over much of the Western Division (Sadlier & Pressey 1994). Threats to this species include the removal of hollow logs and fallen timber, removal of leaf litter (which is used for egg incubation) and predation by introduced predators (Heard *et al*. 2004). Much of the property is consistent with suitable habitat requirements for this species (Heard *et al*. 2004, pers.obs), however no animals, sloughs or faeces were identified during this limited survey. With suitable habitat present and the presence of anecdotal evidence suggesting this species inhabits the site, additional investigation is recommended to determine the status of this species in the study area.

There have been very few records of the Death Adder west of the Great Dividing Range (Sadlier & Pressey 1994; Sass 2003). A museum record pre-1900 confirms the existence of this species in the Cobar district (Swan *et al*. 2004). The recent sighting of a snake with colouration and markings similar to this species by a site worker suggests that the death adder may still persist in certain habitat types across the site. Investigation of this area between Main Peak and Kershaw revealed Eucalypt woodland and rocky substrate with layers of leaf litter identified as suitable habitat by Swan, Shea and Sadlier (2004). Searches of this area were undertaken, however no individuals were sighted.

Table 5. Threatened species recorded within the study area to date by the JC-EC.

Fauna Species	Recorded previously within		Details this survey				
	Locality	**Study area**	**Date(s)**	**Location (GPS)**	**Habitat type**	**No. individuals**	**Comments**
Cacatua leadbeateri Pink Cockatoo	YES	YES	▪ 3/12/04 ▪ 25/06/05 ▪ 20/9/05 ▪ 21/9/05 ▪ 20/09/05 ▪ 21/09/05	▪ 0437981/6445088 ▪ 0434811/6447349 ▪ 0434851/6445156 ▪ 0435724/6446938 ▪ 0440412/6444650 ▪ 0440404/6444630	▪ BB/RB/WCP ▪ BB/RB/WCP ▪ BB/RB/WCP ▪ BB/RB/WCP ▪ BB/RB/WCP ▪ BB/RB/WCP	▪ - ▪ 11 ▪ 2 ▪ 2 ▪ 2 ▪ 1	▪ Heard only flying over BB/WCP woodland ▪ Flying over ▪ Feeding on ground ▪ Flying over BB/RB/WCP woodland ▪ Feeding on ground in BB/RB/WCP ▪ Feeding on ground in BB/RB/WCP
Pomatostomus temporalis temporalis (eastern subspecies) Grey-crowned Babbler	YES	YES	▪ 1/12/04 ▪ 3/12/04 ▪ 3/12/04 ▪ 4/12/04 ▪ 20/09/05 ▪ 20/09/05 ▪ 20/09/05 ▪ 21/9/05 ▪ 22/09/05	▪ 0437969/6444563 ▪ 0437793/6445886 ▪ 0437603/6445941 ▪ 0437554/6444504 ▪ 0440642/6444714 ▪ 0440806/6444845 ▪ 0434668/6445156 ▪ 0435724/6446958 ▪ 0437900/6445650	▪ BB/RB/WCP ▪ BB/RB/WCP ▪ BB/RB/WCP ▪ BB/RB/WCP ▪ BB/RB/WCP ▪ BB/RB/WCP ▪ BB/RB/WCP ▪ BB/RB/WCP ▪ BB/RB/WCP	▪ 4 ▪ 5 ▪ 6 ▪ 7 ▪ 1 ▪ 4 ▪ - ▪ 3 ▪ 5	▪ Near tank, in WCP ▪ 3 domes, fringing Mallee vg ▪ Fringing Mallee veg ▪ 2 domes, large group, feeding ground/trees ▪ Flying through ▪ Near tank, feeding on ground below WCP ▪ Heard only ▪ Woodland/shrubs/Mallee veg, feeding in trees ▪ In WCP, foraging
Melanodryas cucullata Hooded Robin	YES	NO	▪ 4/12/04 ▪ 4/12/04 ▪ 4/12/04 ▪ 25/06/05 ▪ 25/06/05 ▪ 26/06/05 ▪ 21/09/05 ▪ 21/09/05 ▪ 22/9/05 ▪ 21/09/05	▪ 0438922/6444033 ▪ 0439606/6443758 ▪ 0440391/6444130 ▪ 0436088/6446906 ▪ 0434811/6447389 ▪ 0435537/6446905 ▪ 0434811/6446276 ▪ 0437279/6446260 ▪ 0437922/6444677 ▪ 0437828/6445627	▪ BB/RB/WCP ▪ BB/RB/WCP ▪ BB/RB/WCP ▪ BB/RB/WCP ▪ BB/RB/WCP ▪ BB/RB/WCP ▪ BB/WCP/MALL ▪ BB/RB/WCP ▪ BB/RB/WCP ▪ MALL	▪ 2 ▪ 1 ▪ 2 ▪ 2 ▪ 2 ▪ 2 ▪ 1 ▪ 2 ▪ 2 ▪ 2	▪ Male & female, foraging on ground below WCP ▪ Male, foraging on ground ▪ Male & juvenile ▪ - ▪ Male & female ▪ - ▪ Male, rocky outcrop, Mallee veg ▪ - ▪ Female observed feeding chicks in nest ▪ Mallee trees, male and female.
Chthonicola sagittate Speckled Warbler	YES	NO	▪ 21/09/05 ▪ 3/12/04 ▪ 21/09/05 ▪ 20/09/05	▪ 0437486/6445692 ▪ 0437943/6445306 ▪ 0437506/6446775 ▪ 0440393/6444495	▪ - ▪ - ▪ IRON/WCP ▪ BB/RB/WCP	▪ 2 ▪ 1 ▪ 1 ▪ 1	▪ - ▪ - ▪ Feeding with Yellow-rumped Thornbills ▪ -

Fauna Species	**Recorded previously within**		**Details this survey**				
	Locality	**Study area**	**Date(s)**	**Location (GPS)**	**Habitat type**	**No. individuals**	**Comments**
Polytelis swainsonii Superb Parrot	YES	NO	▪ 25/06/05 ▪ 25/06/05 ▪ 26/06/05 ▪ 26/06/05 ▪ 22/09/05	▪ 0436078/6446926 ▪ 0434811/6447369 ▪ 0435537/6446925 ▪ 0435709/6447277 ▪ 0440402/6444619	▪ BB/RB/WCP ▪ BB/RB/WCP ▪ BB/RB/WCP ▪ BB/RB/WCP ▪ BB/RB/WCP	▪ 5 ▪ 6 ▪ 1 ▪ 3 ▪ 12	▪ All juveniles ▪ Flying over, all juveniles ▪ Flying over ▪ Flying over, all juveniles ▪ Inc. 3 adult males, resting in tree near tank on sunset
Certhionyx variegatus Pied Honeyeater	YES	NO	▪ 4/12/04	▪ 0434731/6445440	▪ BB/WCP	▪ 1	▪ Female, near Pete's tank south-west of site foraging in Bimble Box
Melithreptus gularis Black-chinned Honeyeater	NO	NO	▪ 25/06/05 ▪ 26/06/05	▪ 0435593/6447303 ▪ 0435138/6446794	▪ BB/RB/WCP ▪ BB/RB/WCP	▪ 1 ▪ 2	▪ - ▪ -
Stagonopleura guttata Diamond Firetail	YES	NO	▪ 1/12/04	▪ 0434811/6447389	▪ BB/RB/WCP	▪ 2	▪ Near tank at house, flew into roadside veg.
Cinclosoma castanotus Chestnut Quail-thrush	NO	NO	▪ 4/12/04	▪ 0437520/6445505	▪ BB/RB/WCP	▪ 1	▪ Recorded in BB/WCP near track
Chalinolobus picatus Little Pied Bat	YES	NO	▪ 5/12/04	▪ 0434811/6447389	▪ BB/RB/WCP	▪ 1	▪ Female trapped in harp trap at tank near house

Legend to abbreviations in table 5

Abbreviation	**Description** (Locality records sourced from NPWS Wildlife Atlas 2005)
BB/RB/WCP	Bimble Box/Red Box/White Cypress Pine woodland
MALL	Mallee woodland
IRON/WCP	Mugga Ironbark/White Cypress Pine woodland
GRASS	Cleared shrubland grassland derivative

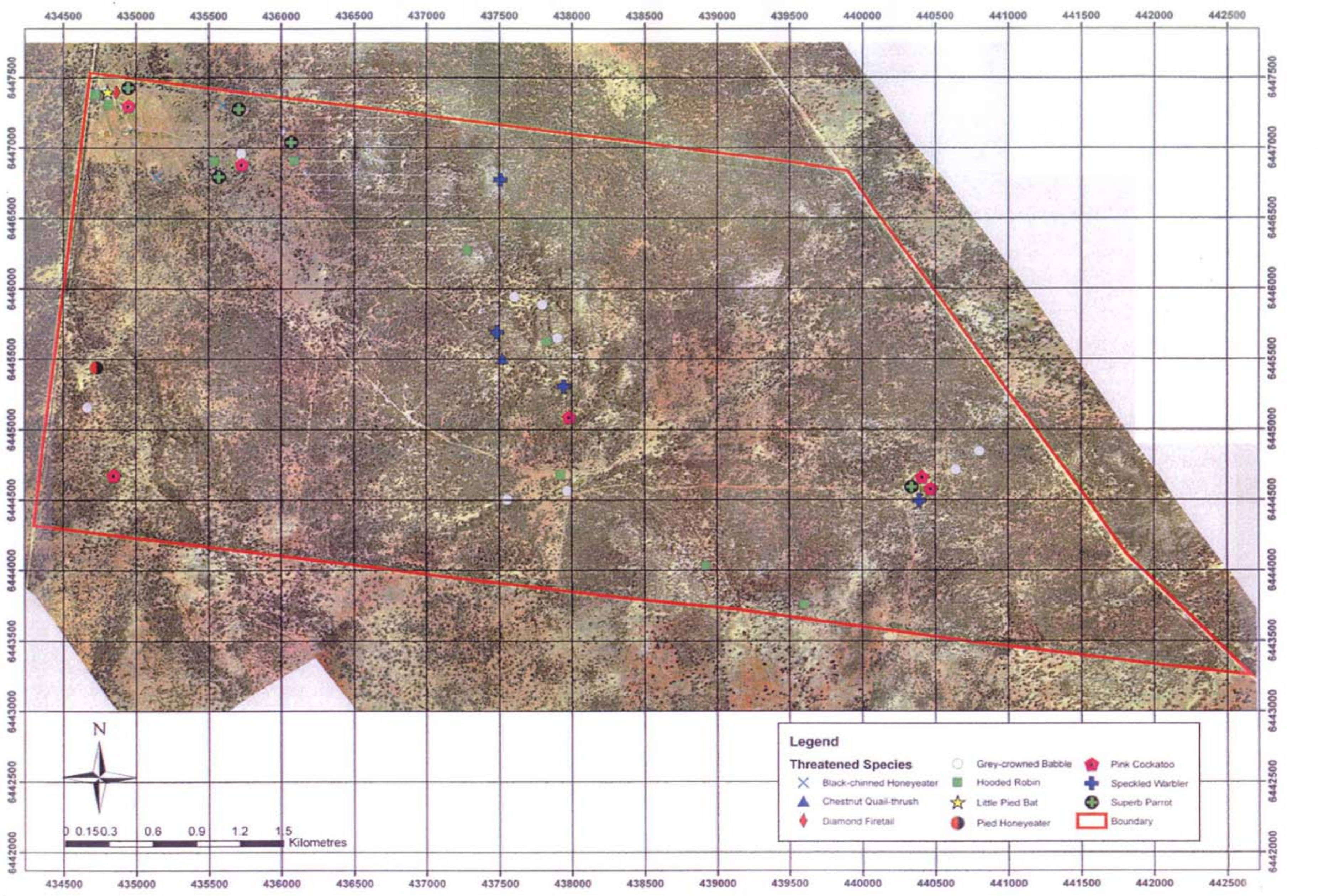

Figure. 4. Threatened species recorded within study area to date by the JC-EC.

2 Nature of proposed activities

The following summary has been adopted from the Draft REF prepared by Corkery and Co. (2006). Specific details of the nature of the proposed exploration decline activities are provided in the draft REF. In general, the following exploration decline is being proposed:

Site establishment

- Surface infrastructure area including: office, carpark and ablutions, fuel and generator storage area and workshop.
- Box cut to create the portal for the exploration decline.
- Waste rock dump for the waste rock from the box cut and exploration decline.
- Ore stockpile for the bulk sample.
- Settling ponds for the containment of dewatered groundwater.
- Ventilation rise to provide fresh air to the deeper sections of the exploration decline.

Exploration decline establishment

- Use conventional underground mining methods to create an exploration decline with two sub-levels.

Resource definition

- Undertake infill drilling of the Hera deposit from various sub-levels of the exploration decline.
- Collect an approximate 10 000t to 12 000t bulk sample from the Hera deposit during the establishment of the exploration decline to provide further information relating to resource quality.

The objectives of the Hera exploration decline are as follows.

- To provide access to the Hera deposit ore body hence allowing better definition of the resource; and
- To obtain a bulk sample to allow metallurgical testing of the resource and test the continuity of the resource.

Activity timetable

The proposed activity would be conducted across a 14 month timeframe.

Table 6. Indicative Activity Timetable (figures provided from REF, R.W. Corkery & Co. 2006).

Activity	2007											2008											
	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
REF approved by DPI (MR)	★																						
Surface Infrastructure Establishment																							
Box Cut																							
Exploration Decline Establishment																							
Ventilation Rise Establishment																							
Exploration Drilling from Decline																							
Bulk Sampling from sublevels off the Decline																							
Transport of Bulk Sample from Site																							
Processing / Evaluation of Bulk Sample																							
Decision to Decommission Site																	✪						
Site Decommissioning																							

Surface preparation

TRL are proposing that surface preparation would be confined to those surface areas to be disturbed by the exploration activities and associated surface infrastructure. The indicative areas requiring vegetation clearing and soil stripping are provided in **Table 7**.

Table 7. Indicative disturbance areas (figures provided from REF, R.W. Corkery & Co. 2006).

	Disturbed Area[1] (ha)	Undisturbed Area (ha)	Total Area (ha)
Magazine	0.02	0.37	0.39
Box cut	0.04	0.42	0.46
Waste rock dump	0.09	2.51	2.60
Ore stockpile	0.03	1.37	1.40
Laydown Area	0.05	0.45	0.50
Workshop and offices	0.02	0.33	0.35
Settling ponds and waste trench	0.01	0.78	0.79
Generators / fuel bay	-	0.15	0.15
Water tank	0.01	0.05	0.06
Ventilation rises	-	0.08	0.08
Internal roads	0.20	3.99	4.19
Water management structures	-	0.70	0.70
TOTALS	**0.47**	**11.20**	**11.67**
[1]: relates to areas already disturbed by grazing and/or exploration activities			

These areas would be clearly defined on the ground to ensure that disturbance is contained to the minimum area. Surface preparation would entail tree clearing and soil stripping, as detailed in the following sections.

Tree Clearing

Tree clearing of all areas nominated for surface disturbance would be cleared in one campaign, following a pre-clearing fauna inspection to ensure that any roosting or nesting fauna are relocated from the area.

Trees would be cleared using a dozer with the blade up so as to not disturb the groundcover or surface soils. This would minimise the opportunity for erosion prior to soil stripping. Felled trees would be track rolled to break up the larger trunk section and pushed to the stockpile location adjacent to each individual area of disturbance. The stockpiling of vegetation close to the source will provide for minimal handling and for easy access to replace the vegetation over the area once it has been rehabilitated. Where practical, the vegetation stockpile would be located on the down slope side of the infrastructure area to act as a natural sediment trap.

Soil Stripping

Soils in the surface disturbance areas are skeletal and as such, it is not anticipated that large quantities of topsoil would be available for stripping and hence, rehabilitation. Additionally, due to its skeletal nature, topsoil and subsoil is indistinguishable, hence there would be no separate soil stripping.

Where sufficient soil does exist for stripping, the topsoil would be stripped with the groundcover to ensure the maximum seed bank is retained, provide structure to the soils within the soil stockpiles and provide the best opportunity for groundcover to re-establish over the soil stockpiles. Where it exists, topsoil and groundcover is to be pushed to the stockpile location, adjacent to each infrastructure area, by dozer. This stripping method minimises the requirement for soil handling and ensures the soil from each area, where available, is available for replacement on that area during rehabilitation. Soil stockpiles would be located between the infrastructure area and the vegetation stockpile.

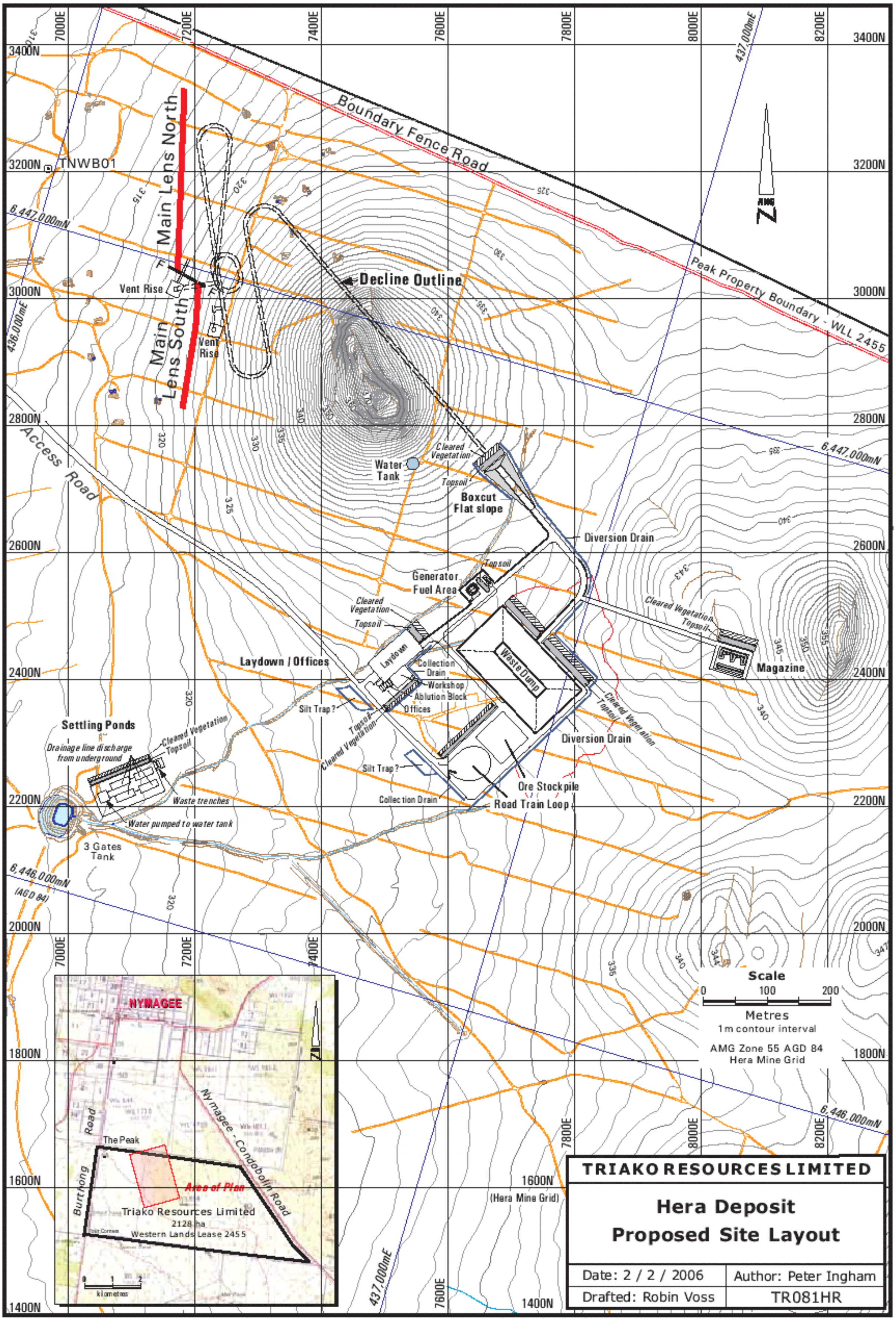

Figure. 5. Nature of the proposed activity (also refer to figure 2 and 3).

3 Methodology

3.1 Literature review & database search

Various sources of information and data available on flora and fauna from the various studies and other surveys conducted in the Cobar Peneplain region were reviewed and utilised in the production of this report. Sources of information included:

- Masters, P. and Foster, E. (2000). *Investigating fauna distributions on the Cobar Peneplain.* NSW National Parks and Wildlife Service;
- Bowen, P.F. and Pressey, R.L. (1993) *Localities and habitats of plants with restricted distributions in the Western Division of NSW.* NSW National Parks and Wildlife Service;
- Smith, P.J., Smith, J.E., Pressey, R.L. and Whish, G.L. (1995) *Birds of particular conservation concern in the Western Division of NSW: Distributions, habitats and threat.* NSW National Parks and Wildlife Service;
- Previous flora and fauna related reports completed of the subject site
  Thompson, D. F. (1972) *Western Lands Lease Management Plan. "The Peak" – County Mouramba*. Unpublished report to Western Lands Lease Commissioner, Condobolin.
  Ede, A. (n.d.) *The Peak – Review of Environmental Factors*. Unpublished report by Soil Conservation Service, Condobolin.
  Other assessment documentation related to mining (various sources); and
- Threatened species profiles (various sources of information, see **Appendix 4**).

A search of all relevant databases available was conducted to obtain records of threatened biota within the region and additional records of threatened species, populations and ecological communities known from the region of state and national significance. Databases searched included:

- NSW NPWS Wildlife Database Atlas (28/11/04) – licensed version all species of flora and fauna (1:100,000 Nymagee Map Sheet);
- NSW NPWS Wildlife Database Atlas (01/03/06) – public access version (http://wildlifeatlas.nationalparks.nsw.gov.au/wildlifeatlas/watlas.jsp) Cobar LGA search of all species of flora and fauna;
- Environment Australia Online Database (01/03/06) – interactive map searcher http://www.environment.gov.au/epbc/db/interact.html Cobar LGA search;
- Rare or Threatened Australian Plant Species database (ROTAP 1995); and
- NSW Department of Agriculture – Cobar LGA Control Area, Noxious Weeds.

A literature review and database search helps overcome some of the limitations associated with such a brief survey period, and the types of survey methods employed. In the south and central western slopes of NSW it has been found that surveys conducted in late summer, autumn and early winter usually record less than 50% of plant species present (Burrows 2004), hence the need for complementary data. However, based on preliminary enquiries thus far, few studies have been completed within the study area and available datasets are difficult to obtain and are mostly incomplete.

3.2 Selection of threatened biota

A list of threatened biota was compiled from the literature review and database search and, as a result, 12 threatened flora, 54 threatened fauna, one threatened population and one threatened ecological community are known to occur within the Cobar Peneplain region. The findings of the review are summarised in **Appendix 3**.

Known threatened biota

To date surveys conducted by the JC-EC of the study area have revealed the presence of 10 threatened species including:

1. Pink Cockatoo (*Cacatua leadbeateri*)
2. Grey-crowned Babbler (*Pomatostomus temporalis temporalis* (eastern subspecies)
3. Hooded Robin (*Melanodryas cucullate*)
4. Chestnut Quail-thrush (*Cinclosoma castanotus*)
5. Speckled Warbler (*Chthonicola sagittate*)
6. Pied Honeyeater (*Certhionyx variegates*)
7. Diamond Firetail (*Stagonopleura guttata*)
8. Superb Parrot (*Polytelis swainsonii*)
9. Black-chinned Honeyeater (*Melithreptus gularis gularis (*eastern subspecies)
10. Little Pied Bat (*Chalinolobus picatus*).

For the purpose of this assessment those threatened species recorded within the study area to date are considered to have known habitat within the subject site. The significance of the potential impacts on these species is discussed in Section 5.1.

The Scientific Committee, established by the *Threatened Species Conservation Act 1995 (TSC Act 1995)*, has made a Preliminary Determination to support a proposal to list the Myall Woodland in the Darling Riverine Plain, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and South Western Slopes bioregions as an endangered ecological community on Part 3 of Schedule 1 of the Act. This community was therefore considered as threatened biota and subject to review as part of this assessment.

Additional threatened biota

The literature review and database search revealed additional threatened biota including: two reptiles; 26 birds; 17 mammals (including ground dwelling, arboreal and microchiropteran bats); 12 plants, one endangered population and two endangered ecological communities that occur within the region.

A review of the ecology, habitat requirements and historical records for the other threatened biota identified to occur within region was conducted in order to determine the likelihood of each occurring within the study area.

As a result of comparing habitat requirements for each threatened biota to the habitat of the study area it was determined that one reptile; 15 birds; 11 mammals (including ground dwelling, arboreal and microchiropteran bats); 12 plants and two endangered ecological communities could potentially occur within the study area. These species are highlighted in yellow **Appendix 3**.

In assessing which of these species, populations and communities are likely to occur within the subject site the following factors were taken into consideration:

- the presence of potential habitat within the subject site;
- condition of and approximate extent of potential habitat within subject site; and
- species occurrence within study area and locality over the past 10 years.

The majority of this information has been summarised for each threatened biota in **Appendix 4**.

Tables 7, 8 and **9** present the threatened species, populations, and ecological communities, which occur in the locality. The likelihood of each threatened biota occurring within the subject site was assessed, given the above factors, including habitat requirements and known records in the region.

The threatened species, populations and ecological communities identified as ‘unlikely’ to occur within the subject site have been identified because suitable habitat was found within the study area, yet no records exist within the locality of the project area, although they may have been previously recorded within the region. The threatened species, populations and ecological communities identified as ‘not’ to occur within the subject site have been identified as such because suitable habitat was not recorded within subject site or surrounding area.

As a result of a review of the ecology, habitat requirements and historical records for each biota it was determined that one reptile; 14 birds; 9 mammals (including ground dwelling, arboreal and microchiropteran bats) and two plants could potentially occur within the study area (see **Tables 7, 8** and **9** highlighted in yellow). These species are listed in **Appendix 3**.

The significance of the potential impacts on each threatened biota that could potentially occur within the study area is discussed in Section 5.1.2.

Table 8. Threatened fauna species within the locality.

Fauna Species	Recorded previously within		Habitat present within		Likelihood of species occurring with subject site
REPTILES & AMPHIBIANS	**Locality**	**Study area**	**Study area***	**Subject site#**	
Tiliqua occipitalis Western Blue-tongued Lizard	NO	NO	YES	YES	LIKELY – suitable habitat within subject site. Previously recorded within 100 km of subject site.
Litoria ranifromis Southern Bell Frog	NO	NO	YES	NO	NO – suitable habitat not recorded within subject site. No recent records within locality.
BIRDS					
Burhinus grallarius Bush Stone-curlew	NO	NO	YES	YES	LIKELY – suitable habitat within subject site. Previously recorded within 100 km of subject site. Although no records despite call playback.
Ardeotis australis Australian Bustard	NO	NO	YES	YES	LIKELY – suitable habitat within subject site. Previously recorded within 100 km of subject site. Nomadic, mobile species.
Falco hyoleucos Grey Falcon	NO	NO	YES	YES	LIKELY – suitable habitat within subject site. Highly mobile. Large range. Although not recorded within 100 km and despite diurnal bird surveys.
Lophoictinia isura Square-tailed Kite	NO	NO	YES	YES	LIKELY – suitable habitat within subject site. Highly mobile. Large range. Although not recorded within 100 km and despite diurnal bird surveys.
Rostratula beghalensis Painted Snipe	NO	NO	YES	NO	NO – suitable habitat not recorded within subject site. No recent records within locality.
Limosa limosa Black-tailed Godwit	NO	NO	YES	NO	NO – suitable habitat not recorded within subject site. No recent records within locality.
Grus rubicundus Brolga	NO	NO	YES	YES	UNLIKELY – suitable habitat not recorded within subject site. Highly mobile. Not recorded within 100 km or despite diurnal bird surveys.
Strictonetta naevosa Freckled Duck	NO	NO	YES	YES	UNLIKELY – habitat within subject site limited, in the form of earth tanks. May use as a stop over for resting. Not recorded within 100 km or despite diurnal bird surveys.
Oxyura australis Blue-billed Duck	NO	NO	YES	YES	UNLIKELY – habitat within subject site limited, in the form of earth tanks. May use as a stop over for resting. Not recorded within 100 km or despite diurnal bird surveys.
Anseranas semipalmate	NO	NO	YES	NO	UNLIKELY – suitable habitat not recorded within subject site.

Magpie Goose					Mobile species. Not recorded within 100 km or despite diurnal bird surveys.
Botaurus poiciloptilus Australasian Bittern	NO	NO	YES	NO	UNLIKELY – suitable habitat not recorded within subject site. Not recorded within 100 km or despite diurnal bird surveys.
Calyptorhynchus lathami Glossy Black-Cockatoo	NO	NO	YES	NO	UNLIKELY – suitable habitat (preferred feed tree *Allocasuarina sp.*) not recorded within subject site. Not recorded within 100 km or despite diurnal bird surveys.
Calyptorhynchus banksii Red-tailed Black-Cockatoo	NO	NO	YES	YES	UNLIKELY – suitable habitat recorded within subject site. Although mobile species, yet not recorded within 100 km or despite diurnal bird surveys.
Neophema pulchella Turquoise Parrot	NO	NO	YES	YES	LIKELY – suitable habitat recorded within subject site (Bimble Box/White cypress Pine woodland) yet not recorded within 100 km or despite diurnal bird surveys.
Ninox connivens Barking Owl	NO	NO	YES	YES	LIKELY – suitable habitat recorded within subject site (Bimble Box/White cypress Pine woodland). Species requires large area. Not recorded within locality or during diurnal surveys. Subject site may be part of overall habitat.
Tyto novaehollandiae Masked Owl	NO	NO	YES	YES	LIKELY – suitable habitat recorded within subject site (Bimble Box/White cypress Pine woodland). Has large home range 500 – 1000 ha. Not recorded within locality or during diurnal surveys. Subject site may be part of overall habitat.
Drymodes brunneopygia Southern Scrub-robin	NO	NO	YES	YES	UNLIKELY – suitable habitat within subject site limited (confined largely to Mallee shrub areas, prefers areas post-fire). No records within 100 km and not recorded despite diurnal bird surveys in suitable habitat.
Pachycephala inornata Gilbert's Whistler	NO	NO	YES	YES	LIKELY – suitable habitat within subject site. Multiple records within 100 km of subject site. Although not recorded despite opportunistic call playback and diurnal bird surveys in suitable habitat.
Pachycephala fogularis Red-lored Whistler	NO	NO	YES	YES	UNLIKELY – suitable habitat within subject site limited (confined largely to Mallee areas, prefers areas post-fire). No records within 100 km and not recorded despite opportunistic call playback and diurnal bird surveys in suitable habitat.
Hylacola cauta Shy Heathwren	NO	NO	YES	YES	UNLIKELY – suitable habitat within subject site limited (confined largely to Mallee areas, prefers areas post-fire). No

					records within 100 km and not recorded diurnal bird surveys in suitable habitat.
Lathamus discolour Swift Parrot	NO	NO	YES	YES	UNLIKELY – suitable habitat within subject site limited (no preferred tree species). Also late-summer winter migrant to mainland, highly mobile. No records within 100 km, not recorded despite diurnal bird surveys.
Xanthomyza phrygia Regent Honeyeater	NO	NO	YES	YES	UNLIKELY – suitable habitat within subject site, yet no records within 100 km and not recorded despite diurnal bird surveys.
Grantiella picta Painted Honeyeater	NO	NO	YES	YES	LIKELY – suitable habitat within subject site in the form of mistletoe, considered common. Not recorded within 100 km of subject site or despite diurnal bird surveys in suitable habitat.
Leipoa ocellata Malleefowl	YES	NO	YES	YES	LIKELY – recorded within 10 km of site, also multiple records within the locality and within 100 km. Suitable habitat within subject site (prefer Mallee areas, although found in Bimble Box/Callitris) although limited. Not recorded despite diurnal bird surveys in suitable habitat.
Amytornis striatus Striated Grasswren	NO	NO	YES	NO	UNLIKELY – preferred habitat not recorded within subject site (mature Spinifex). No records within 100 km, not recorded despite diurnal bird surveys.
Pedionomus torquatus Plains Wanderer	NO	NO	YES	NO	UNLIKELY – preferred habitat not recorded within subject site (sparse native grasslands). No records within 100 km, not recorded despite diurnal bird surveys.
MAMMALS (exc. bats)					
Phascolarctos cinereus Koala	NO	NO	YES	YES	LIKELY – preferred habitat of Eucalyptus spp. (Bimble Box) limited and no signs/records within subject site. Solitary, difficult to survey, large home range, no records within 100 km.
Antechinomys laniger Kultarr	YES	YES	YES	YES	LIKELY – recorded within study area and 10 km of site. Multiple records within the locality and region. Suitable habitat within subject site. Not recorded trapping, yet not all potential habitat areas trapped.
Petrogale penicillata Brush-tailed Rock-wallaby	NO	NO	YES	NO	NO – although suitable habitat does exist (rocky outcrops, elevated areas) it is very limited. Also direct competition with Feral Goats. Surveys of suitable habitat did not reveal this species.
Aepyprymnus rufescens Rufous Bettong	NO	NO	NO	NO	NO – habitat within site marginal at best (proffered habitat woodland with dense tussock grass understorey). No recent or

					historical records for the region.
Ningaui yvonneae Southern Ningaui	NO	NO	YES	YES	LIKELY – Multiple records within similar habitat types within region and within 100 km. Suitable habitat within subject site (dense vegetation, fallen logs, some Mallee). Not recorded trapping, yet not all potential habitat areas trapped.
Phascogale tapoatafa Brush-tailed Phascogale	NO	NO	YES	YES	UNLIKELY – suitable habitat within subject site limited. No recent or historical records for the region.
Rattus villosissimus Long-haired Rat	NO	NO	YES	YES	LIKELY – suitable habitat within subject site limited, despite trapping no records. No recent or historical records for the region. However species has vast range and not all potential habitats was surveyed.
Sminthopsis macroura Stripe-faced Dunnart	NO	NO	YES	YES	LIKELY – suitable habitat within subject site (preferred habitat native dry grasslands and low dry shrublands, often along drainage lines) limited. No recent or historical records for 100 km. However not all potential habitat was surveyed.
Dasyurus maculatus Tiger Quoll	NO	NO	YES	YES	LIKELY – suitable habitat within subject site (continuos woodland, rocky outcrops) although some habitat components limited. No recent or historical records for 100 km. However not all potential habitat was surveyed.
BATS					
Vespadelus baverstocki Inland Forest Bat	NO	NO	YES	YES	LIKELY – suitable habitat within subject site. Previously recorded within 100 km of subject site. Mobile species. Tentative records from Anabat analysis.
Nyctophilus timoriensis Greater Long-eared Bat	NO	NO	YES	YES	LIKELY – suitable habitat within subject site. Previously recorded within 100 km of subject site. Mobile species.
Soccolaimus flaviventris Yellow-bellied Sheathtail Bat	NO	NO	YES	YES	LIKELY – suitable habitat within subject site. Mobile species.

Table 9. Threatened flora species within the locality.

Flora Species	Recorded previously within		Habitat present within		Likelihood of species occurring within subject site
	Locality	Study area	Subject site	Study area	
Acacia curranii	No	No	Yes	Yes	UNLIKELY
Austrostipa metatoris	No	No	Yes	Yes	UNLIKELY
Austrostipa wakoolica	No	No	Yes	Yes	UNLIKELY
Brachyscome papillosa	No	No	No	No	NO
Caladenia arenaria	No	No	No	No	NO
Diuris sheaffiana	No	No	Yes	Yes	UNLIKELY
Goodenia occidentalis	No	No	Yes	Yes	UNLIKELY
Lepidium aschersonii	No	No	No	No	NO
Lepidium monoplocoides	No	No	Yes	Yes	UNLIKELY
Lomandra patens	No	No	Yes	Yes	UNLIKELY
Osteocarpum pentapterum	No	No	No	No	NO
Philotheca difformis	Yes	Yes	Yes	Yes	LIKELY
Philotheca myoporoides subsp. tomentosa	Yes	No	Yes	Yes	UNLIKELY
Pterostylis cobarensis	No	No	Yes	Yes	UNLIKELY
Rulingia procumbens	Yes	No	Yes	Yes	LIKELY
Swainsona murrayana	No	No	Yes	Yes	UNLIKELY
Swainsona pyrophila	No	No	No	No	NO
Swainsona sericea	No	No	No	No	NO

Table 10. Endangered populations and ecological communities.

Endangered population	Recorded previously within		Habitat present within		Likelihood of species occurring with subject site
	Locality	**Study area**	**Study area**	**Subject site**	
Calyptorhynchus lathami Glossy Black-Cockatoo	NO	NO	YES	NO	UNLIKELY – suitable habitat (preferred feed tree *Allocasuarina sp.*) not recorded within subject site. Not recorded within 100 km and despite diurnal bird surveys.
Endangered ecological community					
Acacia loderi shrublands	NO	NO	YES	YES	UNLIKELY

Likelihood of species occurring within project area:
No (suitable habitat not recorded within subject site)
Unlikely (potentially suitable habitat recorded within subject site yet quality and quantity of habitat varies, records exist within the locality of the subject site)
Likely (recorded in the locality, suitable habitat recorded within subject site)
Yes (recorded within subject site).
Note:
- Species habitat within study area considered to be potential habitat only unless, know record of that species occurs within the study area.
*Extent and quality of habitat uncertain as assessment was based upon aerial photograph analysis, review of NPWS Wildlife Atlas records and limited groundtruthing.
habitat recorded within subject site considered to be potential habitat only.

3.3 Potential limitations

On some occasions, surveys are conducted with limited knowledge of historical sightings for many species, particularly threatened biota. Species requirements can vary widely within and between species, between sexes, age groups, seasons, years and on a regional basis.

Results of such rapid assessments are limited. The timing of the study and associated climatic conditions may have affected the ability to detect the presence of some vertebrate species, particularly reptiles, amphibians and birds. These factors also influence the ability to assess abundance and species diversity of some native plants, particularly native grasses and forbs. Other studies in the south and central western slopes of NSW have found that surveys conducted in late summer, autumn and early winter usually record less than 50% of plant species present (Burrows 2004).

Factors such as time of day, climatic conditions, season and survey effort can all influence the findings of a survey. Habitat requirements for many species vary seasonally in response to reproductive status and climatic conditions. Other factors, such as social dynamics and food availability, may also influence a species occurrence. These factors were not tested for during this assessment. Ideally, surveys should be conducted over different seasons and during suitable climatic conditions (e.g. no rain for diurnal bird surveys). In order to overcome some of these limitations database searches were conducted for threatened species, populations and ecological communities known to occur within the region.

Furthermore the abnormal climatic conditions experienced (e.g. ongoing drought and below average rainfall) have probably adversely affected flora and fauna diversity and distribution across the study area. Despite this it is considered that the survey effort employed during this assessment was satisfactory, given the modified nature, small extent of the study site, and limited extent of native vegetation and associated habitat to be affected.

No targeted or general surveys were conducted of the subject site during the course of this assessment. This is a major limitation of this assessment as it cannot be ascertained if any resident threatened biota were within the subject site. It is unlikely that surveys during this time of the year (February/March) would have revealed any threatened flora, yet surveys may have revealed threatened fauna. Consequently it was assumed that any of the threatened biota predicted to have potential habitat within the study area, were assumed to have potential habitat within the subject site.

4 Potential impacts of the proposed activities

The purpose of this section is to identify the potential direct and indirect impacts of the proposed activity. There is a range of potential impacts that could affect threatened biota that occur or could potentially occur within the study area. The potential impacts are predicted to vary in magnitude depending upon the species and their habitat dependence and requirements within the study area.

There is also potential for indirect impacts upon native flora and fauna within the study area and surrounding lands through erosion, dust, chemical and noise pollution. Potential dust and noise pollution are of concern in relation to impacting upon native flora and fauna.

Existing impacts

The subject site has already been partially disturbed as a result of the impacts caused by previous exploration activities, mining operations and agricultural activities. These activities may have already contributed directly to the reduction in quality and fragmentation of habitat. Previous activities may also indirectly contribute to a range of continual disturbances such as increased edge effects and weed infestation.

It is likely that the previous operations have negatively affected some native flora and fauna. The former land owner regularly captured and shot feral goats and also shot fox and feral cats on a regular basis (organised hunting parties) and opportunistically within the study area. The current land owner must now address the management of feral animals within the study area. These introduced predators have already had a detrimental impact upon the native wildlife of the area, particularly reptile, bird and ground dwelling mammal species. Predation by the European Red Fox and Feral Cat are both listed as a key threatening process under the Commonwealth *EPBC Act 1999* and the NSW *TSC Act 1995*, with threat abatement plans prepared under guidelines set by each Act (Environment Australia 1999; NSW NPWS 2001a).

Native species of the study area may become more susceptible to predation by the Feral Cat and European Red Fox (e.g. through loss of habitat cover). The habitat of native species is also likely to be further degraded by the Feral Goat. An appropriate pest control program should be implemented in conjunction with monitoring to ensure that the proposed activity will not significantly affect any of the threatened biota and other native fauna of the study area.

Further reduction and fragmentation of vegetation and associated habitat of the subject site by the proposed activity may further decrease the ecological value of the area, although this impact is considered to be minimal.

Removal of vegetation and habitat

Approximately 12 hectares (maximum) or less than 1% of the 190,000 + hectares of native vegetation of the study area would be removed as a result of the proposed activity. The vegetation to be removed/modified is largely White Cypress Pine woodland, co-dominated by Red Box and Bimble Box. This vegetation is the dominant vegetation type of the study area and is well represented within the general locality of the subject site. As part of this process, all vegetative layers and habitat features of the proposed activity will be removed.

In local and regional terms, the removal of this amount of vegetation is not regarded as of particular consequence, particularly in regards to the extent and rate of removal (i.e. approximately 12 hectares). At a local and regional level the removal of the types of vegetation is also not of concern.

Clearing of native vegetation (as defined and described in the final determination of the Scientific Committee) is listed as a Key Threatening Process under Schedule 3 of the *TSC Act 1995.* In New South Wales, since 1788, at least 61% of the original native vegetation has been cleared, thinned or substantially or significantly disturbed (Environment Protection Authority 1997). Clearing of any area of native vegetation, including areas less than two hectares in extent, may have significant impacts on biological diversity.

Removal of this vegetation and associated habitat would not constitute a significant portion of any vegetation type for any threatened biota. The subject site and study area is well connected to surrounding areas of vegetation (see **Figure 1**). The proposed activity would not result in the subject site or study area becoming isolated from adjacent areas of habitat. The proposed activity is unlikely to create a barrier to the movement of any fauna or remove or significantly alter the value of any wildlife corridors.

Less than one percent of the potential habitat for threatened flora and fauna species available within the study area would be removed and/or altered by the proposed activity. The study area provides resources and habitat features required by other native flora and fauna considered common within the region. Consequently, some of the more common native flora and fauna species of the study area are likely to be adversely affected by the proposed activity. However, the impact amelioration measures would ensure that no significant impact will occur to any vegetation types within the study area.

Edge effects and introduced species

Edge effects, caused by vegetation removal and modification, already occur throughout the subject site, particularly areas divided by the existing operations and the internal road network. The proposed activity would exacerbate edge effects by removing vegetation and exposing remaining vegetation to newly created edge boundaries, thus increasing fragmentation and creating additional edges within an already disturbed area.

This may in turn affect the natural diversity of the site by modifying the existing native seed bank and providing more suitable habitat for exotic species, as exotic species will adapt to disturbed areas more readily than native species. These potential impacts can be managed through the implementation of appropriate measures to be addressed in Section 6.

Noise and dust pollution

Noise pollution would increase as a result of mining operations, possibly deterring native fauna from utilising the subject site and surrounding area for movement and habitat and potentially disrupting the breeding/pollination cycle, foraging and roosting behaviour of some species four the 14 month period.

Given the noise levels emitting from the previous exploration operations, vehicle traffic and nearby road, it is considered unlikely that the proposed activity would increase noise levels beyond levels already experienced. Some above normal noise levels would be experienced for short periods during drilling and blasting operations, which may result in temporary disruptions to some fauna species. Yet, it is considered unlikely that it would cause a significant affect to the survival of any of the native species mentioned in this report or those that may otherwise use the site as part of their overall habitat area.

Excessive dust from drilling operations could potentially disrupt the pollination cycle and the ability of native plants to regenerate (i.e. germination, revegetation and recolonisation of existing plants). The rehabilitation process of the existing drill pads could also be disrupted by dust pollution. However given the dust controls that would be imposed and short duration of the activities, these potential impacts are considered to be minimal.

5 Assessment of Significance

This section reviews the significance of the potential impacts of the proposed activity on threatened biota known from the study area or other threatened biota that could potentially occur within the study area.

The *EP&A Act 1979* includes in Section 5A, eight factors which are to be considered when determining if the proposed activity "*is likely to have a significant effect on the threatened species, populations or ecological communities, or their habitats".* These eight factors must be taken into account by consent or determining authority when considering a development proposal or development application.

5.1 Known threatened species

Surveys conducted by the JC-EC to date revealed the presence of 10 threatened species including:

1. Pink Cockatoo (*Cacatua leadbeateri*)
2. Grey-crowned Babbler (*Pomatostomus temporalis temporalis* (eastern subspecies)
3. Hooded Robin (*Melanodryas cucullate*)
4. Chestnut Quail-thrush (*Cinclosoma castanotus*)
5. Speckled Warbler (*Chthonicola sagittate*)
6. Pied Honeyeater (*Certhionyx variegates*)
7. Diamond Firetail (*Stagonopleura guttata*)
8. Superb Parrot (*Polytelis swainsonii*)
9. Black-chinned Honeyeater (*Melithreptus gularis gularis (*eastern subspecies)
10. Little Pied Bat (*Chalinolobus picatus*).

A formal Section 5A (Assessment) was conducted for each of these in order to determine if the proposed activity "*is likely to have a significant effect"* upon these species (see **Appendix 5**).

Consequently as a result of conducting the Assessment of Significance for each species known to occur within the study area it is considered that the proposed activity is "unlikely" to impose a "significant effect" upon these species within the study area.

It is determined that the proposed activity is "unlikely" to have a "significant effect" only in concurrence with the proposed impact amelioration measures as outlined in Section 6.

5.2 Potential threatened biota

The literature review and database search revealed additional threatened biota including: two reptiles; 26 birds; 17 mammals (including ground dwelling, arboreal and microchiropteran bats); 12 plants, one endangered population and two endangered ecological communities that occur within the region.

As a result of a review of the ecology, habitat requirements and historical records for each biota it was determined that one reptile; 14 birds; 9 mammals (including ground dwelling, arboreal and microchiropteran bats) and two plants could potentially occur within the study area (see Tables 7, 8 & 9). These species are listed in **Appendix 3**.

For the purpose of this assessment it was considered that the study area contained potential habitat for each threatened biota. The ecology, habitat requirements and historical records for each biota were again reviewed and assessed in regards to the potential direct and indirect impacts of the proposed activity (see Section 4). Potential impacts were considered (where relevant) but not limited to the:

- lifecycle of each species (e.g. breeding, roosting, foraging, pollination etc);
- area of potential habitat for each species and community (area to be removed in a local and regional context etc);
- existing disturbance regimes (e.g. fire frequency); and
- habitat connectivity (e.g. barrier to the movement of fauna, genetic dispersal etc).

Section 5A assessment of significance for potential threatened biota

A formal Section 5A was not conducted for each threatened biota thought to have potential habitat within the study area.

The proposed activity would remove approximately 12 hectares of native vegetation (maximum) and potential habitat (less than 1% of the overall potential habitat available within the study area) across an area of approximately 25 hectares. Therefore it is considered unlikely that a significant proportion of any habitat for any threatened biota will be removed or modified. The proposed activity would not significantly alter any existing disturbance regimes (other than sheep grazing), nor would it alter the habitat connectivity within the study area to adjacent areas. It is considered unlikely that the proposed activity would significantly affect the lifecycle of any species which may potentially occur within the study area.

However, given the lack of sufficient information (e.g. lack of field surveys, timing) a precautionary approach must be taken to ensure that a “significant effect” upon any threatened biota would not occur. If the proposed impact amelioration measures (see Section 6) and site rehabilitation works are implemented (see Section 2, as proposed by Corkery and Co. 2006) it is "unlikely" that the proposed activity would have a "significant effect" upon any of the threatened biota which may occur within the study area or utilise the subject site as part of their overall habitat area.

The assessment below indicates that the proposed activities (as defined in Section 2) are "unlikely" to impose a "significant effect" upon the potential habitat of those threatened biota which could occur within the study area. **It is determined that the proposed activity is "unlikely" to have a "significant effect" only in concurrence with the proposed impact amelioration measures as outlined in Section 6.**

With respect to Section 5A of the *EP&A Act 1979* and in concurrence with the impact amelioration measures of this report:

(a) ***in the case of a threatened species, whether the lifecycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction.***

For the purpose of this assessment it was assumed that a *"viable local population"* of each threatened species (this part is not applicable to endangered ecological communities) existed within the study area. It is likely that other threatened species not recorded to date do occur within the study area given that they share similar habitat requirements with some species recorded within the study area.

The proposed activity will remove between 12 hectares of native vegetation and potential habitat across an area of 25 hectares (less than 1% of the overall potential habitat available within the study area). It is considered unlikely that any threatened species would solely rely on ane one or all of the vegetation (see **Tables 2** and **3**) and associated habitat types within the subject site. Compared to the remaining potential habitat within the study area (using vegetation as a surrogate, see **Table 2**) it is considered unlikely that the subject site would form an important component of any species habitat that could potentially occur within the study area. No significant watercourses, riparian vegetation or wetland areas would be removed or modified by the proposed activity. Consequently it is unlikely that a significant proportion of any habitat (e.g. for breeding, roosting, foraging etc) for any threatened species would be removed of modified.

The timing of the proposed works may temporarily disrupt some fauna (e.g. microchiropteran bats and amphibians in torpor), however it is unlikely that this temporary disruption would significantly affect any species. The proposed works are likely to result in the temporary disruption to the lifecycle of some species (e.g. through increased dust, noise etc), yet given the existing impacts, existing modified environment and short lifespan of the proposed activity (14 months), it is considered unlikely that it would cause a significant affect to the survival of any threatened species that may inhabit the study area.

It is considered unlikely that even if a *"viable local population"* of each threatened species did exist within the study area, these species would be resident within or dependent on the resources of the subject site for their survival. Consequently, it is *"unlikely"* that the "*life cycle"* of any species would be *"disrupted"* by the proposed activities such that a *"viable local population"* of any species would be *"placed at risk of extinction"*. Furthermore, the proposed impact amelioration measures provided in Section 6 (e.g ensuring that clearing is conducted during the non-breeding season for most fauna, completion of pre-clearance surveys etc) of this report will ensure that potential habitat for each of these species is adequately protected within the study area.

(b) ***in the case of an endangered population, whether the lifecycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised.***

The Glossy Black-Cockatoo (Riverina Endangered Population) is the only endangered population relevant to the proposed activity. It is considered "*unlikely*" that the "**life cycle**" of any species including the threatened Glossy Black-Cockatoo would be "*disrupted*" by the proposed activities such that a "*viable local population*" of any species would be "*placed at risk of extinction*" as a result of the proposed activities. This species was not recorded within the study area during the survey period despite targeted efforts during the appropriate time of the year. Furthermore, potential habitat for this species is well represented within the study area in the form of White Cypress/Bimble Box/red Box woodland.

Consequently, there is no likelihood that the proposed activity can be regarded as likely to involve any such endangered populations *"likely to be significantly compromised"* even if individuals of that population use the study area. Furthermore, the proposed impact amelioration measures provided in Section 6 of this report would ensure that potential habitat is adequately protected. This part is not applicable to the Endangered Ecological Community.

(c) ***in relation to the regional distribution of the habitat of a threatened species, population or ecological community, whether a significant area of known habitat is to be modified or removed.***

Given the small size of the area of potential resources offered by the subject site (see **Table 3**) and extent of potential habitat in the study area, the proposed activity is unlikely to involve "*a significant area of known habitat*" for any of the threatened biota being "*removed or* *modified*". Furthermore it is unlikely that any threatened species would solely rely on any one or all of the vegetation (see **Tables 2** and **3**) and associated habitat types within the subject site for their existence. The reference to regional within this factor refers to the regions as defined in the Interim Biogeographic Regionalisation of Australia (IBRA). Following the IBRA, the study area occurs within the Cobar Peneplain IBRA. The Cobar Peneplain Bioregion lies within the Central West of New South Wales, occupying over 73,000 square kilometres, or approximately one-tenth of the area of New South Wales. It includes parts of the Western and Central Divisions, extending from near Bourke in the north, through to Griffith in the south, and includes the towns of Nymagee, Cobar, Nyngan, Condobolin, and Lake Cargelligo.

On this basis, the study area cannot be construed as comprising "*a significant area of known habitat*" in respect of the "*regional distribution of habitat*" for any of these subject species. Furthermore, the proposed impact amelioration measures provided in Section 6 of this report will ensure that the potential habitat for each of the threatened biota is adequately protected.

(d) ***whether an area of known habitat is likely to become isolated from currently interconnecting or proximate areas of habitat for a threatened species, population or ecological community.***

The proposed activity would not involve *"an area of known habitat"* becoming *"isolated from currently interconnecting or proximate areas of habitat"*. The proposed activity would involve the removal and modification of 12 hectares of native vegetation and potential habitat (less than 1% of the overall potential habitat available within the study area). Vegetation will be removed across an area of 25 hectares (see Figures 1 and 2.) within the study area of approximately 220, 000 hectares. The study area is well connected to surrounding areas of vegetation (see Figures 1 and 2). The proposed activity would not result in the subject site or study area becoming isolated from adjacent areas of habitat.

It is therefore unlikely that the proposed activity would involve any resources or known habitat for these threatened becoming *"isolated from current or interconnecting areas of habitat"*.

(e) ***whether critical habitat will be affected.***

The study area is not part of any "*critical habitat*" as designated under Part 3 of the *TSC Act 1995*. Subsequently no *"critical habitat"* as declared within NSW, under the register of critical habitat, will be affected by the proposed activity.

(f) ***whether a threatened species, population or ecological community, or their habitats, are adequately represented in conservation reserves (or other similar protected areas) in the region.***

There are conservation reserves/protected areas within the locality of the study area including Scrubby Gum NR (within 10 km of study area), Quanda NR (within 30 km of study area), Yathong, Nombinnie, Tollingo and Waggoon NR's (all within 70 km). These reserves contain records for many of the threatened species mentioned in this report. However, whilst they do contain known habitat for threatened species it is considered unlikely that these species are *"adequately represented"* within *"conservation reserves and or similar protected areas"* in the locality or region. Furthermore, the Cobar Peneplain Bioregion has been identified as a high priority area for additional conservation assessment and action under the Commonwealth Government's National Reserve System Program (NSW NPWS 2002), as less than five per cent of the bioregion is protected by conservation reserves.

(g) ***whether the development or activity proposed is of a class of development or activity that is recognised as a threatening process.***

The proposed development is not *"of a class of development or activity that is recognised as a threatening process"*, pursuant to *TSC Act 1995.* However, there are five key threatening processes pursuant to Schedule 3 of the *TSC Act 1995* which could be considered relevant to the proposed activity including:

- Clearing of native vegetation;
- Competition and degradation by Feral Goats;
- Predation by the European Red Fox *Vulpes Vulpes* (Linnaeus, 1758);
- Predation by the Feral Cat, *Felis catus* (Linnaeus, 1758); and
- Removal of dead wood and dead trees.

Whilst clearing of native vegetation is recognised as a threatening process no significant native vegetation is to be removed/modified (approximately 2 ha) by the proposed activity. Considering the extent of relevant vegetation to be removed and extent of potential habitat remaining it is considered "unlikely" that the proposed activity including removal of native vegetation will *"threaten the survival or evolutionary development"* of any of the threatened biota.

Fox predation is a major threat to native animal populations including threatened species. Foxes also contribute to the dispersal of weeds such as Bathurst and Noogoora Burr, and are a potential carrier of disease (NSW NPWS 2003).

Impacts caused by Feral Goats include competition for water, food and shelter, soil erosion and compaction, modification of vegetation structure through overgrazing. They have the potential to spread disease, especially Footrot and Ovine Johnes Disease (NSW NPWS 2003).

Feral cats predate on native reptiles, frogs, small mammals and bird species. They compete for food and act as a reservoir for diseases and parasites, which can be transferred to native fauna, domestic stock and humans (NSW NPWS 2003).

The proposed activity has the potential to exacerbate the existing impact of feral goats and predation upon native species by the introduced fox and feral cat. The former land owner regularly captured and shot feral goats within the study area. Feral goats were commonly recorded throughout the study area, particularly around the Peak hill and rocky outcrops. The former land owner also shot fox and feral cats on a regular basis (through organised hunting parties) and opportunistically within the study area. TRL must now address the management of feral animals within the study area. These introduced predators are likely to have already had a detrimental impact upon the native wildlife of the area, particularly reptile, bird and ground dwelling mammal species. Numerous native species are at risk of becoming threatened from fox and cat predation.

An appropriate pest control strategy (as outlined under the impact amelioration measures) should be implemented prior to the completion of the proposed activity. This program should be implemented in conjunction with existing pest control programs of the area.

The recommended impact amelioration measures (see Section 6) have been designed to address the problems of predation and habitat degradation by feral animals and to a lesser extent, dead tree and ground debris removal.

(h) ***whether any threatened species, population or ecological community is at the limit of its known distribution.***

It is likely that some of the threatened biota are at the limit of their known distribution, yet it is considered "*unlikely*" to result in the "*regional extinction and range contraction of any species*". Potential habitat is well represented in the surrounding landscape and it is considered unlikely that the proposed activity would involve *"an area of known habitat"* becoming *"isolated from currently interconnecting or proximate areas of habitat"*. Furthermore, potential habitat within the study area would be protected by the proposed impact amelioration measures.

Consequently as a result of conducting an eight part test conducted for each the threatened biota it is considered that the proposed activity is *"unlikely"* to impose a "*significant effect"* upon any of the threatened biota or their habitats within the study area.

It is determined that the proposed activity is "unlikely" to have a "significant effect" only in concurrence with the proposed impact amelioration measures as outlined in Section 6.

6 Proposed impact amelioration measures

The lack of targeted surveys of the subject site dictates that a precautionary approach must be taken. Considering the nature and extent of the proposed activity, the amelioration measures include:

1. General land management amelioration measures (e.g. pest animal control);
2. Amelioration measures to be undertaken prior to commencement of proposed activity (e.g. pre-clearance survey);
3. Amelioration measures to be undertaken during the proposed activity (e.g. clearly marking areas to be cleared); and
4. Amelioration measures to be undertaken after the proposed activity has been completed (e.g. rehabilitation, monitoring of the subject site).

These measures should be implemented to ensure that no *'significant effect'* would occur upon any threatened biota, or their habitats that are known to occur or could potentially occur within the study area. These measures would also ensure that the impacts upon other native flora and fauna and the general environment of the study area would also be minimised.

6.1 Amelioration measures for general land management

TRL propose to conduct a decline in exploration activities as part of the proposed works. Given that there is potential for mining operations to eventuate as a result of the exploration activities TRL should be considering a property management plan (PMP) for the entire study area.

The main purpose of the property management plan is to clarify what can be done with native vegetation and habitat within the study area, with particular reference to threatened biota and give certainty for a designated period of time.

A property management plan has the following benefits:

- provides long term security so that native vegetation and habitat within the study area can be better managed for both financial and environmental outcomes;
- provides clearing provisions that can reduce the need for repeated development applications;

- provides the basis for providing financial support to TRL to improve the condition of native vegetation and habitat within the study area;
- provides consistency between agreed management actions within the study area and in the local Catchment Action Plan; and
- provides clarification for existing use.

These benefits can only be achieved by developing the PMP within the Western CMA framework and within the objectives of the Western CMA Catchment Action Plan.

A PMP would include but is not limited to the following:

- pest animal and plant control, including feral goat, cat and fox, noxious weeds;
- development of offsets where by positive management actions are used to balance environmental outcomes in the case of clearing native vegetation and habitat. A positive outcome must be determined for each environmental outcome: water quality, land degradation, salinity and biodiversity (including threatened species); and
- grazing management plan (e.g. can be useful for the suppression of weeds).

It is unlikely that a PMP or equivalent management plan could be implemented prior to the commencement or completion of the proposed activities. The following two components (pest animal strategy and weed control program) should be prepared and implemented prior to the completion of the proposed activities to ensure that no *'significant effect'* would occur upon any threatened biota, or their habitats that are known to occur or could potentially occur within the study area. A third component (grazing strategy is recommended), although it is understood that it could cause management issues and conflict with exploration activities.

1. <u>Pest animal strategy</u>

A pest animal strategy should be developed by TRL targeting the introduced Fox, Feral Goat and Feral Cat. The main outcome of this strategy would be a management plan aimed at implementing on ground works to control these three pest species. The strategy and subsequent management plan should be developed in conjunction with NSW NPWS, Rural Lands protection Board, Western CMA and neighbouring properties. Existing strategies and management plans including the Upper Darling Region Pest Management Strategy 2003-2006 (NSW NPWS 2003). **Table 10** summarises the main priorities to be included in a pest animal strategy. Additional species (e.g. Rabbit) should be included in the initially strategy.

A detailed baiting program targeted at the Fox is provided in **Appendix 7** as an example.

2. Weed control program

A weed control program should be implemented for the entire subject site, specifically focussing upon the removal of noxious weeds and reducing further weed invasion.

It is also important to deter the growth of weeds in recently disturbed areas, and the transportation of weeds into the subject site and through the study area. Planting fast growing indigenous native grasses (but not monoculture forming) to minimise potential weed invasion will protect exposed areas. Planting of these natives can be incorporated into the site rehabilitation plan.

Existing strategies and management plans including the Upper Darling Region Pest Management Strategy 2003-2006 (NSW NPWS 2003).

3. Grazing strategy

Grazing is a useful tool for weed control and fire suppression. Given that the property has been under some form of grazing for at least the past decade, grazing as a management tool should be considered, although it is understood that it could cause management issues and conflict with exploration activities.

Grazing should be restricted or prevented altogether during plant establishment and when plants are starting their annual growth. Heavy grazing during this time can substantially weaken plantings and natural revegetation. Grazing should occur when plants are dormant, such as in winter, when there will be less impact as well as promoting plant vigour and seed and root production during subsequent growth periods until plants are well established. Vegetation should also be spelled around the time of flowering and seed production in order to allow for continual replacement and maintenance of vegetation cover.

Grazing impact would need to be monitored during initial grazing periods. This would enable the program to assess whether grazing intensity is too high or too low, and to move stock before vegetation degradation becomes a problem.

6.2 Amelioration measures to be undertaken prior to commencement of proposed activity

Given the lack of targeted flora and fauna surveys of the subject site it is essential that a pre-clearance survey be conducted by a qualified ecologist. The purpose of the pre-clearance survey is to:

- Identify threatened flora species and their locations;
- Identify vegetation/habitat which may harbour fauna (e.g. habitat trees);
- Identify locations for nesting boxes or relocation of hollow limbs if necessary; and
- Document the above findings and notify TRL prior to the commencement of clearing;
- (Relocate fauna prior to clearing).

A site inspection should be conducted to identify vegetation which may harbour fauna (e.g. habitat trees) and mark this vegetation accordingly. The extent and location of any threatened flora or significant vegetation will be mapped and recorded. This information should be documented and provided to TRL prior to commencement of clearing.

The site investigation should target hollow bearing trees, fallen vegetation with potential to harbour fauna and trees with obvious signs of fauna occupation (e.g. bird nests) or usage (scratch marks, feeding scares etc). Trees to be removed or affected by the activity would be checked for the presence of threatened and non-threatened fauna by identification of scratch marks, scats, footprints, nests, and evidence of feeding.

Pending the outcomes of the pre-clearance survey it may be necessary to relocate and monitor fauna within the subject site during clearing operations.

Table 11. Pest animal management strategy (adopted from the Upper Darling Region Pest Management Strategy 2003-2006, NSW NPWS 2003).

Pest species	Control method	Management strategy	Performance measures
Fox	Fox control is undertaken in the peak dispersal (Autumn) and mating periods but more frequently in relation to predation on threatened species. Fox control is undertaken in accordance with the Fox TAP best practice guidelines. Methods include: ▪ 1080 ground baiting; ▪ 1080 aerial baiting under licence to the NRA according to Off Label Permits; ▪ shooting in conjunction with rabbit spotlight counting programs.	Must occur in accordance with management models within the Fox Threat Abatement Plan (NSW NPWS 2001). Management activities include: 1. Continue monitoring fox populations. 2. Undertake coordinated programs in cooperation with other agencies and immediate neighbours and stakeholders to protect threatened and other native species (as per Threat Abatement Plan). 3. Strategic 1080 baiting programs are carried out along with ground shooting. 3. Undertake monitoring in all areas where foxes are likely to have a high impact on threatened species.	Increased recovery of threatened species as per high priority programs identified in the Fox Threat Abatement Plan. Short-term reduction in fox numbers as indicated by bait uptake and spotlight surveys. Comments from neighbours.
Goat	Shooting (aerial control programs), contract mustering and trapping. Man-made watering points are closed down or controlled at certain times of the year to assist with mustering and trapping programs.	Continue monitoring of feral goat populations and their impacts: • monitoring of the extent of feral goat distribution and populations within study area. • vegetation monitoring indicating regeneration of species susceptible to grazing by feral goats. • annual endangered species surveys. Continue current methods of control. Evaluate the current control programs in adjacent areas.	Reduced goat numbers as indicated by monitoring programs. Comments from neighbours regarding feral goat sightings.
Cat	No poison is currently registered for use on cats. Other control methods include trapping and opportunistic shooting, however they are largely ineffective on cat numbers. Feral cats are a difficult pest to control, and major advances in their control will depend on further progress with the cat-specific toxin and baiting system currently being developed.	1. Continue to record cat sightings. 2. Undertake trapping where required for problem cats.	Increased awareness of responsible cat ownership. Removal of identified problem cats from areas using available techniques.

6.3 Amelioration measures to be undertaken during the proposed activity.

Where possible, clearing of vegetation and habitat should commence between mid-March and end of May to avoid the breeding period of the majority of native fauna.

During operations the following amelioration measures should be undertaken:

- Areas to be cleared must be clearly marked to ensure no accidental clearing occurs;
- Any infrastructure and machinery required for the proposed activities should be positioned to avoid retained native vegetation (e.g. adjacent vegetation outside designated clearing areas);
- Where clearing of native vegetation is unavoidable, mature seed from native trees and shrubs felled should be collected and stockpiled for future use in rehabilitation of the site;
- Where mature and old growth trees are removed (e.g. any tree with a dbh of > 40 cm), any trees/limbs could be placed in adjacent vegetation to provide important habitat. This will increase valuable ground layer components, creating additional habitat;
- Any noxious weed and other weed material encountered during exploration activities, should be destroyed and/or removed from the site using appropriate methods to ensure weeds do not spread to other sites, especially in regards to invasion of drainage lines and dams;
- Drainage and runoff should be controlled in such a way as that no foreign substrates or materials leave the site;
- Sediment and erosion control structures, which conform with the relevant guidelines, should be installed; and
- Exposed surface soil should be stabilised as soon as possible to avoid potential erosion (by mulching, covering or replanting with native species).

6.4 Amelioration measures to be undertaken after the proposed activity has been completed.

Rehabilitation, restoration and monitoring measures, which should be undertaken:

- Indigenous plant species should be used to provide habitat features for native fauna. Indigenous plant species should include those native species cleared from the subject site.

Emphasis should be placed on rehabilitating cleared areas with native species removed as a result of the clearing process. Rehabilitation should include the use of cleared vegetation and seed bank from redistributed topsoil;

- Reduce or avoid the disturbance of tank sites and drainage lines. Encourage the existing tanks to be developed into waterholes in conjunction with revegetation works to encourage wildlife;
- Exposed surface soil should be stabilised as soon as possible to avoid potential erosion (by mulching, covering or replanting with native species);
- Rehabilitation of the subject site should be monitored to ensure native vegetation regeneration is successful (e.g. permanent plots can be established to gauge germination success) and to control weed invasion. If rehabilitation of sites is unsuccessful, appropriate offsets should be implemented to ensure “no net loss’ of native vegetation and habitat is the outcome.

Net loss offsets can include existing retained native vegetation areas within the study area, and positive land management practices (e.g. implementation of a weed control program). Appropriate offsets should be discussed with the Western CMA.

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Appendix 1 – Flora species

BB/WCP = Bimble Box/White Cypress Pine woodland
Mallee = Mallee (*Eucalyptus* spp.) woodland
WCP/IB = White Cypress Pine/Mugga Ironbark woodland
WCP/RB = White Cypress Pine/Red Box woodland. NW = declared noxious weed of the Cobar Control Area
D = Recorded during December 2004 survey. J = recorded during July 2005 survey.

Family (bold) and Scientific Name	Common Name	BB/ WCP	Mallee	WCP/ IB	WCP/ RB	Incidental
Adiantaceae						
Cheilanthes sieberi	Rock Fern	*	*	*	*	
Cheilanthes tenuifolia	Mulga Fern	*				D
Aizoaceae						
Zaleya sp.	Hogweed		*		*	D
Amaranthaceae						
Alternanthera denticulata	Lesser Joyweed					*
Alternanthera sp.		*			*	
Ptilotus spathulatus	Pussy-tails				*	D
Ptilotus sp.					*	
Amygdalaceae						
Prunus sp.					*	D
Anacardiaceae						
Schinus areira	Pepper Tree					*D
Anthericaceae						
Arthropodium minus	Small Vanilla-lily	*	*		*	
Thysanotus patersonii	Twining Fringe-lily		*			D
Apiaceae						
Daucus glochidiatus	Australian Carrot	*	*	*	*	
Apocynaceae						
Parsonsia eucalyptophylla	Gargaloo					*
Asphodelaceae						
Bulbine semibarbata	Leek Lily		*	*	*	
Asteraceae						
Actinobole uliginosum	Flannel Cudweed	*	*	*	*	
Arctotheca calendula #	Capeweed					*
Brachyscome lineariloba	Hard-headed Daisy			*		
Brachyscome sp.		*				J

Family (bold) and Scientific Name	Common Name	BB/ WCP	Mallee	WCP/ IB	WCP/ RB	Incidental
Bracteantha bracteata	Golden Everlasting	*	*		*	
Calotis anthemoides	Cut-leaf Burr-daisy	*				
Calotis cuneifolia	Purple Burr-daisy	*	*	*	*	
Calotis hispidula	Bogan Flea	*	*	*	*	
Calotis lappulacea	Yellow Burr-daisy	*				
Carthamus lanatus	Saffron Thistle	*				
Centaurea melitensis #	Maltese Cockspur	*	*		*	
Chrysocephalum semipapposum	Clustered Everlasting					*
Cymbonotus lawsonianus	Bear's Ear	*			*	
Hedypnois rhagadioloides #	Cretan Weed	*	*	*		
Hyalosperma glutinosum subsp. *glutinosum*						*
Hyalosperma semisterile		*			*	
Hypochaeris radicata #	Flatweed	*	*	*	*	
Isoetopsis graminifolia	Grass Cushions	*		*	*	
Millotia myosotidifolia	Broad-leaved Millotia		*			
Olearia pimelioides						*
Rhodanthe floribundum	Common White Sunray	*	*		*	D
Rhodanthe laevis	Smooth Sunray			*		
Rhodanthe pygmaeum	Pygmy Sunray	*			*	
Senecio sp.					*	
Senecio sp. E		*			*	D
Sigesbeckia orientalis	Indian Weed		*			
Silybum marinum #	Variegated Thistle					
Sonchus oleraceus #	Common Sowthistle	*	*	*	*	
Stuartina muelleri	Spoon Cudweed		*	*	*	
Triptilodiscus pygmaeus	Common Sunray	*	*	*	*	
Vittadinia cuneata	Fuzzweed	*			*	
Vittadinia dissecta var. *hirta*	Fuzzweed	*				
Xanthium spinosum # NW	Bathurst Burr					*D
Bignoniaceae						
Pandorea pandorana	Inland Wonga Vine		*			
Boraginaceae						
Cynoglossum australe var. *australe*	Australian Hound's-tongue	*	*		*	
Echium plantagineum #	Paterson's Curse					*D
Heliotropium europaeum #	Common Heliotrope					D
Brassicaceae						
Capsella bursa-pastoris #	Shepherds Purse					*
Cuphonotus humistratus	Mother-of-misery	*			*	
Geococcus pusillus	Earth Cress	*			*	

Family (bold) and Scientific Name	Common Name	BB/ WCP	Mallee	WCP/ IB	WCP/ RB	Incidental
Harmsiodoxa blennodioides	Hairy-pod Cress	*	*		*	
Lepidium papillosum #	Warty Peppercress	*	*	*	*	
Sisymbrium irio #	London Rocket	*	*			
Sisymbrium orientale #	Hedge Mustard	*	*		*	
Campanulaceae						
Wahlenbergia gracilenta	Annual Bluebell	*	*	*	*	
Wahlenbergia luteola		*			*	
Wahlenbergia sp.			*		*	
Wahlenbergia stricta	Tall Bluebell					*
Capparidaceae						
Apophyllum anomalum	Warrior Bush					*
Caryophyllaceae						
Polycarpon tetraphyllum	Four-leaf Allseed					*
Stellaria media #	Chickweed	*	*			
Chenopodiaceae						
Chenopodium desertorum subsp. *anidiophyllum*						*
Chenopodium desertorum subsp. *microphyllum*						*
Chenopodium anidiophyllum	Mallee Goosefoot	*			*	
Chenopodium melanocarpum	Black Crumbweed				*	
Chenopodium sp.			*			
Einadia hastata	Climbing Saltbush		*			
Einadia nutans subsp. *nutans*	Climbing Saltbush	*	*	*	*	JD
Einadia spinescens	Thorny Saltbush					JD
Maireana enchylaenoides	Wingless Fissure-weed	*			*	
Maireana excavata	Bottle Fissure-weed	*			*	
Maireana microphylla	Eastern Cottonbush	*	*	*		
Salsola birchii	Galvanised Burr					JD
Salsola kali var. *kali*	Buckbush	*				D
Sclerolaena diacantha	Grey Copperburr	*			*	JD
Sclerolaena muricata	Black Roly-poly	*			*	JD
Convolvulaceae						
Convolvulus erubescens	Australina Bindweed	*			*	
Dichondra repens	Kidneyweed	*				
Crassulaceae						
Crassula colorata	Dense Stonecrop	*	*	*	*	

Family (bold) and Scientific Name	Common Name	BB/ WCP	Mallee	WCP/ IB	WCP/ RB	Incidental
Cucurbitaceae						
Citrullus lanatus #	Camel Melon					*
Cupressaceae						
Callitris glaucophylla	White Cypress Pine	*	*	*	*	JD
Cyperaceae						
Carex sp.	Sedge	*				D
Euphorbiaceae						
Chamaesyce drummondii	Caustic Weed	*				D
Phyllanthus fuernrohrii	Sand Spurge		*			
Poranthera microphylla				*	*	
Fabaceae (Caesalpiniaceae)						
Senna artemisioides subsp. *zygophylla*	Silver Cassia					*D
Fabaceae (Faboideae)						
Glycine canescens	Silky Glycine	*			*	
Glycine clandestina	Twining Glycine		*			
Glycine tabacina						*
Medicago laciniata #	Cut-leaf Medic	*			*	
Medicago minima #	Small Woolly Burr Medic	*	*		*	
Swainsona affinis		*				
Trifolium sp. #			*			
Unknown Fabaceae					*	
Fabaceae (Mimosoideae)						
Acacia acuminata subsp. *burkittii*	Sandhill Wattle					*
Acacia decora	Western Golden Wattle			*	*	
Acacia doratoxylon	Currawang					*D
Acacia homalophylla	Yarran					*D
Acacia oswaldii	Miljee					*D
Geraniaceae						
Erodium crinitum	Blue Crowfoot	*	*	*	*	
Goodeniaceae						
Goodenia glabra	Smooth Goodenia	*	*	*	*	
Goodenia pusilliflora						*
Goodenia sp.				*	*	

Family (bold) and Scientific Name	Common Name	BB/ WCP	Mallee	WCP/ IB	WCP/ RB	Incidental
Haloragaceae						
Gonocarpus elatus	Hill Raspwort		*	*		
Lamiaceae						
Lamium amplexicaule #	Dead-nettle	*				
Salvia verbenaca #	Wild Sage	*	*		*	
Lentibulariaceae						
Utricularia dichotoma	Fairy Aprons		*			
Linaceae						
Linum marginale	Wild Flax	*				
Loranthaceae						
Amyema miquelii	Box Mistletoe	*				
Malvaceae						
Abutilon sp.					*	
Sida corrugata	Corrugated Sida	*	*		*	JD
Sida cunninghamii	Ridge Sida	*	*	*	*	JD
Myoporaceae						
Eremophila deserti	Turkeybush					*D
Eremophila maculata	Spotted Fuchsia	*				
Eremophila mitchellii	Budda	*			*	D
Eremophila sturtii	Turpentine				*	JD
Myrtaceae						
Eucalyptus dwyeri	Dwyer's Red Gum		*	*		D
Eucalyptus intertexta	Red Box	*			*	JD
Eucalyptus populneus subsp. *bimbil*	Bimble Box	*				JD
Eucalyptus sideroxylon	Mugga Ironbark			*		D
Eucalyptus viridis	Green Mallee		*	*		D
Ophioglossaceae						
Ophioglossum polyphyllum	Adder's Tongue	*				
Orchidaceae						
Caladenia carnea	Pink Fingers			*	*	
Pterostylis biseta (Nymagee form)					*	
Pterostylis mutica	Midget Greenhood				*	
Oxalidaceae						
Oxalis corniculata	Sour-grass	*				
Oxalis perennans		*	*	*	*	

Family (bold) and Scientific Name	Common Name	BB/ WCP	Mallee	WCP/ IB	WCP/ RB	Incidental
Phormiaceae						
Dianella longiflora	Blue-Flax-lily					*
Dianella revoluta	Spreading Flax-lily				*	
Pittosporaceae						
Pittosporum angustifolium	Butterbush					D*
Plantaginaceae						
Plantago debilis	Shade plantain	*	*		*	
Plantago sp. #		*			*	
Poaceae						
Aristida behriana	Bunch Wiregrass				*	
Aristida contorta	Bunched Kerosene Grass				*	
Austrodanthonia sp.	A Wallaby Grass	*	*		*	D
Austrostipa scabra subsp. *scabra*						JD*
Austrostipa sp.	A Speargrass	*	*	*	*	JD
Chloris truncata	Windmill Grass				*	D
Elymus scaber	Wheatgrass				*	D
Enteropogon acicularis	Curly Windmill-grass	*			*	D
Eragrostis sp. #		*				D
Hordeum leporinum #	Barley Grass		*			
Lolium rigidum #	Wimmera Ryegrass	*	*			D
Microlaena stipoides	Meadow Rice-grass	*				
Panicum sp.						*
Poa sp.		*				D
Thyridolepis mitchelliana	Mulga Grass		*		*	
Tripogon loliiformis	Five-minute Grass		*			
Vulpia bromoides #	Squirrel-tail Fescue	*	*	*	*	
Polygonaceae						
Rumex brownii	Swamp Dock	*				D
Portulacaceae						
Calandrinia eremaea	Small Purslane	*	*	*	*	
Primulaceae						
Anagallis arvense #	Pimpernel	*	*		*	
Proteaceae						
Hakea tephrosperma	Hooked Needlewood				*	
Ranunculaceae						
Ranunculus sessiliflorus var. *sessiliflorus*	Small-flowered Australian Buttercup	*	*		*	

Family (bold) and Scientific Name	Common Name	BB/ WCP	Mallee	WCP/ IB	WCP/ RB	Incidental
Rhamnaceae						
Cryptandra sp.			*			
Rubiaceae						
Galium gaudichaudii	Rough Bedstraw		*	*		
Rutaceae						
Geijera parviflora	Wilga		*			J
Sapindaceae						
Alectryon oleifolium	Rosewood					*
Dodonaea viscosa subsp. *cuneata*						*
Dodonaea viscosa subsp. *spatulata*					*	J
Scrophulariaceae						
Mimulus prostratus	Small Monkey-flower	*				
Solanaceae						
Nicotiana velutina	Velvet Tobacco	*	*			
Solanum cleistogamum	Shy Nightshade	*			*	
Solanum ferocissimum			*			
Stackhousiaceae						
Stackhousia muricata	Western Stackhousia				*	
Sterculiaceae						
Brachychiton populneus	Kurrajong	*				D
Thymelaeaceae						
Pimelea sp.					*	
Urticaceae						
Urtica incisa #	Small Nettle	*	*			

Appendix 2 – Fauna species

JC-EC – survey results from Dec 04, June 05 & Sept 05, CP – Cobar Peneplain Bioregional Assessment (including Masters & Foster 2000), NPWS – Wildlife Atlas, Nymagee 1:100,000 mapsheet & Cobar LGA search) and SWA (Steve Sass).

REPTILIA					
Scientific name	**Common name**	**JC-EC**	**NPWS**	**SWA**	**CP**
Gekkonidae					
Diplodactylus byrnei	Gibber Gecko		√		
Diplodactylus damaeus	Beaded Gecko		√	√	√
Diplodactylus steundachneri	Box-patterened Gecko		√		√
Diplodactylus tessellatus	Tessellated Gecko				√
Diplodactylus vittatus	Eastern Stone Gecko	√	√	√	√
Gehyra dubia	Dubious Dtella			√	√
Gehyra variegata	Common Dtella	√		√	√
Heteronotia binoei	Prickley Gecko	√		√	√
Nephurus levis	Smooth Knob-tailed Gecko				√
Oedura marmorata	Marbled Velvet Gecko		√		√
Rhynchoedura ornata	Beaked Gecko		√	√	√
Strophurus ciliaris	Northern Spiny-tailed Gecko		√		
Strophurus intermedius	Southern Spiny-tailed Gecko	√	√	√	√
Underwoodisaurus milii	Thick-tailed Gecko		√	√	√
Pygopodidae					
Delma butleri	Unbanded Delma		√		
Liasis burtonis	Burtons Snake-lizard		√	√	√
Pygopus schraderi	Eastern Hooded Scaly-foot		√	√	√
Varanidae					
Varanus gouldii	Sand Goanna	√	√	√	√
Varanus tristis tristis	Black-headed Monitor				√
Varanus varius	Lace Monitor	√	√	√	√
Agamidae					
Amphibolurus nobbi coggeri	Nobbi Dragon	√	√	√	√
Ctenophorus fordi	Mallee Sand-dragon		√		√
Ctenophorus nuchalis	Central Netted Dragon			√	√
Ctenophorus pictus	Painted Dragon		√		
Pogona barbata	Eastern Bearded Dragon				√
Pogona vitticeps	Central Bearded Dragon	√		√	√
Scincidae					
Cryptoblepharus carnabyi	Wall Lizard	√		√	√
Ctenotus allotropis		√			√
Ctenotus atlas	Southern Mallee Ctenotus		√		√
Ctenotus leonhardii	Leonhardi's Ctenotus		√		√
Ctenotus regius					√
Ctenotus robustus	Robust Ctenotus	√	√	√	√

REPTILIA					
Scientific name	**Common name**	**JC-EC**	**NPWS**	**SWA**	**CP**
***Scincidae* (Cont'd)**					
Ctenotus schomburgkii	Barred Wedge-snout Ctenotus		√		√
Egernia inornata	Unadorned Desert-skink		√		
Egernia striolata	Tree Skink	√	√	√	√
Eremiascincus richardsonii	Broad-banded Sand-swimmer				√
Lerista muelleri	Three-toed Lerista	√		√	√
Lerista punctatovittata	Spotted Lerista	√		√	√
Menetia greyii	Common Dwarf-skink	√		√	√
Morethia boulengeri	Boulenger's Morethia	√	√	√	√
Morethia obscura	Dull Morethia		√	√	
Tiliqua scincoides	Eastern Blue-tongue	√	√	√	
Tiliqua rugosa	Shingleback	√	√	√	√
Typhlopidae					
Ramphotyphlops australis	Southern Blind Snake		√	√	
Ramphotyphlops bituberculatus	Prong-snouted Blind Snake		√	√	
Pythonidae					
Morelia spilota metcalfei	Inland Carpet Python				√
Elapidae					
Acanthopis antarticus	Death Adder				√
Brachyurophis australis	Australian Coral Snake		√	√	
Demansia psammophis	Yellow-faced Whipsnake	√		√	
Pseudechis australis	Mulga Snake	√		√	√
Pseudonaja nuchalis	Western Brown Snake	√		√	
Pseudonaja textilis	Eastern Brown Snake	√			
Parasuta dyweri	Dywers Black-headed Snake	√		√	
Vermicella annulata	Bandy-Bandy				√
TOTAL REPTILES		**23**	**21**	**32**	**41**

JC-EC – survey results from Dec 04, June 05 & Sept 05, CP – Cobar Peneplain Bioregional Assessment (including Masters & Foster 2000), NPWS – Wildlife Atlas, Nymagee 1:100,000 mapsheet & Cobar LGA search) and ROB (Steve Sass).

AMPHIBIA					
Scientific name	**Common name**	**JC-EC**	**NPWS**	**ROB**	**CP**
Hylidae					
Litoria caerulea	Green Tree Frog	√	√	√	√
Litoria latopalmata	Broad-palmed Frog				√
Litoria peronii	Perons Tree Frog	√	√	√	√
Litoria rubella	Desert Tree Frog	√	√	√	√
Myobatrachidae					
Limnodynastes interioris	Giant Banjo Frog	√	√	√	√
Limnodynastes fletcheri	Barking Marsh Frog				√
Limnodynastes ornatus	Ornate Burrowing Frog		√		

REPTILIA					
Scientific name	**Common name**	**JC-EC**	**NPWS**	**SWA**	**CP**
Limnodynastes tasmaniensis	Spotted Marsh Frog	√	√	√	√
Neobatrachus sudelli	Common Spade-foot Toad	√	√	√	√
Notaden bennettii	Crucifix Frog	√		√	
Pseudophryne bibronii	Bibrons Toadlet			√	
Uperoleia rugosa	Wrinkled Toadlet	√	√	√	
TOTAL AMPHIBIANS		**7**	**8**	**9**	**8**

JC-EC – survey results from Dec 04, June 05 & Sept 05, CP – Cobar Peneplain Bioregional Assessment (including Masters & Foster 2000), NPWS – Wildlife Atlas, Nymagee 1:100,000 mapsheet & Cobar LGA search) (TS) indicates threatened species

BIRDS				
Scientific name	**Common name**	**JC-EC**	**NPWS**	**CP**
Accipitridae				
Aquila audax	Wedge-tailed Eagle	√	√	√
Circus approximans	Swamp Harrier		√	√
Elanus axillaris	Black-shouldered Kite	√	√	√
Haliastur sphenurus	Whistling Kite	√	√	√
Hieraaetus morphnoides	Little Eagle	√	√	√
Milvus migrans	Black Kite		√	√
Anatidae				
Anas gracilis	Grey Teal		√	√
Anas superciliosa	Pacific Black Duck		√	√
Aythya australis	Hardhead		√	√
Chenonetta jubata	Australian Wood Duck	√	√	√
Cygnus atratus	Black Swan		√	√
Malacorhynchus membranaceus (TS)	Pink-eared Duck		√	√
Anhingidae				
Anhinga melanogaster	Darter		√	√
Ardeidae				
Ardea alba	Great Egret		√	√
Egretta novaehollandiae	White-faced Heron		√	√
Artamidae				
Artamus cinereus	Black-faced Woodswallow	√		
Artamus cyanopterus	Dusky Woodswallow	√		
Artamus personatus	Masked Woodswallow	√	√	√
Artamus superciliosus	White-browed Woodswallow	√	√	√
Cracticus nigrogularis	Pied Butcherbird	√	√	√
Cracticus torquatus	Grey Butcherbird	√	√	√
Gymnorhina tibicen	Australian Magpie	√	√	√

BIRDS				
Scientific name	**Common name**	**JC-EC**	**NPWS**	**CP**
Cacatuidae				
Cacatua galerita	Sulphur-crested Cockatoo	√	√	√
Eolophus roseicapillus	Galah	√	√	√
Nymphicus hollandicus	Cockatiel	√	√	√
Cacatua leadbeateri (TS)	Pink Cockatoo	√	√	√
Campephagidae				
Coracina novaehollandiae	Black-faced Cuckoo-shrike	√		
Lalage sueurii	White-winged Triller	√		√
Caprimulgidae				
Aegotheles cristatus	Australian Owlet-nightjar	√		
Eurostopodus argus	Spotted Nightjar	√	√	√
Charadriidae				
Elseyornis melanops	Black-fronted Dotterel		√	√
Erythrogonys cinctus	Red-kneed Dotterel		√	√
Vanellus miles	Masked Lapwing		√	√
Climacteridae				
Climacteris picumnus	Brown Treecreeper	√		
Cinclosomatidae				
Cinclosoma castanotus(TS)	Chestnut Quail-thrush	√	√	√
Columbidae				
Geopelia placida	Peaceful Dove	√		
Geopelia humeralis	Bar-shouldered Dove	√	√	√
Geopelia cuneata	Diamond Dove	√		
Ocyphaps lophotes	Crested Pigeon	√	√	√
Phaps chalcoptera	Common Bronzewing	√	√	√
Corcoracidae				
Corcorax melanorhamphos	White-winged Chough	√	√	√
Struthidea cinerea	Apostlebird	√	√	√
Corvidae				
Corvus coronoides	Australian Raven	√	√	√
Corvus mellori	Little Raven	√	√	√
Cuculidae				
Cuculus pallidus	Pallid Cuckoo	√	√	√
Chalcites basalis	Horsefield's Bronze-cuckoo	√		
Chalcites sp.	Unknown Cuckoo	√		

BIRDS				
Scientific name	**Common name**	**JC-EC**	**NPWS**	**CP**
Dicruridae				
Grallina cyanoleuca	Magpie-lark	√	√	√
Rhipidura albiscapa	Grey Fantail	√	√	√
Rhipidura leucophrys	Willie Wagtail	√	√	√
Myiagra inquieta	Restless Flycatcher	√		
Falconidae				
Falco berigora	Brown Falcon	√	√	√
Falco cenchroides	Nankeen Kestrel	√	√	√
Falco peregrinus	Peregrine Falcon	√	√	√
Falco longipennis	Australian Hobby	√		
Halcyonidae				
Dacelo novaeguineae	Laughing Kookaburra	√	√	√
Todiramphus pyrrhopygia	Red-backed Kingfisher	√	√	√
Merops ornatus	Rainbow Bee-eater	√	√	√
Hirundinidae				
Hirundo neoxena	Welcome Swallow	√	√	√
Petrochelidon nigricans	Tree Martin	√	√	√
Laridae				
Larus novaehollandiae	Silver Gull		√	√
Megapodiidae				
Leipoa ocellate (TS)	Malleefowl		√	√
Maluridae				
Malurus cyaneus	Superb Fairy-wren	√		
Malurus splendens	Splendid Fairy-wren	√		
Meliphagidae				
Acanthagenys rufogularis	Spiny-cheeked Honeyeater	√	√	√
Certhionyx variegates (TS)	Pied Honeyeater	√		
Certhionyx niger	Black Honeyeater	√		
Entomyzon cyanotis	Blue-faced Honeyeater	√	√	√
Epthianura albifrons	White-fronted Chat	√	√	√
Epthianura tricolor	Crimson Chat	√		
Lichenostomus ornatus	Yellow-plumed Honeyeater	√		
Lichenostomus penicillatus	White-plumed Honeyeater	√	√	√
Lichenostomus plumulus	Grey-fronted Honeyeater		√	√
Lichenostomus virescens	Singing Honeyeater	√	√	√
Lichmera indistincta	Brown Honeyeater		√	√

BIRDS				
Scientific name	**Common name**	**JC-EC**	**NPWS**	**CP**
***Meliphagidae* (Cont'd)**				
Manorina flavigula	Yellow-throated Miner		√	√
Manorina melanocephala	Noisy Miner	√	√	√
Melithreptus brevirostris	Brown-headed Honeyeater	√		
Philemon corniculatus	Noisy Friarbird	√		
Philemon citreogularis	Little Friarbird	√		
Plectorhyncha lanceolata	Striped Honeyeater	√	√	√
Meropidae				
Merops ornatus	Rainbow Bee-eater	√	√	√
Pachycephalidae				
Colluricincla harmonica	Grey Shrike-thrush	√	√	√
Oreoica gutturalis	Crested Bellbird	√	√	√
Pachycephala rufiventris	Rufous Whistler	√	√	√
Pachycephala inornata	Gilbert's Whistler		√	√
Pardalotidae				
Acanthiza apicalis	Inland Thornbill	√	√	√
Acanthiza chrysorrhoa	Yellow-rumped Thornbill	√	√	√
Acanthiza nana	Yellow Thornbill	√	√	√
Acanthiza uropygialis	Chestnut-rumped Thornbill	√	√	√
Aphelocephala leucopsis	Southern Whiteface	√	√	√
Gerygone fusca	Western Gerygone	√		√
Pardalotus striatus	Striated Pardalote	√	√	√
Pardalotus punctatus	Striated Pardalote	√		
Pyrrholaemus sagittatus	Speckled Warbler	√	√	√
Smicrornis brevirostris	Weebill	√		
Petroicidae				
Microeca fascinans	Jacky Winter	√	√	√
Petroica goodenovii	Red-capped Robin	√	√	√
Melanodryas cucullate (TS)	Hooded Robin	√		
Eopsaltria australis	Eastern Yellow Robin	√		
Phalacrocoracida				
Phalacrocorax carbo	Great Cormorant		√	√
Phalacrocorax melanoleucos	Little Pied Cormorant		√	√
Phalacrocorax varius	Pied Cormorant		√	√
Phalangeridae				
Poliocephalus poliocephalus	Hoary-headed Grebe		√	√
Tachybaptus novaehollandiae	Australasian Grebe	√		

BIRDS				
Scientific name	**Common name**	**JC-EC**	**NPWS**	**CP**
Ploceidae				
Taeniopygia guttata	Zebra Finch	√		
Stagonopleura guttata (TS)	Diamond Firetail	√	√	√
Pomatostomidae				
Pomatostomus superciliosus	White-browed Babbler	√	√	√
Pomatostomus temporalis temporalis (TS)	Grey-crowned Babbler (eastern subsp.)	√	√	√
Ptilonorhynchida				
Chlamydera maculata	Spotted Bowerbird	√		
Psittacidae				
Barnardius zonarius	Australian Ringneck	√	√	√
Melopsittacus undulatus	Budgerigar	√	√	√
Neophema chrysostoma	Blue-winged Parrot	√	√	√
Northiella haematogaster	Blue Bonnet	√	√	√
Platycercus adscitus eximius	Eastern Rosella		√	√
Psephotus haematonotus	Red-rumped Parrot	√	√	√
Psephotus varius	Mulga Parrot	√	√	√
Polytelis swainsonii (TS)	Superb Parrot	√	√	√
Recurvirostridae				
Himantopus himantopus	Black-winged Stilt		√	√
Recurvirostra novaehollandiae	Red-necked Avocet		√	√
Scolopacidae				
Tringa nebularia	Common Greenshank		√	√
Sturnidae				
Sturnus vulgaris	Common Starling	√	√	√
Threskiornithida				
Platalea flavipes	Yellow-billed Spoonbill		√	√
Threskiornis molucca	Australian White Ibis	√	√	√
TOTAL BIRDS		**95**	**92**	**94**

JC-EC – survey results from Dec 04, June 05 & Sept 05, CP – Cobar Peneplain Bioregional Assessment (including Masters & Foster 2000), NPWS – Wildlife Atlas, Nymagee 1:100,000 mapsheet & Cobar LGA search)

MAMMALS				
Scientific name	**Common name**	**JC-EC**	**NPWS**	**CP**
Bovidae				
Capra hircus	Goat	√	√	√
Canidae				
Vulpes vulpes	Fox	√	√	√
Dasyuridae				
Antechinomys laniger (TS)	Kultarr		√	√
Antechinus flavipes	Yellow-footed Antechinus	√	√	√
Sminthopsis crassicaudata	Fat-tailed Dunnart		√	√
Sminthopsis murina	Common Dunnart		√	√
Sminthopsis macroura (TS)	Stripe-faced Dunnart			√
Ningaui yvonneae (TS)	Southern Ningaui		√	
Felidae				
Felis catus	Cat	√	√	√
Phalangeridae				
Trichosurus vulpecula	Common Brushtail Possum	√	√	√
Macropodidae				
Petrogale penicillata (TS)	Brush-tailed Rock-wallaby		√	
Macropus fuliginosus	Western Grey Kangaroo	√	√	√
Macropus giganteus	Eastern Grey Kangaroo	√	√	√
Macropus robustus	Common Wallaroo	√	√	√
Macropus rufus	Red Kangaroo	√	√	√
Wallabia bicolor	Swamp Wallaby			√
Molossidae				
Mormopterus planiceps (lpf)	Freetail Bat	√	√	√
Mormopterus planiceps (spf)	Freetail Bat	√	√	√
Mormopterus planiceps sp	Unknown Freetail Bat	√	√	
Nyctinomus australis	White-striped Freetail-bat	√	√	√
Saccolaimus flaviventris (TS)	Yellow-bellied Sheathtail-bat			√
Suidae				
Sus scrofa	Pig	√	√	√
Tachyglossidae				
Tachyglossus aculeatus	Short-beaked Echidna		√	√
Pteropus scapulatus	Little Red Flying-fox			√

MAMMALS				
Scientific name	**Common name**	**JC-EC**	**NPWS**	**CP**
Vespertilionidae				
Chalinolobus gouldii	Gould's Wattled Bat	√	√	√
Chalinolobus picatus (TS)	Little Pied Bat	√	√	√
Nyctophilus geoffroyi	Lesser Long-eared Bat	√	√	√
Nyctophilus gouldi	Gould's Long-eared Bat		√	√
Nyctophilus timoriensis (TS)	Greater Long-eared Bat			√
Scotorepens sp.	Unknown Broad-nosed Bat			√
Scotorepens balstoni	Inland Broad-nosed Bat	√		√
Scotorepens greyii	Little Broad-nosed Bat		√	√
Vespadelus sp.	Unknown Forest Bat	√		√
Vespadelus baverstocki (TS)	Inland Forest Bat			√
Vespadelus vulturnus	Little Forest Bat		√	√
TOTAL MAMMALS		**19**	**24**	**30**

Appendix 3 – Threatened biota of the region

Species bolded were recorded during JC-EC surveys.

Reptile & Amphibian Species	Source	Legal Status	
		NSW	National
Threatened reptile species			
Tiliqua occipitalis Western Blue-tongued Lizard	B	Vulnerable (Schedule 2)	
Litoria raniformis Southern Bell Frog		Endangered (Schedule 1-part 1)	Vulnerable
Reptiles of conservation concern not listed as threatened species			
Gehyra dubia Dubious Dtella	#		
Ctenophorus fordi Mallee Sand-Dragon	#		
Suta nigriceps Short-tailed Snake	#		

Bird Species	Source	Legal Status	
		NSW	National
Threatened bird species			
Burhinus grallarius Bush Stone-curlew	B	Endangered (Schedule 1-part 1)	
Ardeotis australis Australian Bustard	B	Endangered (Schedule 1-part 1)	
Falco hyoleucos Grey Falcon	B	Vulnerable (Schedule 2)	
Lophoictinia isura Square-tailed Kite	B	Vulnerable (Schedule 2)	
Rostratula benghalensis Painted Snipe	B, EA	Vulnerable (Schedule 2)	
Limosa limosa Black-tailed Godwit	B	Vulnerable (Schedule 2)	Vulnerable, WSMP
Grus rubicundus Brolga	B	Vulnerable (Schedule 2)	WSMP
Stictonetta naevosa Freckled Duck	B	Vulnerable (Schedule 2)	
Oxyura australis Blue-billed Duck	B	Vulnerable (Schedule 2)	
Anseranas semipalmate Magpie Goose	B	Vulnerable (Schedule 2)	
Botaurus poiciloptilus Australasian Bittern	B	Vulnerable (Schedule 2)	
Cacatua leadbeateri **Pink Cockatoo**	**B, NP1,CP, ***	**Vulnerable** **(Schedule 2)**	

Bird Species	Source	Legal Status	
		NSW	National
Calyptorhynchus lathami Glossy Black-Cockatoo	B, NP	Vulnerable (Schedule 2)	
Calyptorhynchus banksii Red-tailed Black-Cockatoo	B	Vulnerable (Schedule 2)	
Polytelis swainsonii **Superb Parrot**	**B,CP, EA, ***	**Vulnerable** **(Schedule 2)**	
Neophema pulchella Turquoise Parrot	B	Vulnerable (Schedule 2)	Vulnerable
Ninox connivens Barking Owl	B, CP, *	Vulnerable (Schedule 2)	
Tyto novaehollandiae Masked Owl	B	Vulnerable (Schedule 2)	
***Pomatostomus temporalis temporalis* (eastern subspecies)** **Grey-crowned Babbler**	**NP1 ***	**Vulnerable** **(Schedule 2)**	
Drymodes brunneopygia Southern Scrub-robin	B	Vulnerable (Schedule 2)	
Melanodryas cucullata **Hooded Robin**	**OS ***	**Vulnerable** **(Schedule 2)**	
Pachycephala inornata Gilbert's Whistler	B, NP1, CP, *	Vulnerable (Schedule 2)	Vulnerable
Pachycephala fogularis Red-lored Whistler		Endangered (Schedule 1-part 1)	
Cinclosoma castanotus **Chestnut Quail-thrush**	**B, CP, ***	**Vulnerable** **(Schedule 2)**	
Hylacola cauta Shy Heathwren	B, CP, *	Vulnerable (Schedule 2)	
Chthonicola sagittate **Speckled Warbler**	**NP1, ***	**Vulnerable** **(Schedule 2)**	
Lathamus discolour Swift Parrot	B	Endangered (Schedule 2)	Endangered TSMP
Xanthomyza phrygia Regent Honeyeater		Endangered (Schedule 1-part 1)	
Melithreptus gularis **Black-chinned Honeyeater**		**Vulnerable** **(Schedule 2)**	
Certhionyx variegatus **Pied Honeyeater**	**B, CP, ***	**Vulnerable** **(Schedule 2)**	
Grantiella picta Painted Honeyeater	B	Vulnerable (Schedule 2)	
Stagonopleura guttata **Diamond Firetail**		**Vulnerable** **(Schedule 2)**	**Vulnerable, TSMP**
Leipoa ocellata Malleefowl	B, NP1, EA	Endangered (Schedule 1-part 1)	
Amytornis striatus Striated Grasswren		Vulnerable (Schedule 2)	Vulnerable
Birds of conservation concern/declining woodland birds not listed as threatened species			
Acanthiza reguloides **Buff-rumped Thornbill**	*		

Bird Species	Source	Legal Status	
		NSW	National
Climacteris picumnus **Brown Treecreeper**	* ##		
Cinclosoma castaneothorax Chestnut-breasted Quail	*		
Oreoica gutturalis **Crested Bellbird**	*		
Acanthiza uropygialis **Chestnut-rumped Thornbill**	*		
Eopsaltria australis Eastern Yellow-robin	* ##		
Microeca fascinans **Jacky Winter**	* ##		
Pteroica goodenovii **Red-capped Robin**	* ##		
Mygagra inquiteta **Restless Flycatcher**	*		
Pachycephala rufiventris **Rufous Whistler**	* ##		
Aphelocephala leucopsis **Southern Whiteface**	* ##		
Chlamydera maculate **Spotted Bowerbird**	*		
Daphoenositta chrysoptera **Varied sitella**	* ##		
Pomatostomus superciliosus **White-browed Babbler**	* ##		
Climacteris affinis White-browed Treecreeper	* ##		
Artamus superciliosus **White-browed Woodswallow**	* ##		
Artamus cyanopterus **Dusky Woodswallow**	* ##		
Pachycephala pectoralis Golden Whistler	* ##		
Oriolus sagittatus Olive-backed Oriole	*		
Platalea regia Royal Spoonbill	*		

Mammal Species	**Source**	**Legal Status**	
		NSW	**National**
Threatened MAMMALS (exc. bats)			
Phascolarctos cinereus Koala	B, NP1	Vulnerable (Schedule 2)	
Antechinomys laniger Kultarr	B, CP, +	Endangered (Schedule 1-part 1)	
Macrotis lagotis Bilby	B	Presumed Extinct (Schedule 1-part 4)	
Onychogalae fraenata Brindled Natil-tail Wallaby	B	Presumed Extinct (Schedule 1-part 4)	
Petrogale penicillata Brush-tailed Rock-wallaby	B, NP11	Endangered (Schedule 1-part 1)	
Bettongia penicillata Brush-tailed Bettong	B	Presumed Extinct (Schedule 1-part 4)	
Aepyprymnus rufescens Rufous Bettong	B	Vulnerable (Schedule 2)	
Ningaui yvonneae Southern Ningaui	NP	Vulnerable (Schedule 2)	
Phascogale tapoatafa Brush-tailed Phascogale	B	Vulnerable (Schedule 2)	
Pseudomys gouldii Gould's Mouse	B	Presumed Extinct (Schedule 1-part 4)	
Rattus villosissimus Long-haired Rat	B	Vulnerable (Schedule 2)	
Sminthopsis macroura Stripe-faced Dunnart	B, CP, +	Vulnerable (Schedule 2)	
Dasyurus maculatus Tiger Quoll	B	Vulnerable (Schedule 2)	
Courus albipes White-footed Rabbit-rat	B	Presumed Extinct (Schedule 1-part 4)	
Threatened mammals - BATS			
Chalinolobus picatus **Little Pied Bat**	**B, NP1, CP, +**	**Vulnerable** **(Schedule 2)**	
Vespadelus baverstocki Inland Forest Bat	B, CP, +	Vulnerable (Schedule 2)	
Nyctophilus timoriensis Greater Long-eared Bat	B,CP, EA, +	Vulnerable (Schedule 2)	Vulnerable
Saccolaimus flaviventris Yellow-bellied Sheathtail Bat	B, CP, +	Vulnerable (Schedule 2)	
Mammals of conservation concern			
Antechinus flavipes **Yellow-footed Antechinus**	+		
Sminthopsis murina Common Dunnart	+		
Trichosurus vulpecula **Common Brushtail Possum**	+		
Wallabia bicolour Swamp Wallaby	+		
Pteropus scapulatus Little Red Flying-fox	+		

Flora Species	**Source**	**Legal Status**	
		NSW	**National**
Acacia curranii	B, EA	Vulnerable (Schedule 2)	Vulnerable
Austrostipa metatoris	EA	Vulnerable (Schedule 2)	Vulnerable
Austrostipa wakoolica	B	Endangered (Schedule 1-part 1)	Endangered
Brachyscome papillosa		Vulnerable (Schedule 2)	Vulnerable
Caladenia arenaria		Endangered (Schedule 1-part 1)	Endangered
Diuris sheaffiana	EA	Vulnerable (Schedule 2)	Vulnerable
Goodenia occidentalis	NP1, B	Endangered (Schedule 1-part1)	
Lepidium aschersonii		Vulnerable (Schedule 2)	Vulnerable
Lepidium monoplocoides	NP1, EA	Endangered (Schedule 1-part1)	Endangered
Pterostylis cobarensis	EA	Vulnerable (Schedule 2)	Vulnerable
Rulingia procumbens	B, NP1	Vulnerable (Schedule 2)	
Swainsona murrayana	B, EA	Vulnerable (Schedule 2)	Vulnerable
Swainsona pyrophila	EA,B	Vulnerable (Schedule 2)	Vulnerable
Swainsona sericea	NP1	Vulnerable (Schedule 2)	
Lomandra patens	RT, CP	3Rca	
Osteocarpum pentapterum	RBG	Presumed Extinct	
Philotheca difformis	NP1	P13	
Philotheca myoporoides subsp. tomentosa	NP1	P13	

Endangered Population	**Source**	**Legal Status**	
		NSW	**National**
Calyptorhynchus lathami Glossy Black-Cockatoo	NP2	Endangered Population (Schedule 1-part 2)	

Endangered Ecological Community	**Source**	**Legal Status**	
		NSW	**National**
Acacia loderi shrublands	NP2	Endangered Population (Schedule 1-part 2)	

LEGEND TO APPENDIX 3

Source:

NP1 - NSW NPWS Wildlife Database Atlas (26/11/04) – licensed version (8133 map sheet search);

B - NSW NPWS Wildlife predictive list of endangered populations and ecological communities;

CP – Cobar Peneplain Bioregional Assessment – investigating fauna distributions on the Cobar Peneplain;

EA - Environment Australia Online Database (26/11/04) – interactive map searcher http://www.environment.gov.au/epbc/db/interact.html; and

RT - Rare or Threatened Australian Plant Species database (ROTAP).

RBG = PlantNet – Royal Botanic Gardens Online database

Reptiles and amphibians of conservation concern
- Sadlier, R. A. and Pressey, R.L. (1994) Reptiles and amphibians of particular conservation concern in the Western Division of NSW: a preliminary review. *Biological Conservation* 69:41-54 and Sadlier, R. A., Pressey, R.L. and Whish, G. L. (1996) *Reptiles and amphibians of particular conservation concern in the western division of New South Wales: distribution, habitats and conservation status*. NSW National Parks and Wildlife Service, Hurstville.

Birds of conservation concern/declining woodland birds
* - Smith, P. J., Pressey, R. L. and Smith, J. E. (1994) Birds of particular conservation concern in the western division of New South Wales. *Biological Conservation* 69: 315-338.
- declining woodland bird references

Mammals of conservation concern
+ - Dickman, C. R., Pressey, R. L., Lim, L. and Parnaby, H. E. (1993) Mammals of particular conservation concern in the Western Division of New South Wales. *Biological Conservation* 65: 219-248.

Flora of conservation concern (threatened species and regional)
- Bowen listed in Bowen, P.F. and Pressey, R.L. (1993) - *Localities and habitats of plants with restricted distributions in the Western Division of New South Wales*. Occasional Paper No.17, NSW National Parks and wildlife Service as being in danger of at least regional extinction.
RT - Briggs and Leigh (1995) *Rare or Threatened Australian Plants*. CSIRO.

Legal Status:

NSW: identifies the legal status of species as listed under the NSW *Threatened Species Conservation Act 1995*.

National: identifies the legal status of species as listed under the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999*.

FMA: identifies the species as listed under the *NSW Fisheries Management Act*.

TSMP: Terrestrial species covered by migratory provisions of the EPBC Act 1999.

WSMP: Wetland species covered by migratory provisions of the EPBC Act 1999.

Appendix 4 – Threatened biota profiles

THREATENED FLORA SPECIES PROFILES

Austrostipa metatoris
Occurs in the Murray Valley, from the central-western slopes to the far south-western plains. Sites include Cunninyeuk Station, Stony Crossing, Kyalite SF and Lake Cargelligo.

Grows in sandy areas of the Murray Valley; habitats include sandhills, sandridges, undulating plains and flat open mallee country, with red to red-brown clay-loam to sandy-loam soils. Associated species include *Eucalyptus populnea, E. intertexta, Callitris glaucophylla, Casuarina cristata, Santalum acuminatum* and *Dodonaea viscosa.* Flowers in response to rain. It is not known if fire plays a role in the ecology of this species. Recorded in populations as locally frequent or dominant only in scattered patches.

A perennial spear-grass that grows in tussocks to 1 m tall. The leaves are tightly rolled, 2 - 4 mm wide, and strongly ribbed. The leaves are densely hairy on the upper surface and the margins are rough. The flower-heads are spreading and branched, 15 - 25 cm long and comprise numerous spikelets 16 - 20 mm long (excluding the awns). The awn (bristle) is weakly twice-bent and 5.5 - 6.5 cm long.

Threats include: grazing; total grazing pressure has increased with higher numbers of rabbits, domestic stock and kangaroos. Habitat degradation; sandy habitats are threatened by rabbits and the impacts of stock. Drought; as the species is rainfall-dependant, the flowering season is affected by drought or prolonged dry periods. (DEC NSW 2005)

Austrostipa wakoolica
Confined to the floodplains of the Murray River tributaries of central-western and south-western NSW, with localities including Manna State Forest, Matong, Lake Tooim, Merran Creek, Tulla, Cunninyeuk and Mairjimmy State Forest. A densely-tufted, perennial spear-grass that grows to 1 m tall. The leaves are flattened or rolled, 1.5 - 2.5 mm wide at their bases, slightly to strongly ribbed, and densely hairy. The flower-heads are spreading and moderately dense, to 36 cm long, comprising gaping spikelets 11 - 15 mm long (excluding the awn). The awn (bristle) is twice-bent and 3.5 - 6 cm long.

Grows on floodplains of the Murray River tributaries, in open woodland on grey, silty clay or sandy loam soils; habitats include the edges of a lignum swamp with box and mallee; creek banks in grey, silty clay; mallee and lignum sandy-loam flat; open Cypress Pine forest on low sandy range; and a low, rocky rise. Associated species include *Callitris glaucophylla, Eucalyptus microcarpa, E. populnea, Austrostipa eremophila, A. drummondii, Austrodanthonia eriantha* and *Einadia nutans*.

Flowers from October to December, mainly in response to rain. Seed dispersal is mainly by wind, rain and flood events; the awn and sharp point of the floret appear to be an adaptation for burying the seed into the soil; grass seed is traditionally believed to be viable for three to five years, so a long-lived seed bank is considered unlikely for this species. Recorded as common in the Mairjimmy State Forest population.

Threats include: habitat reduction and modification from pastoral development, irrigation and altered flooding regimes. Grazing; total grazing pressure has increased with higher numbers of rabbits, domestic stock and kangaroos. Drought, as the species is rainfall-dependant, the flowering season is affected by drought or prolonged dry periods. Weed invasion and competition, particularly from exotic grasses. (DEC NSW 2005)

Brachyscome papillosa
Occurs chiefly from Mossgiel to Urana, in south-western NSW, with sites in the Jerilderie area, the Hay Plain, Willandra Lakes district and north to Ivanhoe. A north-western outlier is at Byrnedale Station, north of Menindee. The only known site on South Western Slopes is Ganmain Reserve.

The Mossgiel Daisy is a multi-stemmed, perennial herb that grows to 40 centimetres tall. The young shoots are woolly. Its stemless leaves are up to 7 cm long. Leave edges may vary from being smooth-edged to deeply indented. Its flower-heads, mauve with a yellow centre, are solitary and 6 - 11 mm in diameter. The flowering stem is 10 - 25 cm long. Flowers appear between June and December.

Recorded primarily in clay soils on Bladder Saltbush (Atriplex vesicaria) and Maireana aphylla plains, but also in grassland and in Grey Box (Eucalyptus microcarpa) - Cypress Pine (Callitris spp.) woodland. Flowers from June to December. Recorded as locally occasional to common in populations.

Threats include: may be affected by changes in agricultural practices. Possible habitat disturbance during road maintenance. Grazing is a potential threat to populations as the species is possibly palatable to stock. (DEC NSW 2005)

Caladenia arenaria
Caladenia arenaria is found mostly on the south west plains and western south west slopes. The original description is of a plant from Nangus, west of Gundagai (1865) and there is a report of the species from Adelong near Tumut. A record near Cootamundra needs verifying. Caladenia arenaria is currently only known to occur in the Riverina between Urana and Narrandera.

Sand-hill Spider Orchid is from a group of orchids characterised by five long, spreading petals and sepals around a broad down-curled labellum (‘lip’). Its densely hairy leaves are reddish at the base, up to 10 cm long and 6 mm wide. The flower stalk is up to 40 cm tall and has 1 or 2 pale yellow flowers. The petals and lateral sepals are stiffly spread into a cross shape; the tips of all are red and hairy. The labellum is only 8 mm across when flattened out and without lobes; this combination of flower characters is unique. The flowers appear between September and November.

Occurs in woodland with sandy soil, especially that dominated by White Cypress-pine (*Callitris glaucophylla*). This species is found in the Murrumbidgee catchment and is predicted for the Murray catchment.

Threats include: a lack of security. At risk from catastrophic events because of small number of extant populations and low number of plants. Weed competition. Possibly sensitive to grazing by domestic and feral animals. (DEC NSW 2005)

Diuris sheffiana
Now known as *Diuris tricolor* the Pine Donkey Orchid is a terrestrial species (it grows from the ground rather than from rocks or vegetation). Sporadically distributed on the western slopes of NSW, extending from south of Narrandera all the way to the far north of NSW. Localities include the Condobolin-Nymagee road, Wattamondara towards Cowra, Cooyal, Adelong, Red Hill north of Narrandera, Coolamon, near Darlington Point, Eugowra, Girilambone, Dubbo, Muswellbrook, and several sites west of Wagga Wagga.

It has between one and three leaves, to 30 centimetres long and 4mm wide. The flower stalk is between 20-40cm high and has 2-6 flowers, which are bright yellow to orange, speckled with red to purple and white markings.

The sepals (the down-pointing slender green segments) and very long and often crossed. The flowers appear between September and November and should be unmistakable.

The Pine Donkey Orchid grows in sclerophyll forest among grass, often with native Cypress Pine (*Callitris* spp.). It is found in sandy soils, either on flats or small rises. Also recorded from a red earth soil in a Bimble Box community in western NSW. Soils include gritty orange-brown loam on granite, shallow red loamy sand on stony porphyry, skeletal lateritic soil and alluvial grey silty loam. Flowers from September to November or generally spring. The species is a tuberous, deciduous terrestrial orchid and the flowers have a pleasant, light sweet scent. Disturbance regimes are not known, although the species is usually recorded from disturbed habitats.

Threats include: habitat clearing and modification. The species requires a grassy component to the ground layer to provide some protection and moisture-retaining litter. The short duration of its flowering means that it will be impossible to detect when some developments are assessed for their impact on threatened species. The sandy soils and grassy open areas where this orchid grows are vulnerable to rabbit and goat disturbance and weed competition. (DEC NSW 2005)

Lepidium aschersonii
Not widespread, occurring in the marginal central-western slopes and north-western plains regions of NSW. Previously recorded from West Wyalong (1943), Barmedman (1931) and Temora (1915), however these populations have not been relocated. A more recent survey has located several populations at Narrabri, from where the species was last recorded in 1899.

Erect perennial herb to 30cm high, hairy and intricately branched, with the smaller branches spinescent. Plants become woody and more spinose in dry conditions. Basal leaves lobed, to 12 cm long, leaves reducing in size up the stem. Flowers small, borne in elongated clusters terminating in a spine. Fruit a 2-celled, flattened circular pod on a spreading stalk, 4mm long and 2.5mm wide, with slight wings in the upper half forming a small notch at the apex.

Found on ridges of gilgai clays dominated by Brigalow (*Acacia harpophylla*), with *Austrodanthonia* and/or *Austrostipa* species in the understorey. Grows as a component of the ground flora, in grey loamy clays along the gilgai ridges. Vegetation structure varies from open to dense Brigalow, with sparse grassy understorey and occasional heavy litter. Flowers from spring to autumn. Plants in the Narrabri population have been observed producing abundant seed, and as the species is believed to be short-lived and large numbers of plants were present at the site, Lepidium aschersonii appears to be successfully reproducing.

Populations have been known to immediately disappear following inundation by flooding, reappearing several seasons later. An apparent increase in numbers during drought conditions has also been observed. The species is reported to be salt tolerant and also grows well under dry conditions. Recorded population sizes vary from 10 to 2000+ plants. Plant numbers decrease with increasing overstorey density, and plants were not found where the Brigalow canopy cover exceeded about 60%. The species is often described as a “weed” where it dominates paddocks.

Threats include: weed invasion (intense competition from trees and introduced grasses reduces plant densities), grazing (grazed by stock and rabbits at basal rosette stage), land development (tree clearing, levelling and crop establishment), trampling and soil compaction (reduces seedling regeneration), roadworks, rubbish dumping and grazing by introduced snails and slugs. (DEC NSW 2005)

Swainsona murrayana

Found throughout NSW, it has been recorded in the Jerilderie and Deniliquin areas of the southern riverine plain, the Hay plain as far north as Willandra National Park, near Broken Hill and in various localities between Dubbo and Moree. A sparsely-downy forb with greyish, thin or tapered, stiffly leathery pods. The pea-like flowers are pink or purple with red stripes on densely and darkly hairy slender stalks. It is distinguished by the strongly twisted hypanthium and keel with retracted tip.

The species has been collected from clay-based soils, ranging from grey, red and brown cracking clays to red-brown earths and loams. Grows in a variety of vegetation types including bladder saltbush, black box and grassland communities on level plains, floodplains and depressions and is often found with Maireana species. Plants have been found in remnant native grasslands or grassy woodlands that have been intermittently grazed or cultivated. Plants produce winter-spring growth, flower in spring to early summer and then die back after flowering. They re-shoot readily and often carpet the landscape after good cool-season rains. The species may require some disturbance and has been known to occur in paddocks that have been moderately grazed or occasionally cultivated.

Threats include; heavy grazing by domestic stock, loss of grassland habitat to cultivation (pasture improvement or crops, particularly rice crops), invasion of grassland habitat by exotic species due to ploughing or heavy grazing of paddocks, increased salinisation, frequent fires, feral animal grazing, urban developments and the expansion of townships into surrounding. (DEC NSW 2005)

Swainsona sericea

In NSW, this species has been collected from the Lachlan district (Bowen and Pressey, 1993) northern tablelands to the southern tablelands, the Monaro region and further inland on the slopes and plains. There has been one isolated collection from the far north west of NSW. Outside NSW, it occurs in Victoria and South Australia where it is also considered to be threatened. Many collections are from the 1800s or early 1900s, and recent collections indicate that the species has declined significantly across its former range. Extensive surveys in the northern wheatbelt and southern box woodlands have failed to find the species, whilst it has been found very rarely in surveys of the northern tablelands and Riverina areas. It grows in grassland and eucalypt woodland, sometimes with *Callitris* species (Bowen and Pressey, 1993). Estimates of abundance are largely unknown, but where known vary from 50 – 1000 plants. It is likely that less than 10,000 mature individuals remain in NSW. It is sometimes confused with *S. reticulata* and *S. oroboides*, but can be distinguished by the presence of medifixed hairs. Clearing of remnant habitat has been mostly responsible for the decline of this species, which may also be sensitive to grazing pressure. As a number of remaining sites for the species occur on roadsides, they are also susceptible to disturbance associated with the maintenance of these roads (NSW NPWS 1999a).

Osteocarpum pentapterum

In NSW, this species has been known to occur on the north far western plains. There has been one isolated collection in the Tibooburra-Sturt National Park Region. The species has also been recorded outside of NSW in Queensland, South Australia and the Northern Territory. It has been recorded on sites with heavy soils that are subject to flooding (Bowen and Pressey, 1993). The species is a hemispherical annual or short-lived perennial herb, approximately 20 cm high. There are no known associated species or threats to its survival (NSW NPWS 1996).

Swainsona pyrophila

In NSW, this species has been recorded from MT Hope, Menindee, Euston and Buronga. It is also found in Kinchega National Park (Bowen and Pressey, 1993). It is not a common species within western NSW and is found as scattered plants or in isolated clumps. It grows on sandy or loamy soils and has been recorded in mallee and black bluebush communities. It is usually only found after fire (Bowen and Pressey, 1993). The species has also been recorded outside of NSW in Victoria and South Australia. Threats to its survival are unknown but may be linked to a change in fire regime.

Acacia curranii
In NSW, this species has been recorded in the north western and south western plains, from Cobar to Hillston. There are three disjunct areas of occurrence known: Lake Cargelligo and the Gunderbooka ranges in NSW, and Gurulmundi in Queensland. The species grows in acacia shrubland and mallee on rocky outcrops (Bowen and Pressey, 1993). In the Lake Cargelligo area it occurs on trachyte, rhyolite, porphyry, and on sandstone in the Gunderbooka ranges. In other areas of NSW it occurs on acidic skeletal sandy soil and on the foot-slopes or north facing crests of rocky outcrops of sandstone and acid igneous sediments. There have been no seedlings recorded at any site. *A. currannii* regenerates from root suckers after fire and attempts to germinate seeds after pre sowing treatment have been largely unsuccessful. It is associated with *Eucalyptus dwyeri, Acacia triptera, A. doratoxylon* in mallee/shrubland and *E. intertexata/ Callitris glaucophylla, E. microcarpa/C. glaucophylla* woodland in the Lake Cargelligo area, and *E.morrisii/C. galucophylla* woodland in the Gunderbooka ranges. Threats to the species survival include clearing, grazing, quarrying, insect seed predatation, low seed viability and fire (lack of suitable disturbance for seedling establishment) (NSW NPWS 1996).

Goodenia occidentalis
In NSW, this species has been recorded from the Louth district of the north western plains. The species has also been recorded outside of NSW in South Australia and Western Australia. It grows in a variety of drier communities on deep red sand to sandy loam (Bowen and Pressey, 1993). There are no known associated species or threats (NSW NPWS 1996).

Pterostylis cobarensis
In NSW, this species has been recorded in the north and south far western plains and the north western plains from Nyngan to the Bourke district. There are sixteen populations ranging from a few to a 100 individuals, which are known from an area of about 240 by 100 kilometres. It grows among rocks on low hills or slopes, above streams, and on skeletal soils in sheltered locations between rocks and under trees. It is associated with *Callitris glaucophylla*. Threats to the species survival include grazing (feral goats, sheep and rabbits), trampling (feral goats), development (waste disposal site at Cobar) and mining (NSW NPWS 1996)

Philotheca brevifolia (syn Eriostemon brevifolius)
In NSW, this species occurs mainly in the Griffith district but extends as far west as the Cocoparra Range and north to near Lake Cargelligo. It is an uncommon species and usually occurs as single isolated plants. It usually grows in mallee communities on red sandy soils. It is recorded as occurring on shale hills with gravel soils by Bowen and Pressey, (1993).The species is not conspicuous except when flowering (late winter to early summer). There are no known associated species or threats.

Philotheca difformis* subsp. d*ifformis (*syn *Eriostemon difformis)
In NSW, this species is widespread in inland districts, west from Boggabri and West Wyalong. The species is relatively uncommon, usually occurring singly or in groups of a few plants. It grows in mallee communities, woodland and dry sclerophyll forest on red sandy and skeletal soils of hilly areas. There are no known associated species or threats.

Philotheca linearis* (syn. *Eriostemon linearis)
This small shrub grows in rocky areas with skeletal soils, chiefly in Cobar--Bourke--Broken Hill district. There are no known associated species or threats.

Philotheca myoporoides* subsp. *acutus (*syn. *Eriostemon myoporoides)
In NSW, this species occurs on the central western slopes, south western slope, north western plains and south western plains. Its range extends as far west as Rankin Springs and to near Cobar. The species grows on hilly areas with sandstone and quartzite (Bowen and Pressey, 1993), usually in currawang (*Acacia doratoxylon)* communities. There are no known threats.

Rulingia procumbens
In NSW, this species occurs on the central western slopes, north western plains and south western plains, throughout the Dubbo-Mendooran-Gilgandra region and also in the Pilliga and Nymagee areas. The species grows on sandy sites, often along roadsides. It is associated with *Eucalyptus dealbata, E. sideroxylon* and *Melaleuca uncinata.* Threats to the species survival include clearing of woodlands and road construction (a threat since it often grows on road verges).

Lepidium monoplocoides
In NSW, this species was once widespread in the semi arid regions (the northwest plains, south west plains, north far west plains and south far west plains). Outside of NSW it occurred in Victoria and possibly South Australia. The species is now very rare (Leigh *et al.* 1984, Retter and Harden 1990). It has been recorded from the Cobar, Bourke, Lake Cargelligo, Deniliquin, and Euabalong districts. Most collections in NSW and Victoria have been made from semi-arid regions supporting mallee shrubland (Leigh *et al.* 1984). In NSW the species has also been recorded from Bimble Box (*Eucalyptus populnea*) communities and in woodlands and grasslands of the Riverine Plain including Urana Nature Reserve (Cunningham *et al.* 1981, Benson *et al.* 1996, Bowen and Pressey, 1993). Most collections were made in the first half of the century or earlier. A collection from the Euabalong district was made from an open plain subject to infrequent flooding (ROTAP 1995). There are no known associated species. Threats include grazing (domestic stock, rabbits and increased numbers of kangaroos) and clearing (for cereal crops).

THREATENED FAUNA SPECIES PROFILES

***Tiliqua occipitalis* (Western Blue-tongued Lizard)**
This species is distributed across south western and south central Australia (Cogger 2000), inhabiting plains, swales, ranges and sometimes dunes of loamy or clayey/sandy soils (Ayers *et al*. 1996). Preferred vegetation types appear to be mixed mallee/*Triodia* woodland communities (Cogger 2000), although it is also found in shrublands (including chenopods), heaths and hummock grasslands. In the Western Zone of NSW, it occurs in the central parts from Broken Hill to Condobolin and south to the Victorian border (Swan 1990). A terrestrial and diurnal species, it is known to utilise rabbit warrens for shelter (Swanson 1987) and has a diet comprising insects, snails, native vegetation and carrion (Swan 1990). Although the specific causes of decline are unknown, Sadlier and Pressey (1994) suggest that fragmentation of habitat through clearing and grazing, the ripping of rabbit warrens, predation by foxes and cats, and baits used for pest control are all likely to be detrimental to this species.

***Grus rubicundus* (Brolga)**
The Brolga is distributed throughout terrestrial wetlands, grasslands and woodlands of tropical and temperate Australia, although is less common in arid and semi-arid regions (Marchant and Higgins 1993). During the northern Australian 'dry season' it is concentrated on coastal and sub-coastal swamps dominated by spikerush upon which it feeds on tubers and those of other sedges (Marchant and Higgins 1993). Pairs mate for life and vigorously defend their substantial breeding territory of up to 2.5 km^2, with breeding stimulated by flooding (Arnol. *et* al. 1984; Briggs 1990). Formerly abundant throughout south eastern Australia, however, has been displaced from most settled districts and is now either locally extinct or rare casual visitor to this region (Pizzey and Knight 1997).

The Brolga occurs on extensive open wetlands, including shallow swamps, their margins and floodplains; grasslands, paddocks and ploughed fields, irrigated pastures, stubble crops and salt flats (Serventy 1985; Marchant and Higgins 1993; Pizzey and Knight 1997). Although most feeding occurs near water, they are also known to forage in grasslands, dry wetlands or cultivated areas (Kingsford 1991). Their diet includes seeds, roots, sedges, tubers, aquatic plants, invertebrates and their larvae, small vertebrates and rarely fish (Arnol. *et al*. 1984; Serventy 1985; Siepen 1987; Pizzey and Knight 1997).

Changes to hydrological regimes, such as the drainage of wetland areas or the alteration of their flooding patterns have significantly reduced the availability of suitable habitat for breeding and flocking, especially in Victoria and NSW (Arnol *et al*. 1984; Pizzey and Knight 1997). The density of food items is also severely affected by trampling and grazing by domestic stock, which also reduces nesting opportunities (Arnol *et al*. 1984). There is a high rate of early mortality (egg or chick stages) due to illegal egg collecting, trampling by stock, natural flooding of nest sites, and predation (Arnol *et al*. 1984; Serventy 1985). Large numbers of Brolgas were shot and poisoned, especially in the wheat areas of NSW and Victoria, which led to their decline in these areas.

***Falco hypoleucos* (Grey Falcon)**
Infrequently seen over much of arid and semi-arid Australia, including the Murray-Darling basin, Eyre basin, central Australia and north-western Australia (Blakers *et al.* 1984; Olsen and Olsen 1986; Marchant and Higgins 1993). The distribution of the Grey Falcon is centred on inland drainage systems where there is <500 mm rainfall per year. There it frequents timbered lowland plains, particularly *Acacia* shrublands, which are crossed by tree-lined watercourses. It also hunts far out into treeless areas and frequents tussock grassland and open woodland, especially in winter. Though recorded from most Australian deserts, it generally avoids them (Olsen and Olsen 1986). It is also found near and over swamps and waterholes (Olsen *et al.* 1993). Evidence exists of regular seasonal movements between the arid zone and northern Australia, and possibly New Guinea (Olsen and Olsen 1986), and from the west to the east in Queensland (G. Czechura in Garnett 1992b).

Always at low densities, the total population is estimated at less than 5000 individuals and 1,000 pairs (P. Olsen in Brouwer and Garnett 1990). Nests are usually separated by many kilometres (Olsen and Olsen 1986); in the Pilbara adjacent pairs built nests between 16 and 23 km apart (A. Sutton in Garnett 1992b). It is still not known whether Grey Falcons build their own nests or rely on the adoption of nests built by other birds (Czechura and Debus 1985). They prey on birds, mostly granivorous parrots and pigeons (Marchant and Higgins 1993), and mammals, including dead lambs (Olsen and Olsen 1986). Probably breed throughout arid zone area (Marchant and Higgins 1993). Species may have been eliminated early in 20th century from some former breeding areas, particularly those with more than 250 mm annual rainfall in NSW (Olsen and Olsen 1986; Olsen 1998).

***Stictonetta naevosa* (Freckled Duck)**
The Freckled Duck has been recorded across southern and central Australia. Primarily considered an inland species, during times of drought it apparently seeks refuge in the Murray River Basin, and coastal regions of south eastern Queensland, eastern NSW and southern South Australia (Jaensch and Vervest 1990; Marchant and Higgins 1990; Jaensch and Bellchambers 1997). This species is likely to occur on wetlands in any part of western NSW when conditions are suitable. In inland eastern Australia, it utilises a variety of plankton-rich wetland types, including brackish to hyposaline wetlands that are heavily vegetated with Cumbungi, Lignum, Canegrass (Braithwaite 1976) or Ti-tree (in coastal areas), large open lakes and their shores, rivers, creeks, farm dams, sewage ponds and floodwaters (Marchant and Higgins 1990; Pizzey and Knight 1997). Outside the breeding season, they can be found on permanent open water bodies (fresh and saline), or resting on fallen trees, flood debris and sand spits (Frith 1982; Martindale 1986), moving to the edge of the water body at dusk to feed (Marchant and Higgins 1990).

Changes to the hydrological sequences, which affect flooding patterns through river regulation, water harvesting and other water conservation schemes, pose a major threat to the Freckled Duck. A further threat is the loss of habitat and potential breeding sites through the drainage of swamps for irrigation, flood mitigation works, increased salinity and increased inundation, along with the burning, grazing and clearing of Cumbungi, Lignum and other wetland vegetation that is required by these birds (Marchant and Higgins 1990; Kingsford 1991). The illegal hunting of this species, especially during dry periods when birds are concentrated in a few large groups, also has the potential to remove a large proportion of the population very quickly as this species has the unfortunate tendency to circle low after it has been disturbed (Martindale 1986, Marchant and Higgins 1990; Loyn 1991). There has however been no correlation identified between the abundance of the Freckled Duck and hunting effort (Kingsford *et al*. 1999).

Hylacola cauta **(Shy Heathwren or Shy Hylacola)** – previously *Sericornis cautus*
The Shy Heathwren is distributed in central NSW, between Hay, Griffith, West Wyalong and Cobar (Smith *et al*. 1995; Schodde and Mason 1999), including the Charcoal Tank Nature Reserve where it is common (Ayers *et al*. 1996). They are most abundant in the regrowth that occurs after disturbances, such as fire, but persist at lower densities in unburnt areas (Blakers *et* al. 1984; Smith *et* al. 1995). This species is restricted to dense mallee and feed on the ground, almost entirely on insects and rarely on seeds, including those of saltbush (Garnett and Crowley 2000). They nest near the ground in prickly shrubs or on the ground amongst plants at the base of a shrub or tree (Beruldsen 1980; Schodde and Tidemann 1986). They also appear to have specialised habitat requirements that are yet to be identified because the species is absent from many mallee areas with apparently suitable habitat (Ayers *et al*. 1996).

The distribution of the Shy Heathwren has become severely fragmented, with local extinctions, due to the degradation of suitable mallee habitat caused by clearing, grazing, weed invasion and ill-timed burning (Smith *et* al. 1995; Garnett and Crowley 2000). The ground-dwelling habits of this species also make it vulnerable to predation by feral cats and foxes (Smith *et al*. 1995), although they have persisted in their presence for over 150 years.

Cacatua leadbeateri **(Pink Cockatoo or Major Mitchell's Cockatoo)**
This species is distributed from the Murray-Darling, Eyre and Bulloo River Basins as far north as Isisford and Roma in Queensland, through western NSW to north-west Victoria and west to Adelaide and Mt Mary Plains (Schodde and Mason 1997; Higgins 1999). The Major Mitchell's cockatoo had disappeared from the Adelaide and Mt Mary Plains by the 1950s (Boehm 1961) and density had greatly reduced in north-west Victoria (Emison *et al.* 1987) and western NSW (Cooper and McAllan 1995).

The eastern subspecies of Pink Cockatoo is found in arid and semi-arid zone woodlands dominated by Mulga (*Acacia aneura)*, mallee and box eucalypts, Cypress Pine *Callitris* or Belah (*Casuarina cristate)* where it feeds primarily on seeds, roots and fruits. The main requirements of the species are trees with suitable nesting hollows and fresh surface water (Higgins 1999). Breeding pairs of the western subspecies occupy nests at least 1 km apart with densities of about one pair per 30 km^2 (Saunders *et al.* 1985; Rowley and Chapman 1991).

Calyptorhynchus lathami **(Glossy Black-Cockatoo) and Endangered Riverina Population**
Patchy distribution from Mitchell, Qld, to Mallacoota and possibly Melbourne, Victoria and King Island, Bass Strait (Baird 1986; Schodde *et al.* 1993; Schodde and Mason 1997). Thinly distributed throughout range, with the highest densities east of Great Dividing Range; more scattered distribution inland, to as far west as the Riverina and the Pilliga Scrub (McAllan and Bruce 1988; Ayers *et al*. 1996). Probably breeding throughout range. In Victoria it is no longer found regularly west of Mallacoota (Baird 1986; Schodde *et al.* 1993).

The Glossy Black-Cockatoo is dependent upon *Allocasuarina.* They prefer woodland dominated by *Allocasuarina*, or open sclerophyll forests or woodlands, with middle stratum of *Allocasuarina* below *Eucalyptus* or *Angophora*; often confined to remnant patches in hill and gullies, surrounded by cleared agricultural land. Also in mixed *Allocasuarina, Casuarina, Callitris* or Brigalow (*Acacia harpophylla)* woodland assemblages or dense sclerophyll forests. Rarely observed away from *Allocasuarina* (Higgins 1999). Often in coastal or subcoastal area, but also occurring farther inland in foothills, mountain ranges and plains, especially in *Allocasuarina* associations fringing watercourses or on stony ridges (Higgins 1999). They breed in hollow stumps or limbs, living or dead, or a hole in the trunk of tall trees (usually in eucalypt). Mainly within woodland or remnant woodland, but also recorded within dead, ringbarked eucalypt in cleared country (Higgins 1999). They forage arboreally among branches of fruiting *Allocasuarina*. Prefer mature sparse trees, between 2 and 10 m tall with dense regrowth. Mostly roost in canopy of live leafy trees, preferring eucalypts but will use other species. Usually found less that one kilometre from feeding site and during breeding season within 30 m of nesting tree (Higgins 1999).

The main habitat of the eastern subspecies of Glossy Black-Cockatoo *Calyptorhynchus lathami lathami* is eucalypt woodlands and forests in which there is a sub-canopy or understorey of casuarinas *Allocasuarina*/*Casuarina,* but Brigalow is also used in south-eastern Queensland. The subspecies diet is primarily restricted to the seeds of *Allocasuarina*/*Casuarina*, with seeds of other species (e.g. *Callitris*) locally important (Higgins 1999). The cockatoos must forage for long hours each day to gain sufficient food, particularly during the breeding season, and not all apparently suitable habitat provides adequate food value to support the cockatoos (Clout 1989; Crowley *et al*. in press).

The Endangered Riverina population of the Glossy Black-Cockatoo is largely restricted to hills and low ridges where suitable assemblages of Drooping She-Oak (*Allocasuarina verticillata)* remain within the Narrandera Range and to the north-west in the Brobenah Hills, McPherson Range, Cocoparra Range, Lachlan Range and Jimberoo State Forests, and the Naradhan Range (NSW NPWS 1999b). The Riverine population is disjunct and at the western edge of the range for the species in NSW. There is some evidence that these western populations are more closely related to the Kangaroo Island subspecies *Calyptorhynchus lathami halmaturinus* than to more easterly populations indicating that this population is of significant conservation value.

***Polytelis swainsonii* (Superb Parrot)**

The Superb Parrot breeds only in the Riverina and south-west slopes of NSW, and in northern Victoria (Webster and Ahern 1992). Virtually restricted to the interior of NSW, it is confined as a breeding bird to River Red Gum forests along the Murray and Edwards Rivers near Deniliquin and Mathoura, along the Murrumbidgee River from Wagga Wagga to Darlington Point (Schrader 1980; Higgins 1999; Lindsey 1992). In Victoria, they are now largely confined to the Barmah Forest area of northern Victoria, rarely to Wangaratta (Higgins 1999), having disappeared from central and southern Victoria in the early 1900s, and from northern Victoria by 1930 (Webster and Ahern, 1992). All but disappeared in the ACT in the 1950s and, in NSW, have declined in the Parkes district since 1960s. However, it may have extended its range to Deniliquin and in northern NSW over the same period (Schrader 1980; Higgins 1999). The breeding population is estimated at fewer than 5,000 pairs (Davidson and Chambers 1992). Counts in December 1998 found 200 birds at Nathalia, Victoria, 60 at Deniliquin and 100 near Wagga Wagga, both NSW (Anon 1999).

In the Riverina, Superb Parrots nest in loose colonies in riparian woodland of River Red Gum (*Eucalyptus camaldulensis)* and forage in box woodland, particularly that dominated by Yellow Box (*E. melliodora)*, on seeds of herbaceous plants, switching to lerp, mistletoe berries, eucalypt flowers and grass seed in winter (Webster 1988; Higgins 1999). On the inland slopes of the Great Dividing Range, Superb Parrots forage and nest within box woodland (Webster 1988). They forage up to 15 km from the nest, particularly on inland slopes where suitable nesting trees are widely dispersed, but rarely cross extensive open ground, using woodland remnants as corridors (Webster 1988; Davidson and Chambers 1992; Webster and Ahern 1992; Anon 1999; Higgins 1999).

Recently observed west of Griffith (10-12 birds), east to Binalong and west of Temora (J. Leonard unpub.). One individual has also been observed at Cocoparra National Park, 25 km north east of Griffith (NSW NPWS 1997a). There are eight known nest sites located along the Murrumbidgee River from Narrandera to west of Darlington Point, 30 km south of Griffith. Another nest site is found at Goolgowi, 46 km north-west of Griffith (Webster and Ahern 1992) and sightings have also been made within the Brobenah Hills (MFN 1999a). This species has also been recorded within the McPherson range area and Griffith City locality (MFN various dates).

***Neophema pulchella* (Turquoise Parrot)**
Early in the 19th century, the Turquoise Parrot was found throughout south eastern Australia from the Suttor River, inland from Mackay in eastern Queensland and through eastern NSW, including suburban Sydney, to Melbourne, Victoria. It declined rapidly in the 1890s with no reports of substantial numbers until 1920s (Jarman 1973; Higgins 1999). It is now a widespread species, erratically distributed through south eastern Australia from south-east Queensland to northern Victoria, mainly west of the Great Dividing Range, but locally extended to the south-east coast (Higgins 1999; Lindsey 1992). In Queensland, it now occurs no further north than Maryborough and Fraser Island, distribution in NSW is patchy and in Victoria is largely confined to north-east and east Gippsland (Higgins 1999).

The Turquoise Parrot lives in the foothills of the Great Dividing Range in open eucalypt woodlands and forests with a grassy or sparsely shrubby understorey. It forages on the ground, feeding on the seeds of native grasses or introduced weeds and sometimes shrubs and herbaceous plants, preferring to roost and shelter in trees. Breeding occurs between August and December. It nests in tree hollows, stumps or even fence posts (Quin 1990; Quin and Baker-Gabb 1993; Higgins 1999). Nesting sites are located within a few kilometres of their foraging sites, in forests within 100 m from cleared land and 250 m from surface water (Quin and Baker-Gabb 1993). Four individuals have been observed at Cocoparra National Park, 25 km north east of Griffith (NSW NPWS 1997a) and within the Brobenah Hills (MFN 1999a).

***Ninox connivens* (Barking Owl)**
Found sparsely distributed through temperate and semi-arid regions from Cooktown, Qld, to Flinders Ranges, S. A., extending inland to the Lake Eyre, Bulloo and Murray Darling Basins. The present general distribution is as above but local declines or extinctions have been recorded in the Herbert River district, Qld (Young and de Lai 1997) and through much of NSW (Debus 1997), Victoria (Silveira 1997) and South Australia (Parker 1988; Higgins 1999) as well as in south-west Australia (Johnstone and Storr 1998). Population in Victoria estimated at 50 pairs (Silveira *et al.* 1997).

The Barking Owl mainly inhabits dry open sclerophyll forests and woodlands, favouring dense riparian vegetation along watercourses or round wetlands. Also inhabits dry sclerophyll forests and woodlands, of tropical, temperate and semi-arid zones, often dominated by *Eucalyptus* and containing many large trees suitable for roosting or breeding. Also occurring in open communities on plains and in foothills, often dominated by *Eucalyptus* or *Angophora*, and including remnant patches of forest or woodlands, or clumps of trees in partly cleared land, such as farmland or denser riparian or gallery communities near rivers, creeks, lakes or swamps, also usually dominated by *Eucalyptus* (Higgins 1999). Breeds in hollows in large trees, mainly *Eucalyptus* in woodland or open forest, usually near watercourses or wetlands, occasionally nest in other large trees. Usually roosts in large, densely foliaged trees; either among foliage or on bare branches beneath canopy and shaded foliage, often near watercourses or wetlands (Higgins 1999). The southern subspecies of Barking Owl (*Ninox connivens connivens)* occurs primarily in dry sclerophyll woodland, nesting in large hollows in live eucalypts, often near open country (Higgins 1999; NSW NPWS 1999c) where it hunts primarily for mainly hollow dwelling birds and mammals, but including rabbits (Higgins 1999).

***Tyto novaehollandiae* (Masked Owl)**
Distributed widely across Australia, this species is almost endemic to this country, with a population also in southern New Guinea. Although considered predominantly a coastal species, it is sparsely distributed inland although is absent from the most arid central regions (Higgins 1999). It is rare on the inland NSW slopes and plains but has been located as far west as Mootwingee National Park and Fowlers Gap near Broken Hill (Debus and Rose 1994; Higgins 1999).

It appears to require a diversity of habitat, including eucalypt forests for roosting and nesting, and forest edges and open woodlands for hunting, with a large home range of 500 – 1000 ha per pair in coastal and forested areas (Kavanagh and Murray 1996; Higgins 1999). They roost in tree hollows, caves, sink-holes or crevices in cliffs, and in or under dense foliage (Debus 1997; Higgins 1999). They also nest in tree hollows or crevices in cliffs, and possibly within caves (Debus and Rose 1994; Mooney 1997; Higgins 1999).

Nest sites in trees are generally located 10 – 30 m above ground within vertical hollows, 40 – 500 cm deep, and lined with decayed debris and the discarded remains of prey items (Debus and Rose 1994; Kavanagh 1996; Mooney 1997; Higgins 1999). Pairs mate permanently and hold the same territory all year round, and may use the same nest site over successive years (Kavanagh and Murray 1996; Higgins 1999). They eat a variety of small terrestrial mammals up to the size of a rabbit, the occasional possum, various birds and some insects such as beetles and moths (Debus and Rose 1994; Kavanagh 1996; Kavanagh and Murray 1996; Higgins 1999).

Clearing and timber harvesting not only removes potential nest and roost sites, but may also affect the availability of prey species by removing logs and ground cover (Debus and Rose 1994; Higgins 1999). Dense regeneration at ground level may also hinder the owl's foraging (Debus and Rose 1994). Grazing has degraded habitat and caused regional extinctions of native prey species, and the predation by foxes of fledglings in disturbed areas may also be significant (Debus and Rose 1994; Debus 1997). Masked Owls are often killed or injured accidentally by collisions with vehicles, barbed-wire fences and overhead wires, and even occasionally drowning in water tanks (Debus and Rose 1994; Debus 1997; Higgins 1999). Secondary poisoning by rodenticides based on brodifacoum may also cause a significant threat to all owl species that eat rodents in croplands (Young and De Lai 1997).

***Pomatostomus temporalis temporalis* (Grey-crowned Babbler)**
This species formerly ranged throughout eastern Australia from South Australia, through Victoria and broadly through NSW and central Queensland up into southern New Guinea. It is now extinct in South Australia, coastal Victoria and the ACT. Grey-crowned Babblers occupy open woodlands dominated by mature eucalypts, with regenerating trees, tall shrubs and an intact ground cover of grass and forbs. This species is insectivorous, foraging in leaf litter and the bark of trees, and breeds cooperatively in sedentary family groups of 2 – 13 birds, building conspicuous dome-shaped nests (Davidson and Robinson 1992) and a home ranges that varies from 2 – 53 ha (Blakers et al. 1984), which increases with group size. Territory and group size varies accordingly with the quality of habitat (Brown et al. 1983).

The Grey-crowned Babbler has declined in numbers and disappeared from large parts of its range. Occupying woodlands on fertile soils of plains and undulating terrain, the habitat of this species has been disproportionately cleared for agriculture, including the removal of dead timber. The apparent reluctance of birds to traverse tracts of cleared land exacerbates the isolation of populations. Via stochastic events and the loss of long-term genetic viability, the reduced family groups in small isolated populations are vulnerable to extinction (NPWS 2001b).

The degradation of habitat, particularly as a result of grazing and weed infestation, also threatens this species. It is also likely that the increased abundance of competitors, such as Noisy Miners, and nest predators, from species such as the Pied Currawong and Australian Raven, threaten the foraging efficiency and breeding success of the Grey-crowned Babbler (Major *et al*. 1996).

***Melanodryas cucullata cucullata* (Hooded Robin south-eastern form)**

The Hooded Robin is distributed throughout south eastern Australia, from central Queensland to Spencer Gulf in South Australia. The south eastern form occurs throughout NSW except for the north-west of the state where it intergrades with the smaller northern form of the Hooded Robin *M. cucullata picata* (Schodde and Mason 1999). They occupy a wide range of eucalypt woodlands, *Acacia* shrublands and open forests (Blakers *et al*. 1984). In semi-arid western NSW, the species favours open woodlands of Belah, Rosewood, Mulga and Cypress. In temperate woodlands, they favour open areas adjoining large woodland blocks, with areas of dead timber and sparse shrub cover (Fitri and Ford 1997). It has declined significantly in both range and population, and was identified by Reid (1999) as a 'decliner' in a review of bird status in the NSW sheep-wheatbelt.

The Hooded Robin is threatened by clearance and fragmentation of habitat, including the removal of dead timber, and is apparently unable to survive in remnants smaller than 100 – 200 ha (Egan *et al*. 1997). Via stochastic events and loss of long-term genetic viability, the isolation of populations in small remnants increases their vulnerability to local extinction. Low population densities and relatively large home ranges also exacerbate their vulnerability within a highly fragmented and predominantly cleared landscape. The degradation of their habitat by stock grazing and weed invasion may reduce the availability of prey, and the increasing populations of nest predators such as Pied Currawongs and Australian Ravens is likely to cause a reduction in their breeding success (Major *et al.* 1996).

***Pachycephala inornata* (Gilbert's Whistler)**

The Gilbert's Whistler occurs in the broombrush and whipstick mallee required by the Red-lored Whistler, but also occupies a much wider range of habitats, showing a special fondness for lignum (Lindsey 1992). It is locally common across interior southern Australia from the Lachlan River in NSW, westward to the vicinity of Northam in Western Australia. In the Western Zone this species is known from Scotia mallee west of the Darling (including Tarawi Nature Reserve), in the mallee around Yathong and Round Hill Nature Reserves, in thick Belah patches between Dareton and Burgonga and especially on "Sunnyside" around Abbots Tank Rd, north-east of Euston (Franklin 1993). This species also occurs on shrubby sandhills along the Murray River and extends east into the heathy upper reaches of the Lachlan River (Schodde and Tidemann 1986). It lives in pairs that together defend apparently permanent territories. Breeding extends from September to December, with nests usually found in an upright fork, on a dead stump or, occasionally in the disused nest of some other bird.

Gilbert's Whistler preferred habitat appears to be mallee, often in association with spinifex, although it utilises shrubby mulga or taller eucalypt woodlands, Belah, riverine Black Box and Lignum, or partly cleared country (Pizzey and Knight 1997). Within these habitats, this species occurs patchily where mixed shrubs, particularly Melaleuca occur in dense stands (Schodde and Tidemann 1986). It forages mainly on the ground, feeding largely on insects (Lindsey 1992). It was observed at Round Hill Nature Reserve on 9 October 1997 (T. Quested pers.obs). Six individuals also observed at Cocoparra National Park, 25 km north east of Griffith (NSW NPWS 1997a). Other localities include Pulletop Nature Reserve and the Brobenah Hills (MFN 1999a, 1999b).

***Cinclosoma castanotus* (Chestnut Quail-thrush)**

Occurs in the southern interior of Australia from central NSW westward to the coast of Western Australia (Lindsey 1992). The eastern subspecies (*Cinclosoma castanotus castanotus)* occurs through the eastern mallee regions, including Flinders Ranges, Eyre Peninsula, Ninety Mile Plain and Murray Mallee, SA, Big and Little Deserts and Sunset Country, Victoria, and central and south western NSW (Schodde and Mason, unpubl. manuscript). It has disappeared from those areas that have been cleared for agriculture but is still broadly distributed through its former range (Blakers *et al.* 1984; Emison *et al.* 1987; Smith *et al.* 1995). In the Western Zone this species is known in and around the mallee of Round Hill Nature Reserve, the Mandleman mallee in the Willandra World Heritage Area, the Riverina mallee remnants and in thick mallee with *Triodia* north-east of Euston. Also recorded from the Mulga west of Byrock and in the Scotia mallee west of the Darling River, including Tarawi Nature Reserve (Franklin 1993).

Mainly sedentary and fairly common, it is somewhat local in distribution. Breeding occurs mainly from July to December, but is influenced by local rainfall (Lindsey 1992). This species is shy and often difficult to see. It occurs in mallee (including mallee with spinifex *Triodia* as an understorey), acacia (Mulga) scrub, native pine and eucalypt woodland areas, preferably those with a shrub layer and in areas of heath (Pizzey and Knight 1997), especially mallee and mulga scrub, and almost always on substrates of sand (Lindsey 1992). The eastern subspecies of Chestnut Quail-thrush feeds primarily on insects and seeds (Blakers *et al.* 1984). Observed at Round Hill Nature Reserve on 9 of October 1997 (T. Quested pers.obs) and 29 of October 1997 (N. Kuehn pers.obs). Two individuals were observed at Cocoparra National Park, 25km north east of Griffith (NSW NPWS 1997a) and Pulletop Nature Reserve, 35 km north of Griffith (MFN 1999b).

***Pyrrholaemus sagittatus* (Speckled Warbler)**
It is distributed from south-eastern Queensland, through central and eastern NSW to Victoria. In NSW, they occupy eucalypt and cypress woodlands on the slopes west of the Great Dividing Range, with an extension of range into the cypress woodlands of the northern Riverina. Populations also occur in drier coastal areas such as the Cumberland Plain, Western Sydney and the Hunter and Snowy River Valleys (Blakers *et al*. 1984; Schodde and Mason 1999).

They inhabit woodlands with a grassy understorey, often on ridges or gullies, with a home range varying from 6 – 12 ha. It is a sedentary species, lives in pairs or trios and nests on the ground in grassy tussocks, dense litter and fallen branches. They forage on the ground and in the understorey for arthropods and seeds (Ford *et al*. 1986). It has declined in numbers from large parts of its range, and was identified by Reid (1999) as a 'decliner' in a review of bird status in the NSW sheep-wheatbelt.

The Speckled Warbler is threatened by clearance and fragmentation of habitat, including the removal of dead timber. It decreases in abundance as woodland area decreases, and appears to be extinct in districts where no fragments larger than 100 ha remain (Barrett *et al*. 1994). Via stochastic events and loss of long-term genetic viability, the isolation of populations in small remnants increases their vulnerability to local extinction. Low population densities and relatively large home ranges also exacerbate their vulnerability within a highly fragmented and predominantly cleared landscape. Their preferred foraging habitat, a combination of open grassy patches, leaf litter and shrub cover, is susceptible to degradation by stock grazing and weed invasion. Nesting on the ground also makes them susceptible to predation by foxes and cats (NPWS 2001c).

***Melithreptus gularis gularis* (Black-chinned Honeyeater eastern subspecies)**
This species is predominantly distributed west of the Great Dividing Range in a narrow belt through NSW and into southern Queensland, and south into Victoria and South Australia where it occupies woodlands within an approximate annual rainfall range of 400 – 700 mm (Blakers *et al*. 1984). In NSW, it is most commonly found in woodlands containing box-ironbark associations and River Red Gum. They are also found in drier coastal woodlands of the Cumberland Plain, Western Sydney and in the Hunter, Richmond and Clarence Valleys.

They build compact, cup-shaped nests and feed on arthropods, nectar and lerp from eucalypt foliage and bark (Blakers *et al*. 1984). They are widely distributed and occur naturally at low densities, ranging from 0.02 to 0.26 per hectare in box-ironbark forests in Victoria (Traill 1995) and 0.28 per hectare in northern NSW (Oliver *et al*. 1999). It has declined in numbers and has disappeared from parts of its former range, apparently not persisting in remnants less than 200 ha. Reid (1999) identified it as a 'decliner' in a review of bird species' status in the NSW sheep-wheatbelt.

The Black-chinned Honeyeater (eastern spp.) is threatened by clearance and fragmentation of habitat. Via stochastic events and loss of long-term genetic viability, the reduction in size of remnant habitat leads to the isolation of populations and increases their vulnerability to local extinction. Low population densities also exacerbate their vulnerability within a highly fragmented and predominantly cleared landscape. They are also likely to experience high levels of competition from more aggressive species, such as Noisy Miners and White-plumed Honeyeaters, which occur at relatively high densities in small remnants of box-ironbark associations and River Red Gum. Also, the increasing populations of nest predators such as Pied Currawongs and Australian Ravens is likely to cause a reduction in their breeding success, particularly in small remnants (Major *et al.* 1996).

Grantiella picta **(Painted Honeyeater)**

Sparsely distributed from southern Victoria and south-eastern South Australia to far northern Queensland and eastern Northern Territory (Blakers *et al.* 1984; Schodde and Mason, unpubl. manuscript). Greatest concentrations and almost all breeding occurs south of 26°S, on the inland slopes of the Great Dividing Range between the Grampians, Victoria, and Roma, Queensland (Morris *et al.* 1981; Blakers *et al.* 1984). After April, it migrates to semi-arid regions, including north eastern South Australia, central and western Queensland and central Northern Territory (Hall 1974; Matheson 1981; Morris *et al.* 1981; Blakers *et al.* 1984; Keast 1985; McNamara 1986; Emison *et al.* 1987). The present range and distribution is mostly as above but no recent records from southern South Australia (Blakers *et al.* 1984) and has declined in abundance in western NSW (Maher 1988; Smith *et al.* 1995), central Victoria (Bridley 1991) and probably from north-central Queensland where once relatively common near Cloncurry (McGillivray 1901). In the Western Zone, this species has been recorded along the Warrego, Culgoa and Bogan Rivers, west of Byrock, on the Fletchers Creek Floodplain near Dareton and in Willandra National Park (Brickhill pers comm. n/d).

The Painted Honeyeater lives in dry forests and woodlands. Its primary food is the fruit of mistletoes in the genus *Amyema*, though it will also take some nectar and insects (Eddy 1961; Reid 1986; Oliver *et al.* 1998). The bird helps disperse mistletoe seed, and sometimes all trees in areas where it breeds repeatedly are infected and some die (Reid 1986). Its distribution is dictated by distribution of mistletoes, which are largely restricted to older trees, and the seasonality of their fruiting. However, extent of vegetation is also important, with birds being less likely to be found in strips of remnant woodlands, such as found in roadside vegetation and windbreaks, than in wider blocks (Robinson 1994). In the Western zone, this habitat is mainly along floodplains or drainage lines (Pizzey and Knight 1997; Slater *et al*. 1986). It is locally nomadic and strongly migratory, breeding mainly in the interior south-east and dispersing northward to northern Queensland and the Northern Territory over the winter period (Lindsey 1992). Observed at Round Hill Nature Reserve (N. Kuehn pers.obs), near Griffith (C. Gladwin pers.obs). Two individuals observed at Cocoparra National Park 25km north east of Griffith (NSW NPWS 1997a) and also at Pulletop Nature Reserve (MFN 1999a, 1999b). Other records although not in conservation reserves or other similar protected areas include the Brobenah Hills (MFN 1999a, 1999b) and Scenic Hill, McPhersons Range (GBNEG 2000).

Certhionyx variegatus **(Pied Honeyeater)**

The Pied Honeyeater is widespread across the arid interior and mainland Australia but, like the Black Honeyeater, it is strongly nomadic and erratic in occurrence, following the flowering cycle of eremophilas and similar plants (Slater *et al.* 1986; Schodde and Tidemann 1986). It is generally more common in the west than in the east. In the Western Zone, it frequents stands of *Eremophila maculata* near Buronga and Dareton in the south, common on *Grevillea juncifolia* in spring in the west of the Culgoa River, also recorded on *Eremophila duttoni* west of the Paroo River. Recorded amongst *G. huegelii* and *Acacia colletioides* within Tarawi Nature Reserve (NSW NPWS 1996). Pied Honeyeaters inhabit acacia shrub (primarily Mulga), mallee, spinifex and eucalypt woodlands, usually when shrubs are flowering (Pizzey and Knight 1997). These birds feed in nectar, predominantly from various species of *Eremophila*; also from mistletoe and various *Brachysema* and *Gervillea* shrubs (Schodde and Tidemann 1986). Travelling in small groups it forages mainly in the crowns of bushes and trees, and feeds largely on nectar supplemented by flying insects. Breeding is strongly influenced by local rainfall but occurs mainly from September to February. Nests are small, loose cups of twigs and grass bound by cobweb and suspended in a slender horizontal fork within a few meters from the ground (Lindsey 1992). One individual observed at Cocoparra National Park, 25km north east of Griffith (NSW NPWS 1997a).

Stagonopleura guttata **(Diamond Firetail)**

This species is distributed through central and eastern NSW, extending north into southern and central Queensland and south through Victoria to the Eyre Peninsula, South Australia. In NSW, it is predominantly distributed west of the Great Dividing Range, although they are also found in drier coastal woodlands of the Cumberland Plain, Western Sydney and in the Hunter, Richmond, Clarence Valleys and Snowy River Valleys (Blakers *et al*. 1984; Schodde and Mason 1999).

This species occupies eucalypt woodlands, forests and mallee where there is a grassy understorey. They build bottle-shaped nests in trees and bushes, and forage on the ground for grass seeds and other plant material and also insects (Blakers *et al*. 1984; Read 1994). It has declined in numbers in many areas and has disappeared from parts of its former range. Reid (1999) identified it as a 'decliner' in a review of bird species' status in the NSW sheep-wheatbelt.

The Diamond Firetail is threatened by clearance and fragmentation of habitat, apparently unable to persist in districts that lack remnants of native vegetation larger than 200 ha. Via stochastic events and loss of long-term genetic viability, the reduction in size of remnant habitat leads to the isolation of populations, inhibits dispersal, and increases their vulnerability to local extinction (Barrett *et al*. 1994). Habitat degradation, particularly stock grazing, threatens the food availability of this granivorous species. Also, the increasing populations of nest predators such as Pied Currawongs and Australian Ravens is likely to cause a reduction in their breeding success, particularly in small remnants (Major *et al.* 1996).

Nyctophilus timoriensis **(Greater Long-eared Bat)**

This species is distributed across southern mainland Australia, generally associated with the semi-arid environment (Churchill 1998), but as this taxon has recently been shown to be comprised of three species with allopatric distributions, the former distribution is therefore unclear. The biology and taxonomy of this bat remains poorly understood (Churchill 1998). Known current distribution is from southern central Queensland, central western NSW, north western Victoria and South Australia. There are only four records of this species from Victoria, all from the north-west of the state (Lumsden 1994). There have been no records from central western Victoria since 1888 (a single specimen). In South Australia, records are confined to north of the Murray River, east of Canegrass Station and south of the Barrier Highway, but the northern range limit in this state remains unclear.

The preferred habitat of this species is River Red Gum forest, semi-arid woodlands and savannahs. It also occurs in box/ironbark/*Callitris* open forests and Buloke woodland in northern New South Wales and inland south-east Queensland. In South Australia, it is confined to tall mallee shrublands north of the Murray River and is known to roost in hollows in *Eucalyptus gracilis.* Victorian records are from *E. gracilis* mallee, Buloke and Black Box woodlands (Churchill 1998; Strahan 1995; Lumsden 1994). It roosts in tree hollows, fissures in branches and under loose bark (Churchill 1998; Strahan 1995; Lumsden 1994).

Chalinolobus picatus **(Little Pied Bat)**

The Little Pied Bat ranges from coastal and south eastern Queensland, extending across south western Queensland, western NSW and far north eastern South Australia. Despite having largely an inland distribution (Duncan *et al.* 1999), and most records being west of the Great Dividing Range (Churchill 1998) there are a number of records from south eastern Queensland within 50 km of the coast. No evidence exists that the range of this species has contracted (Duncan *et al.* 1999). Originally thought to be an obligate cave-dwelling species and therefore thought rare due to the scattered and infrequent occurrence of suitable roosting and maternity sites across its range. However, colonies are now known from tree hollows and disused buildings (Duncan *et al.* 1999). In caves and mines they occur in small colonies of fewer than 10 individuals. A colony of 38 males and females was recorded in an abandoned house (Churchill 1998).

This species occurs most frequently in dry, open woodland communities throughout its range, but also has been recorded in dry sclerophyll forests, chenopod shrublands, *Callitris* forest, mallee (Churchill 1998; Duncan *et al.* 1999), and vine forests (Duncan *et al.* 1999). In the more arid parts of its range in NSW it has been recorded from mulga (*Acacia aneura*) woodlands, patches of Black Box Woodlands and riverine River Red Gum dominated communities. Surveys have indicated that in arid and semi-arid environments the species may be locally common near permanent or semi-permanent water (Duncan *et al*., 1999).

***Vespadelus baverstocki* (Inland Forest Bat)**
Widely distributed in inland arid and semi-arid parts of Australia (Churchill 1998). This species inhabits *Acacia, Callitris* and *Casuarina* woodlands, mallee, open eucalypt woodland, River Red Gum woodland, shrub and grassland communities across its range (Churchill 1998; Strahan 1995). Inland Forest Bats roost in tree hollows and abandoned buildings. Much of their distribution occurs in areas where large trees are absent. In adaptation they can roost in extremely small tree hollows in stunted trees only a few metres high (Churchill 1998; Strahan 1995). This species usually forages over a wide area (Strahan 1995).

***Saccolaimus flaviventris* (Yellow-bellied Sheathtail Bat)**
A wide-ranging species occurring throughout tropical Australia with many records extending into south eastern Australia (Churchill 1998) but rarely recorded because of its high and rapid flying habit (Richards 1995a). Occurs in most habitat types, from wet and dry sclerophyll forest, open woodland, Acacia shrubland, mallee, grasslands and desert (Churchill 1998). This species roosts in large tree hollows and, sometimes, the abandoned nests of Sugar Gliders (Richards 1995a; Churchill 1998) and occasionally have been found hanging from the outside walls of buildings in broad daylight (Churchill 1998). Within NSW, this species has been caught around watering points in a variety of semi-arid woodlands east of Enngonia and at several sites between Bourke, Walgett and Collarenebri (Richards 1995a). The Yellow-bellied Sheathtail Bat forages for airborne insects (largely beetles and moths) above the canopy with foraging height varying with height of the canopy (Richards 1995a; Churchill 1998), although in open woodlands and mallee country they feed closer to the ground (Hall and Richards 1979; Richards 1995a).

***Hamirostra melanosternon* (Black-breasted Buzzard)**
The endemic Black-breasted Buzzard is distributed mainly throughout the northern interior, along the adjacent coasts and in the semi-arid and arid central regions. A severe decline in the distribution of this species occurred in the Lachlan River district of NSW and in central-eastern Queensland in the late 1800s (Marchant and Higgins 1993). Although the species could occur over any part of the NSW Western Division, they are more likely in the north and west (Marchant and Higgins 1993). Black-breasted Buzzards were formerly a moderately common breeding species in the Riverina and central NSW however breeding population are now likely to occur only on and west of the Darling River, south to Kinchega National Park, with rare vagrants further east (Debus and Czechura 1992). Recent records include sighting south of Louth (D. Ayers pers. obs.), on "Salisbury Downs" south east of Tibooburra (L. Kogge pers. comm.), and at Mallee Cliffs. There has been breeding pairs on the Paroo River and in Sturt National Park in the 1990, and probably on the lower Darling River in the 1980s (Debus and Czechura, S. Debus). The species displays seasonal movements, with more sightings being made in the south from August to January (Marchant and Higgins 1993).

Black-breasted Buzzards use a variety of open habitats from riverine and tropical eucalypt woodlands to shrub steppes, arid scrubs (*Hakea*) with a grassy understorey (*Plectrachne)*, grassy plains and sandy deserts (Simpson and Day 1993). The species prefers tree-lined watercourses, billabongs and ephemeral lakes and the open woodlands of associated floodplains (Marchant and Higgins 1993). In western NSW they are most frequently observed along watercourses; in Queensland it is also observed in *Triodia* and *Astrebla* grassland savannas. Black-breasted Buzzards actively avoid dense vegetation of all sorts (Marchant and Higgins 1993). Traditional nest sites and territories may be sued from year to year by a resident pair of birds, with nests being located in tall mature, dead or partially dead eucalyptus, often along a timbered watercourse or near waterhole (Reader's Digest 1986, Debus and Czechura 1992).

Black-breasted Buzzards are generalist and opportunistic feeders, taking most of their prey from the ground (Marchant and Higgins 1993). It is predatory on lizards, snakes, birds (passerines, parrots, large ducks, bustards), mammals (especially rabbits, also wallabies), amphibians, large insects, nestlings of various raptor and corvid species, and the eggs of large ground-nesting birds, such as Emus (Pizzey1980, Reader's Digest 1986, Debus and Czechura 1992, Marchant and Higgins 1993, Barker and Vestjens undated). Individuals may be sedentary when conditions permit, especially in the south-east of their range (dispersing in drought years); or they may be nomadic, particularly in northern Australia (Pizzey 1980). An uncommon species, which has a large home range and is usually solitary, occasionally seen in pairs and rarely in small groups. The species does not tolerate disturbance by human activity (Debus and Czechura 1992).

Threats facing the Black-breasted Buzzard include: disturbance – human activities displaces the species with breeding birds being particularly sensitive (e.g. breeding has declined in south-western and mid-western NSW, Marchant and Higgins 1993). Disturbance declines reflect the retreat by the species from settlements and areas of habitat destruction in general (Debus andCzechura 1992). Clearing of nesting trees along waterways and of vegetation within territories affects the birds directly (disturbance; reduced breeding sites) and indirectly (changed habitat of prey species). Removal of large nesting trees is though to be partially responsible for the severe distribution declines within western NSW and central-eastern Qld in the late 1800s (Marchant and Higgins 1993). Grazing is also a threat and in particular overgrazing as it displaces the species by degrading habitat and affecting prey species (Debus and Czechura 1992). Cultivation may also affect the species by indirectly reducing the habitat of prey species.

Calyptorhynchus banksii (**Red-tailed Black Cockatoo)**

The Red-tailed Black Cockatoo is widespread over northern Australia with several discrete populations. In NSW, this species population is very closely associated with the Darling River and its tributaries in the Western Zone. These birds are frequently seen along the Barwon and upper Darling Rivers, with one flock spotted just north of Wilcannia during 1994 totally approximately 300 individuals (D. A. pers. obs.). The species is less common downstream from Wilcannia although they are found in associated with *Casuarina* species between Menindee and Ivanhoe.

The species predominately inhabits eucalypt woodlands along watercourses, but are also found in open forests and woodlands as well as grassland (Pizzey 1980). Nests are as high above the ground as possible on decayed debris within large hollows of mature or dead River Red Gums. They feed on the ground along the floodplains of these rivers in small flocks. Their diet consists of assorted seeds and fruits, including those of various *Casuarina* and *Callitris* species, members of the Proteaceae (e.g. *Hakea*) and, in pastoral areas, the introduced Cat Head, Double-gee (*Emex australis*) or Storksbill (*Erodium)*. Bulbous roots and beetle larvae are also eaten (Barker and Vestjens undated). The species may be sedentary, nomadic or part-migratory, depending on the area and local conditions (Pizzey 1980, Reader's Digest 1986).

Threats to Red-tailed Black Cockatoos include: clearing - especially of River Red Gum as it removes actual and potential nesting sites, as well as feeding and roosting habitats. Grazing prevents regeneration of nesting trees, destabilizes river banks leading to erosion and bank undercutting, and also prevents the regeneration of food trees. All these effects reduce the availability of suitable habitat. Cultivation may impact on food availability although the degree to which this occurs has yet to be determined. Aviculture probably constitutes a significant threat to the species because it is sought after by the aviary trade (P. Ewin pers. comm.). There is therefore always a temptation to trap birds or rob nests, activities that often destroy the nest hollow in the process.

***Climacteris picumnus* (Brown Treecreeper – south-eastern)**

The endemic Brown Treecreeper occurs in south eastern Australia in subcoastal environments and slopes of the Great Dividing Range between the Grampians in western Victoria, through central NSW (Wagga Wagga, Temora, Forbes, Dubbo, Inverell), to the Queensland border and northward to the Bunya Mountains (Schodde and Mason 1999). Whilst it has a large range the species has greatly reduced in density of most of that range (Taylor and COG 1992, Robinson 1993, Paton *et al.* 1994, Reid 1999, Traill and Duncan 2000) and there has been a decline of 70% recorded in the last decade in central NSW (N. Schrader in Traill 2000).

The Brown Treecreeper occupies eucalypt woodland and adjoining vegetation. It feeds on ants, beetles and larvae, which it takes from the trunks of live and dead trees as well as from fallen branches and among leaf litter. Nests often occur in hollows.

The survival of the species is threatened by habitat clearance (the decline of woodland habitats in south-eastern Australia). The subspecies has also declined or disappeared from most remaining remnants that are smaller than 300 ha, at least partly because females disperse from these areas or die preferentially and are not replaced (Walters *et al.* 1999). Once the subspecies is lost from a remnant, recolonisation is unlikely without assistance (Walters *et al.* 1999). Local extinctions occur 50 years after the habitat was cleared. As clearing is continuing and over 90% of the remaining vegetation in some regions being in patches that are smaller than 500 ha, local extinctions are likely to continue for many decades to come (Traill and Duncan 2000). The readiness with which treecreepers use artificial hollows for nesting suggests that a lack of hollow may be a limiting factor in reproduction in some habitats (B. Quinn).

***Antechinomys laniger* (Kultarr)**

The Kultarr was originally distributed in the arid and semi-arid zones of Australia. It has declined regionally in NSW, Queensland and South Australia and is though to be extinct in the southern part of its range in southern NSW, Victoria and south-eastern South Australia (Dickman and Read 1992). The species is rare over most of its geographic range and populations appear to fluctuate seasonally. Currently in NSW, the species occurs near Bourke on the Darling Floodplain, in the Gunderbooka region (recorded in 1994) and south of Cobar (Ayers *et al.* 1996, Ellis and Henle 1988 & 1996, Maxwell *et al.* 1996). It has been recorded at Round Hill Nature Reserve, Sturt National Park, Kinchega National Park and Willandra National Park (NPWS 1999).

The species inhabits a variety of sparsely vegetated, arid to semi-arid plains on stony, sandy and clayey soils. Its preferred habitat are less disturbed areas, open scrub and mallee woodland, acacia woodlands and shrublands and hummock grasslands with sparse ground cover (Dickman and Read 1992, Maxwell *et al.* 1996). Kultarrs are nocturnal and spend the day sheltering in hollow logs or tree stumps, beneath saltbush and spinifex tussocks, soil cracks and in the burrows of other animals including trapdoor spiders, hopping mice, goannas and dragons (Valente 1983 1995). Kultarrs are able to enter torpor spontaneously which enables them to conserve energy and water. This ability is also correlated with an extended life span and thus is likely to be an important survival mechanism in arid environments (Geiser 1986).

Threats to survival for this species include: fire which removes refuge sites such as hollow logs and tree stumps. On a larger scale, the alteration of fire regimes since European colonisation has increased the occurrence of infrequent, large-scale fires (Dickman *et al.* 1993). Local refuges from which species can recolonise adjoining areas are less likely to persist under such conditions, thereby reducing the survival of populations within isolated areas. Land degradation through cattle grazing does not appear to result in complete removal of the Kultarr from affected areas however less disturbed country is usually preferred. Overstocking of cattle causes considerable destruction of the vegetation and soil structure (e.g. collapse of deep soil cracks), which reduces the availability of shelter sites for this species. Flooding can also eliminate populations locally through drowning or through starvation (as the flooding would also affect food supplies). Recolonisation of such areas is hindered or prevented if populations are isolated (Dickman *et al.* 1993). Predation by feral cats and owls, and also foxes may also have an affect.

Ningaui yvonneae **(Southern Ningaui)**
The Southern Ningaui occurs across southern South Australia, western Victoria and central-western NSW (Fleming and Cockburn 1979). In NSW this distribution corresponds approximately with that of mallee woodland (Dickman and Read 1992). Thirty to forty percent of the known national distribution is within the Western Zone of NSW, however it has only been recorded from 11 localities within this region (Dickman *et al.* 1993, T. Mazzer pers. comm.). The species is reasonably common in the Willandra Lakes World Heritage Area. All NSW records are between latitudes 32º and 34ºS (including between Pooncarie and Wentworth, and in Tarawi Nature Reserve) but specimens have also been collected from more southerly localities in Victoria and South Australia (Fleming and Cockburn 1979, Dickman and Read 1992).

The Southern Ningaui is restricted generally to sandy undulating country with open mallee woodland, but it depends most critically on hummock grass and low ground shrubs for cover. The species is found from the interdune flat, to the dune base and up onto the dune itself (Kennedy 1992). It may occasionally occur in open heath and in some mallee areas with a gravel or clay substrate (Dickman and Read 1992). This nocturnal species seldom ventures far from the cover of hummock grass clumps (Dickman and Read 1992). During the day it shelters under spinifex clumps or occupies burrows, which it has constructed, the vertical burrows of trapdoor spiders or hollow logs. The Southern Ningaui is an exclusively insectivorous species, which forages primarily within spinifex or shrub complexes or occasionally on open sand, and detects prey primarily by scent (Dickman and Read 1992). The species appears to occupy a shifting home range and is for the most part solitary.

Threats to the survival of the Southern Ningaui include: land clearance of any form because it specialises in the mallee-hummock grass/shrub areas (Dickman and Read 1992). Both fire and the mechanical removal of the shrub layer have been shown to result in the disappearance of the species. Grazing by rabbits, domestic and feral livestock depletes the ground flora, thereby reducing the availability of shelter for the Southern Ningaui. Stock also compact the soil and disrupt its structure, thus modifying its suitability for burrow construction. Fire removes the ground flora temporarily and results in the temporary elimination of the Southern Ningaui from an area. Repeated fires can cause the local extinction of the species if refuge areas are not retained from which recolonisation can occur.

Onychogalea fraenata **(Bridled Nailtail Wallaby)**
The Bridled Nailtail Wallaby is previously known to occur from eastern South Australia, through the Murray River region of northern Victoria, northward through a broad strip of central NSW from the south-west to the north of the State (bordered by Glenn Innes and Tallong in the east and Cobar in the west), through southern and central Queensland to Charters Towers and perhaps even Townsville (Robertson 1980). Once the commonest of all small wallabies in many areas including the Darling Downs, on the lower Namoi and along the lower Murray and Darling Rivers (Roberston 1980)Last recorded in NSW at Manilla near the Namoi River in 1924 (Robertson 1980). Presently known only from near Dingo, in the central-eastern Queensland brigalow belt (Evans and Gordon 1995), where it was rediscovered in 1973.

The species (which is now presumed extinct in NSW) inhabited semi-arid inland areas from the slopes and plains west of the Great Dividing Range. It was not recorded from the driest parts of the plains, a factor, which may related to the fact that this species is dependent on the presence of suitable vegetative cover (Robertson 1980). Its preferred habitat is a mixture of shrubland, savannah scrubland and grassy woodland. In Queensland the remaining population inhabits an area of eucalypt forest/woodland and Brigalow (*Acacia harphohylla*) scrub. Here it grazes and shelters in the edges of the scrub and grazes in the more open surrounding grassy woodland areas (Evans and Gordon 1995). The species has a high dietary preference for herbaceous plants; chenopod forbs are favoured together with soft-leaved grasses such as species of *Chloris, Sporobolus* and *Bothriochloa* and forbs of the genus *Malvaceae* (Evans and Gordon 1995).

The threats to the survival of the Bridled Nailtail Wallaby include: shooting as a pest species and for its fur (pelts were frequently sold simply as being from “pademelon”) was a widespread practice. The culling of macropods was common on the Northern Tablelands of NSW and bounties were offered on hundreds of thousands of small wallabies and “kangaroo rats”. In addition, a special breed of dog trained to pull down kangaroos were used to kill this particular species of macropod and are also though to have contributed to its extinction (Chilcott 1983). Habitat modification such as the destruction of ground cover by introduced herbivores is thought to have contributed to the declined of this species, primarily because of its clear dependence on vegetation cover (Robertson 1980, Kennedy 1992). Clearing also significantly reduced the availability of suitable habitat for this macropod because it is known to have been cover-dependent. In NSW, for example, the wheat belt now covers approximately half of the former range of the Bridled Nailtail Wallaby (Robertson 1980). Predation by introduced predators, principally the fox, is thought to have had a significant impact on this species (Kennedy 1992). Young wallabies are though to have been most vulnerable (Robertson 1980). Preferred diet of forbs, which are affected by dry conditions (Dawson *et al.* 1992) reducing the availability of food for the Bridled Nailtail Wallaby. Competition with domestic stock and possibly rabbits for food compounds the above situation. The Bridled Nailtail Wallaby is one of the native species most adversely affected by food competition with introduced stock (Dawson *et al.* 1992l, Dickman *et al.* 1993).

***Petrogale penicillata* (Brush-tailed Rock-wallaby)**

The distribution of the Brush-tailed Rock-wallaby follows the Great Dividing Range from southern Victoria into central Queensland. The range further extends from the Divide into central NSW, including the Warrumbungles and Mt Kaputar National Park. The species is now absent from the western slopes and plains of NSW except for one or two isolated locations and has also disappeared from the upper Murray River district (Kennedy 1992). Although it is presumed extinct from the western extent of its range in NSW there were scats tentatively assigned to rock-wallabies collected from the Gunderbooka Range between Bourke and Louth during 1992, where confirmed Brush-tailed Rock-wallaby skulls have been collected (Dickman *et al.* 1993, D. Choquenot & B. Law pers. comm.). The species is still relatively common in the upper reaches of many of the east-flowing rivers of the Great Dividing Range, particularly in south-eastern Queensland and northern and central NSW (Short and Milkovits 1990). A new colony was located near Goulburn in 1996.

The Brush-tailed Rock-wallaby inhabits a broad range of habitats from rocky gorges with a vegetation of rainforest or wet sclerophyll forest to isolated rocky outcrops in semi-arid woodland country (Short 1982). The species is often found on rock slopes which receive direct sunlight for much of the day (i.e. with a northerly aspect) and which also provide adequate shelter sites in the form of caves, cracks and rockpiles (Short 1982, Eldridge and Close 1995). Shelter may also be taken in lantana thickets. The habitats and microhabitats chosen by this species are of a very specialised nature, not only do they provide shelter, they are also important for thermoregulatory and water balance purposes (the caves being of a more constant temperature and a higher humidity than the outside environment). Feeding sites (areas of native or introduced grasses, frequently in open forest areas) are normally located near to the rocky retreat sites. The population and distribution is severely reduced (Lunney *et al.* 1995).

The Brush-tailed Rock-wallaby's survival is threatened by competition from introduced herbivores (particularly feral goats) for food and also for shelter, which may prevent the expansion of remaining population. The degree of dietary overlap may increase during drought. In addition, grazing by sheep, goats and rabbits on areas surrounding the remnant colonies, in conjunction with other forms of habitat modification, may also physically restrict the colonies to their present locations and prevent recolonisation of previously-inhabited sites. Those areas where the species is still regarded as relatively common are typically of greater topographic relief, higher rainfall and are dominated by cattle grazing, forestry or national parks and are not used for sheep grazing (Short and Milkovits 1990). Isolation of the remnant population places them at risk of catastrophic events and genetic introgression. Predation of juveniles by foxes, Wedge-tailed Eagles, dingoes and possibly feral cats almost certainly restricts the growth of existing populations (Eldridge and Close 1995). Foxes are known to actively hunt the species on cliffs and are thought to have eliminated populations on all but the most complex and inaccessible of rocky sites (Short 1982). Hunting for the fur trade was also a significant pressure in the late 1800s and early 1900s and whilst this threat no longer it exists it did have a considerable impact upon the species. Tens of thousands of Brush-tailed Rock-wallabies were taken for the fur trade and as agricultural pests around the late 1800s to early 1900s, which gives some idea of the former abundance of the species (Short and Milkovits 1990, Eldridge and Close 1995). Brush-tailed Rock-wallabies are also susceptible to poisoning as they are highly attracted to carrots which graziers use (laced with 1080) to kill rabbits and may have had a major role in the recent decline of the species in East Gippsland (Hill and Baker-Gabb 1991). There is also the threat of disease such as toxoplamosis (transmitted via cysts in the faeces of cats) and hydatidosis (carried by foxes, dingoes/wild dogs and sheep), which is though to be at least partly responsible for the disappearance of some populations (Hill and Baker-Gabb 1991).

Appendix 5 – Assessment of Significance for known threatened species

The *Environmental Planning and Assessment Act 1979* includes in Section 5A, eight factors which are to be considered when determining if the proposed activity or activity "is likely to have a significant effect on the threatened species, populations or ecological communities, or their habitats". These eight factors must be taken into account by a consent or determining authority when considering a development proposal or development application, particularly in administering Sections 78, 79C and 112 of the EP&A Act 1979.

Surveys conducted to date by the JC-EC revealed the presence of 10 threatened species:

1. Pink Cockatoo (*Cacatua leadbeateri*)
2. Grey-crowned Babbler (*Pomatostomus temporalis temporalis* (eastern subspecies)
3. Hooded Robin (*Melanodryas cucullate*)
4. Chestnut Quail-thrush (*Cinclosoma castanotus*)
5. Speckled Warbler (*Chthonicola sagittate*)
6. Pied Honeyeater (*Certhionyx variegates*)
7. Diamond Firetail (*Stagonopleura guttata*)
8. Superb Parrot (*Polytelis swainsonii*)
9. Black-chinned Honeyeater (*Melithreptus gularis gularis (*eastern subspecies)
10. Little Pied Bat (*Chalinolobus picatus*).

Consequently, a formal Section 5A (8 part test) was conducted for each of these specie in order to determine if the proposed activity "*is likely to have a significant effect"*.

Threatened species locations and records for all surveys completed by the JC-EC to date of the study area are provided in **Table 7** and **Figure 8**.

Pink Cockatoo *(Cacatua leadbeateri leadbeateri)*

(a) In the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction.

The eastern subspecies of the Pink Cockatoo is found in arid and semi-arid zone woodlands dominated by Mulga, mallee and box eucalypts, Cypress Pine or Belah where it feeds primarily on seeds, roots and fruits. The main requirements of this species are trees with suitable nesting hollows and fresh surface water (Higgins 1999). Breeding pairs of the western subspecies occupy nests at least 1 km apart with densities of about one pair per 30 km^2 recorded (Saunders *et al*. 1985; Rowley and Chapman 1991).

The subject site and remainder of the study area supports known and potential resources for the Pink Cockatoo, largely in the form of foraging habitat provided by the White Cypress Pine/eucalypt woodland. Whilst the subject site does offer some nesting and roosting opportunities (i.e. hollow bearing Bimble Box, Red Box) it does not offer any freshwater, although there are five earth tanks (dams) scattered through the remainder of the study area.

The proposed activity would remove 12 hectares of native vegetation across an area of 25 hectares (less than 1% of the overall potential habitat available within the study area). Furthermore, White Cypress Pine woodland (co-dominated by eucalypts species) is the dominant vegetation community of the subject site and study area, therefore, potential habitat for this species is well represented. Compared to the remaining potential habitat within the study area (in excess of 100,000 ha), it is considered unlikely that the subject site would form an important component of habitat for this species. Consequently it is unlikely that a significant proportion of any habitat (e.g. for breeding, roosting, foraging etc) for the Pink Cockatoo would be removed of modified.

The timing of the proposed works is unlikely to disrupt the breeding cycle of the Pink Cockatoo. Clearing operations are likely to be conducted outside the breeding season for this species (pending approval timing). It is considered unlikely that it would cause a significant affect to the survival of the Pink Cockatoo within the study area.

Given the small extent of available habitat to be removed, lack of specific resources within the subject site (i.e. fresh surface water) and extent of potential habitat found within the remainder of the study area it is likely that this species would only use the subject site as part of its overall foraging habitat. Proposed impact amelioration measures would also ensure that potential habitat within the subject site is adequately protected. It is considered unlikely that the "*life cycle*" of the Pink Cockatoo would be "*disrupted*" by the proposed activity, and no "*viable local population*" of this species would be "*placed at risk of extinction*".

(b) In the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised.

There is no '*endangered population'* of the Pink Cockatoo listed under Part 2 of Schedule 1 of the *TSC Act 1995*. No evidence exists for the presence of an endangered population occurring within the study area. Consequently, there is no likelihood that the proposed activity can be regarded to involve any such populations even if individuals of such a population use the study area.

(c) In relation to the regional distribution of the habitat of a threatened species, population or ecological community, whether a significant area of known habitat is to be modified or removed.

The reference to regional within this factor refers to the regions as defined in the Interim Biogeographic Regionalisation of Australia (IBRA). Following the IBRA, the study area occurs within the Cobar Peneplain IBRA. The Cobar Peneplain Bioregion lies within the Central West of New South Wales, occupying over 73,000 square kilometres, or approximately one-tenth of the area of New South Wales. On this basis, the study area cannot be construed as comprising "*a significant area of known habitat*" in respect of the "*regional distribution of habitat*" for the Pink Cockatoo. Furthermore, given the relatively small area of resources within the subject site (< 12 ha) in terms of the local (study area) and regional distribution of habitat, the proposed activity is unlikely to involve "*a significant area of known habitat*" for the Pink Cockatoo to be "*removed or modified*".

(d) Whether an area of known habitat is likely to become isolated from currently interconnecting or proximate areas of habitat for a threatened species, population or ecological community.

The proposed activity would involve the removal and modification of <12 hectares of foraging and potential roosting habitat (less than 1% of the overall potential habitat available within the study area) for the Pink Cockatoo. The 12ha of vegetation would be removed from across an area of 25 hectares (see figure 1 & 2) within the study area of approximately 200,000 + hectares. The study area is well connected to surrounding areas of vegetation. Given the small extent and rate of removal of this vegetation, it is unlikely that the proposed activity would involve *"an area of known habitat"* for the Pink Cockatoo becoming *"isolated from currently interconnecting or proximate areas of habitat"*.

(e) Whether critical habitat will be affected.

There is currently no declared "critical habitat" in the area likely to be affected by the proposed activity as designated under Part 3 of the *TSC Act 1995*. No area of declared critical habitat is relevant to this proposed activity.

(f) Whether a threatened species, population or ecological community, or their habitats, are adequately represented in conservation reserves (or other similar protected areas) in the region.

There are conservation reserves/protected areas within the locality of the study area including Quanda NR (within 30 km of study area), Yathong and Nombinnie NR's (all within 70 km). These reserves contain records for the Pink Cockatoo. However, whilst they do contain known habitat for the Pink Cockatoo it is considered unlikely that the Pink Cockatoo is *"adequately represented"* within *"conservation reserves and or similar protected areas"* in the locality or region. Furthermore, the Cobar Peneplain Bioregion has been identified as a high priority area for additional conservation assessment and action under the Commonwealth Government's National Reserve System Program (NSW NPWS 2002), as less than five per cent of the bioregion is protected by conservation reserves.

(g) Whether the development or activity proposed is of a class of development or activity that is recognised as a threatening process.

Whilst the proposed activity is not of a class of development or activity that is recognised as a key threatening process as listed in Schedule 3 of the *TSC Act 1995*, clearing of native vegetation is. The proposed activity would involve the clearing of native vegetation and associated potential foraging and roosting resources of the Pink Cockatoo.

The continual clearance of feeding and breeding habitat has substantially reduced the population of Pink Cockatoos in the southern and eastern parts of its range. Grazing and weed invasion are also impeding recruitment of trees that will be used for breeding in the future (Emison *et al*. 1987; Ayers *et al*. 1996; Higgins 1999). Nest robbing and trapping for aviculture are thought to have been a major cause of decline in South Australia and may be a significant threat elsewhere in the range (Ayers *et al.* 1996; Higgins 1999). Considering the small extent and the availability of known and potential habitat within the remainder of the study area, the removal of this vegetation from the subject site would not *"threaten the survival or evolutionary development"* of the Pink Cockatoo.

(h) Whether any threatened species, population or ecological community is at the limit of its known distribution.

This species occurs in the Murray-Darling, Eyre and Bulloo River basins as far north as Isisford and Roma in Queensland, through western New South Wales to north-west Victoria and west to Adelaide and Mt Mary Plains (Schodde and Mason 1997; Higgins 1999). It had however disappeared from the Adelaide and Mt Mary Plains by the 1950s (Boehm 1961) and density greatly reduced in north-west Victoria (Emison *et al.* 1987) and western New South Wales (Cooper and McAllan 1995). The eastern subspecies of the Pink Cockatoo is found in arid and semi-arid zone woodlands dominated by Mulga, mallee and box eucalypts, Cypress Pine or Belah. It is considered unlikely that the Pink Cockatoo is at *"the limit of its known distribution"* within the study area, locality or region.

Conclusion

It is unlikely that the proposed activity would impose a *"significant effect"* on the Pink Cockatoo. Furthermore, known habitat and ample potential foraging, roosting and breeding opportunities within the remainder of the study area would remain unaffected by the proposed activity.

Grey-crowned Babbler (*Pomatostomus temporalis temporalis*)

(a) In the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction.

In New South Wales, the Grey-crowned Babbler occurs on the western slopes and plains but is less common at the higher altitudes of the tablelands. Isolated populations are known from coastal woodlands on the North Coast, in the Hunter Valley and from the South Coast near Nowra (Blakers *et al.* 1984, Schodde and Mason 1999). Grey-crowned Babblers occupy open woodlands dominated by mature eucalypts, with regenerating trees, tall shrubs and an intact ground cover of grass and forbs. The Grey-crowned Babbler has declined in numbers and disappeared from large parts of its range. The species is extinct in the Orange area (Heron 1973) and possibly also from around Bathurst, where A. Fisher (pers.comm.) has made no record of the species in a study of almost 300 sites. Recent surveys (NSW NPWS 2001b) show a decline in the number of family groups that remain in the southern portion of its range, such that approximately five groups remain in Boorowa Shire, less than 10 around Wagga Wagga, and less than 30 groups in the shires of Young, Junee and Harden. A survey of 96 woodland sites in Holbrook Shire revealed only 14 groups (NSW NPWS 2001b). Further, the species has apparently disappeared from the Shires of Gundagai, Gunning, Yass and Yarrowlumla.

This species is insectivorous, foraging in leaf litter and the bark of trees, and breeds cooperatively in sedentary family groups of 2 – 13 birds, building conspicuous dome-shaped nests (Davidson and Robinson 1992) and have home ranges varying from 2-53 ha (Blakers et al. 1984), which increases with group size. Territory and group size varies accordingly with the quality of habitat (Brown et al. 1983). Although it is difficult to differentiate between individuals of this species it is estimated that at least 5 – 7 groups were recorded within the study area to date.

The subject site provides potential habitat for this species in the form of the White Cypress Pine/eucalypt woodland. The presence of a number of groups within the study area indicates the likely presence of "a viable local population" of Grey-crowned Babbler.

The proposed activity would remove up to 12 hectares of native vegetation across an area of 25 hectares (less than 1% of the overall habitat available within the study area). Compared to the remaining known and potential habitat within the study area (in excess of 50,000 ha), it is considered unlikely that the subject site would form an important component of habitat for this species. Consequently it is unlikely that a significant proportion of any habitat (e.g. for breeding, roosting, foraging etc) for the Grey-crowned Babbler would be removed of modified.

It is unlikely that the proposed activity would temporarily disrupt the lifecycle of the Grey-crowned Babbler. Given the small extent of resources within the subject site that would be removed by the proposed activity and extent of known and potential habitat within the remainder of the study area it is likely that this species would only use the subject site as part of their overall habitat area. It is considered unlikely that the "*life cycle*" of the Grey-crowned Babbler would be "*disrupted*" by the proposed activity, and no "*viable local population*" of this species would be "*placed at risk of extinction*" as a result of the proposed activity.

(b) In the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised.

There is no 'endangered population' of Grey-crowned Babbler listed under Part 2 of Schedule 1 of the *TSC Act 1995*. No evidence exists for the presence of an endangered population occurring within the study area. Consequently, there is no likelihood that the proposed activity can be regarded to involve any such populations even if individuals of such a population use the study area.

(c) In relation to the regional distribution of the habitat of a threatened species, population or ecological community, whether a significant area of known habitat is to be modified or removed.

Given the small area of potential resources offered by the subject site and extent of known and potential habitat in the study area, the proposed activity is unlikely to involve "*a significant area of known habitat*" for the Grey-crowned Babbler being "*removed or modified*". The reference to regional within this factor refers to the regions as defined in the Interim Biogeographic Regionalisation of Australia (IBRA). Following the IBRA, the study area occurs within the Cobar Peneplain IBRA. The Cobar Peneplain Bioregion lies within the Central West of New South Wales, occupying over 73,000 square kilometres, or approximately one-tenth of the area of New South Wales. On this basis, the study area cannot be construed as comprising "*a significant area of known habitat*" in respect of the "*regional distribution of habitat*" for the Grey-crowned Babbler.

(d) Whether an area of known habitat is likely to become isolated from currently interconnecting or proximate areas of habitat for a threatened species, population or ecological community.

It is '*unlikely*' that the proposed activity, including the removal of vegetation will impose a movement barrier to the Grey-crowned Babbler. The proposed activity would involve the removal and modification of 12 hectares of potential habitat. This 12ha area of vegetation would be removed from across an area of 25 hectares (see figures 1 and 2.) within the study area of approximately 200, 000 + hectares. The study area is well connected to surrounding areas of vegetation (see figure 1). Given the small extent and rate of removal of this vegetation, it is unlikely that the proposed activity would involve *"an area of known habitat"* for the Grey-crowned Babbler becoming *"isolated from currently interconnecting or proximate areas of habitat"*.

(e) Whether critical habitat will be affected.

There is currently no declared "critical habitat" in the area likely to be affected by the proposed activity as designated under Part 3 of the *TSC Act 1995*. No area of declared critical habitat is relevant to this proposed activity.

(f) Whether a threatened species, population or ecological community, or their habitats, are adequately represented in conservation reserves (or other similar protected areas) in the region.

Conservation reserves or other similar protected areas within the region that do contain records of the Grey-crowned Babbler include Quanda NR (within 30 km of study area), Yathong and Nombinnie NR's (all within 70 km). However, whilst they do contain known and potential habitat for the Grey-crowned Babbler it is considered unlikely that the Grey-crowned Babbler is *"adequately represented"* within *"conservation reserves and or similar protected areas"* in the locality or region. Also, the Cobar Peneplain Bioregion has been identified as a high priority area for additional conservation assessment and action under the Commonwealth Government's National Reserve System Program (NSW NPWS 2002), as less than five per cent of the bioregion is protected by conservation reserves. Furthermore, more than 90% of woodland and open woodland vegetation types (i.e. preferred habitat type of this species) have been cleared within New South Wales alone.

(g) Whether the development or activity proposed is ~~of~~ a class of development or activity that is recognised as a threatening process.

Whilst the proposed activity is not of a class of development or activity that is recognised as a key threatening process as listed in Schedule 3 of the *TSC Act 1995*, clearing of native vegetation and associated habitats generally is. Clearing of native vegetation is of particular importance as it has been identified as a threatening process to this species.

The Grey-crowned Babbler is threatened by clearance and the fragmentation of habitat including removal of dead timber. Grey-crowned Babbler habitat has been disproportionately cleared for agriculture. Isolation of populations in scattered remnants is exacerbated by the apparent reluctance of birds to traverse tracts of cleared land. Via stochastic events and the loss of long-term genetic viability, the reduced family groups in small isolated populations are vulnerable to extinction (NSW NPWS 2001b). Habitat degradation threatens Grey-crowned Babblers, particularly as a result of weed invasion and grazing by stock. In addition, it is likely that increased abundance of competitors, such as Noisy Miners, and nest predators, including the Pied Currawong and Australian Raven (Major *et al*. 1996) threaten Babbler foraging efficiency and breeding success.

Considering the availability of known and potential habitat within the study area, the removal of this vegetation from the subject site would not *"threaten the survival or evolutionary development"* of the Grey-crowned Babbler. Furthermore, the proposed impact measures would ensure that potential habitat for this species is adequately protected within the study area.

(h) Whether any threatened species, population or ecological community is at the limit of its known distribution.

The eastern form of the Grey-crowned Babbler formerly ranged throughout eastern Australia from South Australia, through Victoria and broadly through New South Wales and central Queensland up into southern New Guinea. The Grey-crowned Babbler is now extinct in South Australia, coastal Victoria and the ACT. In NSW, the Grey-crowned Babbler occurs on the western slopes and plains but is less common at the higher altitudes of the tablelands. Isolated populations are known from coastal woodlands on the North Coast, in the Hunter Valley and from the South Coast near Nowra (Blakers *et al.* 1984; Schodde and Mason 1999). It is considered *'unlikely'* that the Grey-crowned Babbler is at *"the limit of its known distribution"* within the study area, locality or region.

<u>Conclusion</u>

It is unlikely that the proposed activity would impose a *"significant effect"* on the Grey-crowned Babbler. At least 5 – 7 groups have been recorded within the study area to date by the JC-EC, potentially constituting a viable local population of this species. The habitat for these groups would not be removed or modified by the proposed activity.

Hooded Robin south-eastern form (*Melanodryas cucullata cucullata*)

(a) In the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction.

The south-eastern form of the Hooded Robin, is distributed throughout south-eastern Australia, from Central Queensland, to Spencer Gulf, South Australia. This form of the Hooded Robin occurs throughout NSW except for the north-west of the state where it inter-grades with the smaller northern form of the Hooded Robin *M. cucullata picata* (Schodde & Mason 1999). They occupy a wide range of eucalypt woodlands, *Acacia* shrublands and open forests (Blakers *et al*. 1984). In semi-arid western NSW, the species favours open woodlands of Belah, Rosewood, Mulga and Cypress. In temperate woodlands, they favour open areas adjoining large woodland blocks, with areas of dead timber and sparse shrub cover (Fitri and Ford 1997). It has declined significantly in both range and population, and was identified by Reid (1999) as a 'decliner' in a review of bird status in the NSW sheep-wheatbelt.

Hooded Robins live in small family groups of pairs or trios. Home ranges are relatively large, and averaged 18 hectares for birds from the New England Tableland (Fitri and Ford 1997). The species feeds on the ground by pouncing on insects, and forages in areas with a mix of bare ground, ground cover and litter (Blakers et al. 1984, H. Recher, pers. comm).

The proposed activity would remove up to 12 hectares of native vegetation across an area of 25 hectares (less than 1% of the overall habitat available within the study area). Compared to the remaining known and potential habitat within the study area (in excess of 50,000 ha) it is considered unlikely that the subject site would form an important component of habitat for this species. Consequently it is unlikely that a significant proportion of habitat (e.g. for breeding, roosting, foraging etc) for the Hooded Robin would be removed of modified.

The timing of the proposed works is unlikely to disrupt the breeding cycle of the Hooded Robin. Clearing operations will be conducted outside the breeding season for this species. It is considered unlikely that it would cause a significant affect to the survival of the Hooded Robin within the study area.

Given that the small extent of resources within the subject site that would be removed by the proposed activity and extent of known and potential habitat within the remainder of the study area it is likely that this species would only use the subject site as part of their overall habitat area. It is considered unlikely that the "*life cycle*" of the Hooded Robin would be "*disrupted*" by the proposed activity, and no "*viable local population*" of this species would be "*placed at risk of extinction*" as a result of the proposed activity.

(b) In the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised.

There is no 'endangered population' of Hooded Robin listed under Part 2 of Schedule 1 of the *TSC Act 1995*. No evidence exists for the presence of an endangered population occurring within the study area. Consequently, there is no likelihood that the proposed activity can be regarded to involve any such populations even if individuals of such a population use the study area.

(c) In relation to the regional distribution of the habitat of a threatened species, population or ecological community, whether a significant area of known habitat is to be modified or removed.

Given the small size of the area of resources offered by the subject site and extent of known and potential habitat in the study area, the proposed activity is unlikely to involve "*a significant area of known habitat*" for the Hooded Robin being "*removed or modified*". The reference to regional within this factor refers to the regions as defined in the Interim Biogeographic Regionalisation of Australia (IBRA). Following the IBRA, the study area occurs within the Cobar Peneplain IBRA. The Cobar Peneplain Bioregion lies within the Central West of New South Wales, occupying over 73,000 square kilometres, or approximately one-tenth of the area of New South Wales. On this basis, the study area cannot be construed as comprising "*a significant area of known habitat*" in respect of the "*regional distribution of habitat*" for the Hooded Robin.

(d) Whether an area of known habitat is likely to become isolated from currently interconnecting or proximate areas of habitat for a threatened species, population or ecological community.

It is '*unlikely*' that the proposed activity, including the removal of vegetation will impose a movement barrier to the Hooded Robin. The proposed activity would involve the removal and modification of up to 12 hectares of potential habitat (less than 1% of the overall known and potential habitat available within the study area). This area of vegetation would be removed from across an area of 25 hectares (see figures 1 and 2) within the study area of approximately 200,000 + hectares. The study area is well connected to surrounding areas of vegetation. Given the small extent of removal of this vegetation, it is unlikely that the proposed activity would involve *"an area of known habitat"* for the Hooded Robin becoming *"isolated from currently interconnecting or proximate areas of habitat"*.

(e) Whether critical habitat will be affected.

There is currently no declared "critical habitat" in the area likely to be affected by the proposed activity as designated under Part 3 of the *TSC Act 1995*. No area of declared critical habitat is relevant to this proposed activity.

(f) Whether a threatened species, population or ecological community, or their habitats, are adequately represented in conservation reserves (or other similar protected areas) in the region.

Conservation reserves or other similar protected areas within the region that do contain record of the Hooded Robin including Yathong, Nombinnie and Tollingo NR's (all within 80 km). However, whilst they do contain known and potential habitat for the Hooded Robin it is considered unlikely that the Hooded Robin is *"adequately represented"* within *"conservation reserves and or similar protected areas"* in the locality or region. Also, the Cobar Peneplain Bioregion has been identified as a high priority area for additional conservation assessment and action under the Commonwealth Government's National Reserve System Program (NSW NPWS 2002), as less than five per cent of the bioregion is protected by conservation reserves.

(g) Whether the development or activity proposed is ~~of~~ a class of development or activity that is recognised as a threatening process.

Whilst the proposed activity is not of a class of development or activity that is recognised as a key threatening process as listed in Schedule 3 of the *TSC Act 1995*, clearing of native vegetation and associated habitats generally is. Clearing of native vegetation has been identified as a threatening process to this species.

The Hooded Robin is threatened by clearance and fragmentation of habitat, including the removal of dead timber, and is apparently unable to survive in remnants smaller than 100 – 200 hectares (Egan *et al*. 1997). Via stochastic events and loss of long-term genetic viability, the isolation of populations in small remnants increases their vulnerability to local extinction. Low population densities and relatively large home ranges also exacerbate their vulnerability within a highly fragmented and predominantly cleared landscape. The degradation of their habitat by stock grazing and weed invasion may reduce the availability of prey, and the increasing populations of nest predators such as Pied Currawongs and Australian Ravens is likely to cause a reduction in their breeding success (Major *et al.* 1996).

Considering the small extent of removal and the availability of known and potential habitat within areas adjacent to the subject site, the removal of this vegetation from the subject site will not *"threaten the survival or evolutionary development"* of the Hooded Robin.

(h) Whether any threatened species, population or ecological community is at the limit of its known distribution.

The south-eastern form of the Hooded Robin, is distributed throughout south-eastern Australia, from Central Queensland, to Spencer Gulf, South Australia. This form of the Hooded Robin occurs throughout NSW except for the north-west of the state where it inter-grades with the smaller northern form of the Hooded Robin M. cucullata picata (Schodde & Mason 1999). It is considered *'unlikely'* that the Hooded Robin is at *"the limit of its known distribution"* within the study area, locality or region.

<u>**Conclusion**</u>

It is unlikely that the proposed activity would impose a *"significant effect"* on the Hooded Robin. Less than 1% of its known and potential habitat within the study area would be removed/modified as a result of the proposed activity. Furthermore, known habitat records of this species outside the subject site would not be removed or modified by the proposed activity.

Chestnut Quail-thrush (*Cinclosoma castanotus)*

(a) In the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction.

Occurs in the southern interior of Australia from central NSW westward to the coast of Western Australia (Lindsey 1992). The eastern subspecies (*Cinclosoma castanotus castanotus)* occurs through the eastern mallee regions, including Flinders Ranges, Eyre Peninsula, Ninety Mile Plain and Murray Mallee, SA, Big and Little Deserts and Sunset Country, Victoria, and central and south western NSW (Schodde and Mason, unpubl. manuscript). It has disappeared from those areas that have been cleared for agriculture but is still broadly distributed through its former range (Blakers *et al.* 1984; Emison *et al.* 1987; Smith *et al.* 1995). In the Western Zone this species is known in and around the mallee of Round Hill Nature Reserve, the Mandleman mallee in the Willandra World Heritage Area, the Riverina mallee remnants and in thick mallee with *Triodia* north-east of Euston. Also recorded from the Mulga west of Byrock and in the Scotia mallee west of the Darling River, including Tarawi Nature Reserve (Franklin 1993).

Mainly sedentary and fairly common, it is somewhat local in distribution. Breeding occurs mainly from July to December, but is influenced by local rainfall (Lindsey 1992). This species is shy and often difficult to see. It occurs in mallee (including mallee with spinifex *Triodia* as an understorey), acacia (Mulga) scrub, native pine and eucalypt woodland areas, preferably those with a shrub layer and in areas of heath (Pizzey and Knight 1997), especially mallee and mulga scrub, and almost always on substrates of sand (Lindsey 1992). The eastern subspecies of Chestnut Quail-thrush feeds primarily on insects and seeds (Blakers *et al.* 1984).

This species was recorded on one occasion during the December 2004 surveys only. The subject site provides potential habitat for this species in the form of the White Cypress Pine woodland/eucalypt woodland, with native grass groundcovers. The proposed activity would remove up to 12 hectares of native vegetation across an area of 25 hectares (less than 1% of the overall habitat available within the study area). Compared to the remaining known and potential habitat within the study area, existing impacts and modified environment of the subject site it is considered unlikely that the subject site would form an important component of habitat for this species. Consequently it is unlikely that a significant proportion of any habitat (e.g. for breeding, roosting, foraging etc) for the Chestnut Quail-thrush would be removed or modified.

The timing of the proposed works is unlikely to disrupt the breeding season of the Chestnut Quail-thrush (breeding season is from July to December). It is considered unlikely that it would cause a significant affect to the survival of the Chestnut Quail-thrush within the study area.

Given that the small extent of resources within the subject site that would be removed by the proposed activity, and known and potential habitat found within the remainder of the study area it is likely that this species would only use the subject site as part of its overall habitat area. It is considered unlikely that the "*life cycle*" of the Chestnut Quail-thrush would be "*disrupted*" by the proposed activity, and no "*viable local population*" of this species would be "*placed at risk of extinction*" as a result of the proposed activity.

(b) In the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised.

There is no 'endangered population' of Chestnut Quail-thrush listed under Part 2 of Schedule 1 of the *TSC Act 1995*. No evidence exists for the presence of an endangered population occurring within the study area. Consequently, there is no likelihood that the proposed activity can be regarded to involve any such populations even if individuals of such a population use the study area.

(c) In relation to the regional distribution of the habitat of a threatened species, population or ecological community, whether a significant area of known habitat is to be modified or removed.

The reference to regional within this factor refers to the regions as defined in the Interim Biogeographic Regionalisation of Australia (IBRA). Following the IBRA, the study area occurs within the Cobar Peneplain IBRA. The Cobar Peneplain Bioregion lies within the Central West of New South Wales, occupying over 73,000 square kilometres, or approximately one-tenth of the area of New South Wales. On this basis, the study area cannot be construed as comprising "*a significant area of known habitat*" in respect of the "*regional distribution of habitat*" for the Chestnut Quail-thrush. Furthermore, given the limited area of resources offered by the subject site and extent of available habitat in the study area, the proposed activity is unlikely to involve "*a significant area of known habitat*" for the Chestnut Quail-thrush being "*removed or modified*".

(d) Whether an area of known habitat is likely to become isolated from currently interconnecting or proximate areas of habitat for a threatened species, population or ecological community.

Given the limited extent, quality of available habitat within the subject site and rate of removal of this vegetation, it is unlikely that the proposed activity would involve *"an area of known habitat"* for the Chestnut Quail-thrush becoming *"isolated from currently interconnecting or proximate areas of habitat"*. The proposed activity will only involve the removal and modification of up to 12 hectares of potential foraging, roosting and nesting habitat. This area of vegetation would be removed from across an area of 25 hectares (see figures 1 and 2) within the study area of approximately 200,000 + hectares. The study area is well connected to surrounding areas of vegetation. It is '*unlikely*' that the proposed activity, including the removal of relevant vegetation would impose a movement barrier to the Chestnut Quail-thrush.

(e) Whether critical habitat will be affected.

There is currently no declared "critical habitat" in the area likely to be affected by the proposed activity as designated under Part 3 of the *TSC Act 1995*. No area of declared critical habitat is relevant to this proposed activity.

(f) Whether a threatened species, population or ecological community, or their habitats, are adequately represented in conservation reserves (or other similar protected areas) in the region.

Conservation reserves or other similar protected areas within the region that do contain record of the Chestnut Quail-thrush including Yathong and Nombinnie NR's (all within 70 km). However, whilst other similar areas probably do contain potential habitat for this species it is considered unlikely that the Chestnut Quail-thrush is *"adequately represented"* within *"conservation reserves and or similar protected areas"* in the locality or region. Also, the Cobar Peneplain Bioregion has been identified as a high priority area for additional conservation assessment and action under the Commonwealth Government's National Reserve System Program (NSW NPWS 2002), as less than five per cent of the bioregion is protected by conservation reserves.

(g) Whether the development or activity proposed is ~~of~~ a class of development or activity that is recognised as a threatening process.

Whilst the proposed activity is not of a class of development or activity that is recognised as a key threatening process as listed in Schedule 3 of the *TSC Act 1995*, clearing of native vegetation and associated habitats generally is. Clearing of native vegetation and predation by introduced species have both been identified as a threatening process to this species.

The chief cause of decline has been the extensive clearing of mallee scrub for agriculture. This species is also threatened by habitat degradation through altered fire regimes and overgrazing, and by the predation by foxes and feral cats. Considering the small extent (< 12 ha), and the availability of known and potential habitat within areas adjacent to the subject site, the removal of this vegetation would not *"threaten the survival or evolutionary development"* of the Chestnut Quail-thrush. Furthermore, the proposed impact measures (including a feral animal control program and grazing management) would ensure that measures are being undertaken to mitigate against these threatening processes.

(h) Whether any threatened species, population or ecological community is at the limit of its known distribution.

The eastern subspecies (*Cinclosoma castanotus castanotus)* occurs through the eastern mallee regions, including Flinders Ranges, Eyre Peninsula, Ninety Mile Plain and Murray Mallee, SA, Big and Little Deserts and Sunset Country, Victoria, and central and south western NSW (Schodde and Mason, unpubl. manuscript). In the Western Zone this species is known in and around the mallee of Round Hill Nature Reserve, the Mandleman mallee in the Willandra World Heritage Area, the Riverina mallee remnants and in thick mallee with *Triodia* north-east of Euston. Also recorded from the Mulga west of Byrock and in the Scotia mallee west of the Darling River, including Tarawi Nature Reserve (Franklin 1993). It is considered *'unlikely'* that the Chestnut Quail-thrush is at *"the limit of its known distribution"* within the study area, locality or region.

Conclusion

It is unlikely that the proposed activity would impose a *"significant effect"* on the Chestnut Quail-thrush. Less than 1% of its known and potential habitat within the study area will be removed/modified as a result of the proposed activity. Furthermore, impact amelioration measures have been recommended to ensure that threatening processes which may effect this species are mitigated against.

Speckled Warbler *Pyrrholaemus sagittata*

(a) In the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction.

In NSW, they occupy eucalypt and cypress woodlands on the slopes west of the Great Dividing Range, with an extension of range into the cypress woodlands of the northern Riverina. Populations also occur in drier coastal areas such as the Cumberland Plain, Western Sydney and the Hunter and Snowy River Valleys (Blakers *et al*. 1984; Schodde and Mason 1999). Speckled Warblers inhabit woodlands with a grassy understorey, often on ridges or gullies. The species is sedentary, living in pairs or trios and nests on the ground in grass tussocks, dense litter and fallen branches. They forage on the ground and in the understorey for arthropods and seeds. Home ranges vary from 6-12 hectares. (Ford et al. 1986). It has declined in numbers from large parts of its range, and was identified by Reid (1999) as a 'decliner' in a review of bird status in the NSW sheep-wheatbelt.

The subject site provides potential habitat for this species in the form of the White Cypress Pine/eucalypt woodland with associated grassy understorey. The proposed activity would remove up to 12 hectares of native vegetation across an area of 25 hectares (less than 1% of the overall habitat available within the study area). Compared to the remaining known and potential habitat within the study area (in excess of 50,000 ha) it is considered unlikely that the subject site would form an important component of habitat for this species. Consequently it is unlikely that a significant proportion of habitat (e.g. for breeding, roosting, foraging etc) for the Speckled Warbler would be removed of modified.

The timing of the proposed works is unlikely to disrupt the breeding season of the Speckled Warbler. It is considered unlikely that it would cause a significant affect to the survival of the Speckled Warbler within the study area.

It is considered unlikely that the "*life cycle*" of the Speckled Warbler would be "*disrupted*" by the proposed activity, and no "*viable local population*" of this species would be "*placed at risk of extinction*" as a result of the proposed activity.

(b) In the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised.

There is no 'endangered population' of Speckled Warbler listed under Part 2 of Schedule 1 of the *TSC Act 1995*. No evidence exists for the presence of an endangered population occurring within the study area. Consequently, there is no likelihood that the proposed activity can be regarded to involve any such populations even if individuals of such a population use the study area.

(c) In relation to the regional distribution of the habitat of a threatened species, population or ecological community, whether a significant area of known habitat is to be modified or removed.

Given the small area of resources offered by the subject site and extent of known and potential habitat in the study area, the proposed activity is unlikely to involve "*a significant area of known habitat*" for the Speckled Warbler being "*removed or modified*". The reference to regional within this factor refers to the regions as defined in the Interim Biogeographic Regionalisation of Australia (IBRA). Following the IBRA, the study area occurs within the Cobar Peneplain IBRA. The Cobar Peneplain Bioregion lies within the Central West of New South Wales, occupying over 73,000 square kilometres, or approximately one-tenth of the area of New South Wales. On this basis, the study area cannot be construed as comprising "*a significant area of known habitat*" in respect of the "*regional distribution of habitat*" for the Speckled Warbler.

(d) Whether an area of known habitat is likely to become isolated from currently interconnecting or proximate areas of habitat for a threatened species, population or ecological community.

It is '*unlikely*' that the proposed activity, including the removal of relevant vegetation would impose a movement barrier to the Speckled Warbler. The proposed activity will involve the removal and modification of up to 12 hectares of potential habitat. This area of vegetation would be removed across an area of 25 hectares (see figures 1 and 2) within the study area of approximately 200,000 + hectares. The study area is well connected to surrounding areas of vegetation (see figure 1). Given the small extent of removal of this vegetation, it is unlikely that the proposed activity would involve *"an area of known habitat"* for the Speckled Warbler becoming *"isolated from currently interconnecting or proximate areas of habitat"*.

(e) Whether critical habitat will be affected.

There is currently no declared "critical habitat" in the area likely to be affected by the proposed activity as designated under Part 3 of the *TSC Act 1995*. No area of declared critical habitat is relevant to this proposed activity.

(f) Whether a threatened species, population or ecological community, or their habitats, are adequately represented in conservation reserves (or other similar protected areas) in the region.

Conservation reserves or other similar protected areas within the region that do contain record of the Speckled Warbler including Yathong and Nombinnie NR's (all within 70 km). However, whilst they do contain known habitat for the Speckled Warbler it is considered unlikely that the Speckled Warbler is *"adequately represented"* within *"conservation reserves and or similar protected areas"* in the locality or region. Also, the Cobar Peneplain Bioregion has been identified as a high priority area for additional conservation assessment and action under the Commonwealth Government's National Reserve System Program (NSW NPWS 2002), as less than five per cent of the bioregion is protected by conservation reserves.

(g) Whether the development or activity proposed is ~~of~~ a class of development or activity that is recognised as a threatening process.

Whilst the proposed activity is not of a class of development or activity that is recognised as a key threatening process as listed in Schedule 3 of the *TSC Act 1995*, clearing of native vegetation and associated habitats generally is. Clearing of native vegetation and predation by introduced species have both been identified as a threatening process to this species.

The Speckled Warbler is threatened by clearance and fragmentation of habitat, including the removal of dead timber. It decreases in abundance as woodland area decreases, and appears to be extinct in districts where no fragments larger than 100 hectares remain (Barrett *et al*. 1994). Via stochastic events and loss of long-term genetic viability, the isolation of populations in small remnants increases their vulnerability to local extinction. Low population densities and relatively large home ranges also exacerbate their vulnerability within a highly fragmented and predominantly cleared landscape. Their preferred foraging habitat, a combination of open grassy patches, leaf litter and shrub cover, is susceptible to degradation by stock grazing and weed invasion. Nesting on the ground also makes them susceptible to predation by foxes and cats (NPWS 2001c).

Considering the small extent and the availability of known and potential habitat within areas adjacent to the subject site, the removal of this vegetation will not *"threaten the survival or evolutionary development"* of the Speckled Warbler. Furthermore, the proposed impact measures (including a feral animal control program) would ensure that measures are being undertaken to mitigate against these threatening processes.

(h) Whether any threatened species, population or ecological community is at the limit of its known distribution.

Distributed from south-eastern Queensland, through central and eastern NSW to Victoria. In NSW, they occupy eucalypt and cypress woodlands on the slopes west of the Great Dividing Range, with an extension of range into the cypress woodlands of the northern Riverina. Populations also occur in drier coastal areas such as the Cumberland Plain, Western Sydney and the Hunter and Snowy River Valleys (Blakers *et al*. 1984; Schodde and Mason 1999). Furthermore, this species was found to occur at several locations within the study area, outside the limits of the subject site and there are nearby local records within unprotected and conservation reserve areas. It is considered *'unlikely'* that the Speckled Warbler is at *"the limit of its known distribution"* within the study area, locality or region.

Conclusion

It is unlikely that the proposed activity would impose a *"significant effect"* on the Speckled Warbler. Less than 1% of its habitat within the study area would be removed/modified as a result of the proposed activity. Impact amelioration measures have been recommended to ensure that threatening processes which may affect this species are mitigated against.

Pied Honeyeater (*Certhionyx variegates*)

(a) In the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction.

Widespread across the arid interior and mainland Australia but, strongly nomadic and erratic in occurrence, following the flowering cycle of eremophilas and similar plants (Slater *et al.* 1986; Schodde and Tidemann 1986). It is generally more common in the west than in the east. In the Western Zone, it frequents stands of *Eremophila maculata* near Buronga and Dareton in the south, common on *Grevillea juncifolia* in spring in the west of the Culgoa River, also recorded on *Eremophila duttoni* west of the Paroo River. Recorded amongst *G. huegelii* and *Acacia colletioides* within Tarawi Nature Reserve (NSW NPWS 1996). Pied Honeyeaters inhabit acacia shrub (primarily Mulga), mallee, spinifex and eucalypt woodlands, usually when shrubs are flowering (Pizzey and Knight 1997). These birds feed in nectar, predominantly from various species of *Eremophila*; also from mistletoe and various *Brachysema* and *Gervillea* shrubs (Schodde and Tidemann 1986). Travelling in small groups it forages mainly in the crowns of bushes and trees, and feeds largely on nectar supplemented by flying insects. Breeding is strongly influenced by local rainfall but occurs mainly from September to February. Nests are small, loose cups of twigs and grass bound by cobweb and suspended in a slender horizontal fork within a few meters from the ground (Lindsey 1992).

This species was recorded on one occasion at an earth tank (dam) in the north-west portion of the property during the December 2004 survey. It has not been recorded since then by the JC-EC. Potential foraging and breeding resources are limited and restricted to eucalypt dominated woodland areas. Although the subject site does contain some of the specific foraging resources required by this species in the form of flowering plants, (e.g. the occasional *Eremophila spp.*, mistletoe spp., and Ironbark), potential habitat offered by the subject site was considered to be limited and only part of the overall habitat required by this species.

The proposed activity would remove up to 12 hectares of native vegetation across an area of 25 hectares (less than 1% of the overall habitat available within the study area). Compared to the potential habitat within the study area, it is considered unlikely that the subject site would form an important component of habitat for this species. Consequently it is unlikely that a significant proportion of habitat for the Pied Honeyeater would be removed or modified. It is unlikely that the proposed activity would disrupt the breeding season of the Pied Honeyeater. It is considered unlikely that the proposed activity would cause a significant affect to the survival of the Pied Honeyeater within the study area.

It is considered unlikely that the "*life cycle*" of the Pied Honeyeater would be "*disrupted*" by the proposed activity, and no "*viable local population*" of this species would be "*placed at risk of extinction*" as a result of the proposed activity. The lack of specific foraging resources and strongly nomadic nature of this species further supports this finding.

(b) In the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised.

There is no 'endangered population' of Pied Honeyeater listed under Part 2 of Schedule 1 of the *TSC Act 1995*. No evidence exists for the presence of an endangered population occurring within the study area. Consequently, there is no likelihood that the proposed activity can be regarded to involve any such populations even if individuals of such a population use the study area.

(c) In relation to the regional distribution of the habitat of a threatened species, population or ecological community, whether a significant area of known habitat is to be modified or removed.

The study area cannot be construed as comprising "*a significant area of known habitat*" in respect of the "*regional distribution of habitat*" for the Pied Honeyeater. Potential habitat is restricted to the eucalypt woodland and there is a lack of specific foraging resources within the subject site and therefore considered to be only part of the overall habitat for this species within the study area. The reference to regional within this factor refers to the regions as defined in the Interim Biogeographic Regionalisation of Australia (IBRA). Following the IBRA, the study area occurs within the Cobar Peneplain IBRA. The Cobar Peneplain Bioregion lies within the Central West of New South Wales, occupying over 73,000 square kilometres, or approximately one-tenth of the area of New South Wales. The proposed activity is therefore unlikely to involve "*a significant area of known habitat*" for the Pied Honeyeater being "*removed or modified*".

(d) Whether an area of known habitat is likely to become isolated from currently interconnecting or proximate areas of habitat for a threatened species, population or ecological community.

It is '*unlikely*' that the proposed activity, including the removal of relevant vegetation would impose a movement barrier to the Pied Honeyeater. Given the limited extent and quality of available habitat within the subject site, it is unlikely that the proposed activity would involve *"an area of known habitat"* for the Pied Honeyeater becoming *"isolated from currently interconnecting or proximate areas of habitat"*. The proposed activity would only involve the removal and modification of 12 hectares of potential foraging, roosting and nesting habitat. This area of vegetation would be removed from across an area of 25 hectares (see figures 1 and2) within the study area of approximately 200,000 + hectares. The study area is well connected to surrounding areas of vegetation (see figure 1). Furthermore, the strongly nomadic nature of this species further supports this finding.

(e) Whether critical habitat will be affected.

There is currently no declared "critical habitat" in the area likely to be affected by the proposed activity as designated under Part 3 of the *TSC Act 1995*. No area of declared critical habitat is relevant to this proposed activity.

(f) Whether a threatened species, population or ecological community, or their habitats, are adequately represented in conservation reserves (or other similar protected areas) in the region.

Conservation reserves or other similar protected areas within the region that do contain records of the Pied Honeyeater include Yathong and Nombinnie NR's (all within 70 km). However, whilst other similar areas probably do contain potential habitat for the Pied Honeyeater it is considered unlikely that the Pied Honeyeater is *"adequately represented"* within *"conservation reserves and or similar protected areas"* in the locality or region. Also, the Cobar Peneplain Bioregion has been identified as a high priority area for additional conservation assessment and action under the Commonwealth Government's National Reserve System Program (NSW NPWS 2002), as less than five per cent of the bioregion is protected by conservation reserves.

(g) Whether the development or activity proposed is ~~of~~ a class of development or activity that is recognised as a threatening process.

Whilst the proposed activity is not of a class of development or activity that is recognised as a key threatening process as listed in Schedule 3 of the *TSC Act 1995*, clearing of native vegetation and associated habitats generally is. Clearing of native vegetation has been identified as a threatening process to this species.

Considering the small extent (< 12 ha) and the availability of potential habitat within areas adjacent to the subject site, the removal of this vegetation from the subject site would not *"threaten the survival or evolutionary development"* of the Pied Honeyeater. Furthermore, the proposed activity would not result in any of the preferred habitat for this species being removed or modified.

(h) Whether any threatened species, population or ecological community is at the limit of its known distribution.

Widespread across the arid interior and mainland Australia but, strongly nomadic and erratic in occurrence, following the flowering cycle of eremophilas and similar plants (Slater *et al.* 1986; Schodde and Tidemann 1986). It is generally more common in the west than in the east. In the Western Zone, it frequents stands of *Eremophila maculata* near Buronga and Dareton in the south, common on *Grevillea juncifolia* in spring in the west of the Culgoa River, also recorded on *Eremophila duttoni* west of the Paroo River. Recorded amongst *G. huegelii* and *Acacia colletioides* within Tarawi Nature Reserve (NSW NPWS 1996). It is considered *'unlikely'* that the Pied Honeyeater is at *"the limit of its known distribution"* within the study area, locality or region.

Conclusion

It is unlikely that the proposed activity would impose a *"significant effect"* on the Pied Honeyeater. Less than 1% of its habitat within the study area would be removed/modified as a result of the proposed activity. Furthermore, specific foraging habitat for this species is limited within the subject site and areas of potential habitat (eucalypt woodland) within the remainder of the study area would remain unmodified by the proposed activity.

Diamond Firetail (*Stagonopleura guttata*)

(a) In the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction.

Diamond Firetail are distributed through central and eastern NSW, extending north into southern and central Queensland and south through Victoria to the Eyre Peninsula, South Australia. In NSW, it is predominantly distributed west of the Great Dividing Range, although they are also found in drier coastal woodlands of the Cumberland Plain, Western Sydney and in the Hunter, Richmond, Clarence Valleys and Snowy River Valleys (Blakers *et al*. 1984; Schodde and Mason 1999). This species occupies eucalypt woodlands, forests and mallee where there is a grassy understorey. They build bottle-shaped nests in trees and bushes, and forage on the ground for grass seeds and other plant material and also insects (Blakers *et al*. 1984; Read 1994). It has declined in numbers in many areas and has disappeared from parts of its former range. Reid (1999) identified it as a 'decliner' in a review of bird species' status in the NSW sheep-wheatbelt.

The subject site provides potential habitat for this species in the form of the White Cypress Pine woodland/eucalypt woodland, with native grass groundcovers. The proposed activity would remove up to 12 hectares of native vegetation across an area of 25 hectares (less than 1% of the overall habitat available within the study area). Compared to the remaining known and potential habitat within the study area it is considered unlikely that the subject site would form an important component of habitat for this species. Consequently it is unlikely that a significant proportion of any habitat (e.g. for breeding, roosting, foraging etc) for the Diamond Firetail would be removed or modified.

The timing of the proposed works is unlikely to disrupt the Diamond Firetail, as it would be outside the breeding season. It is considered unlikely that it would cause a significant affect to the survival of the Diamond Firetail within the study area.

Given that the small extent of resources within the subject site that would be removed by the proposed activity and known and potential habitat found within and in close proximity to the subject site it is likely that this species would only use the subject site as part of its overall habitat area. It is considered unlikely that the "*life cycle*" of the Diamond Firetail would be "*disrupted*" by the proposed activity, and no "*viable local population*" of this species would be "*placed at risk of extinction*" as a result of the proposed activity.

(b) In the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised.

There is no 'endangered population' of Diamond Firetail listed under Part 2 of Schedule 1 of the *TSC Act 1995*. No evidence exists for the presence of an endangered population occurring within the study area. Consequently, there is no likelihood that the proposed activity can be regarded to involve any such populations even if individuals of such a population use the study area.

(c) In relation to the regional distribution of the habitat of a threatened species, population or ecological community, whether a significant area of known habitat is to be modified or removed.

The reference to regional within this factor refers to the regions as defined in the Interim Biogeographic Regionalisation of Australia (IBRA). Following the IBRA, the study area occurs within the Cobar Peneplain IBRA. The Cobar Peneplain Bioregion lies within the Central West of New South Wales, occupying over 73,000 square kilometres, or approximately one-tenth of the area of New South Wales. On this basis, the study area cannot be construed as comprising "*a significant area of known habitat*" in respect of the "*regional distribution of habitat*" for the Diamond Firetail. Furthermore, given the limited are of resources offered by the subject site and extent of available habitat in the study area, the proposed activity is unlikely to involve "*a significant area of known habitat*" for the Diamond Firetail being "*removed or modified*".

(d) Whether an area of known habitat is likely to become isolated from currently interconnecting or proximate areas of habitat for a threatened species, population or ecological community.

The proposed activity would involve the removal and modification of 2 hectares of potential foraging, roosting and nesting habitat (less than 1% of the overall potential habitat available within the study area). This are of vegetation would be removed from across an area of 25 hectares (see figures 1 and 2) within the study area of approximately 200,000 + hectares. The study area is well connected to surrounding areas of vegetation (see figure 1). It is '*unlikely*' that the proposed activity, including the removal of relevant vegetation would impose a movement barrier to the Diamond Firetail. Given the limited extent available habitat within the subject site, it is unlikely that the proposed activity would involve *"an area of known habitat"* for the Diamond Firetail becoming *"isolated from currently interconnecting or proximate areas of habitat"*.

(e) Whether critical habitat will be affected.

There is currently no declared "critical habitat" in the area likely to be affected by the proposed activity as designated under Part 3 of the *TSC Act 1995*. No area of declared critical habitat is relevant to this proposed activity.

(f) Whether a threatened species, population or ecological community, or their habitats, are adequately represented in conservation reserves (or other similar protected areas) in the region.

It is likely that conservation reserves or other similar protected areas within the region do contain records for this species (although none could be found). However, whilst they probably do contain potential habitat for the Diamond Firetail it is considered unlikely that the Diamond Firetail is *"adequately represented"* within *"conservation reserves and or similar protected areas"* in the locality or region. Also, the Cobar Peneplain Bioregion has been identified as a high priority area for additional conservation assessment and action under the Commonwealth Government's National Reserve System Program (NSW NPWS 2002), as less than 5% of the bioregion is protected by conservation reserves.

(g) Whether the development or activity proposed is ~~of~~ a class of development or activity that is recognised as a threatening process.

Whilst the proposed activity is not of a class of development or activity that is recognised as a key threatening process as listed in Schedule 3 of the *TSC Act 1995*, clearing of native vegetation and associated habitats generally is. Clearing of native vegetation is of particular importance as it has been identified as a threatening process to this species.

The Diamond Firetail is threatened by clearance and fragmentation of habitat and apparently is unable to persist in districts that lack remnants of native vegetation larger than 200 hectares. Via stochastic events and loss of long-term genetic viability, the reduction in size of remnant habitat leads to the isolation of populations, inhibits dispersal, and increases their vulnerability to local extinction (Barrett *et al*. 1994). Habitat degradation, particularly stock grazing, threatens the food availability of this granivorous species. Also, the increasing populations of nest predators such as Pied Currawongs and Australian Ravens is likely to cause a reduction in their breeding success, particularly in small remnants (Major *et al.* 1996).

Considering the small extent (< 12 ha) of the potential habitat in the subject site and the availability of known and potential habitat within the study area, the removal of this vegetation from the subject site would not *"threaten the survival or evolutionary development"* of the Diamond Firetail. Furthermore, the proposed impact measures would ensure that measures are being undertaken to mitigate against threatening processes within the study area.

(h) Whether any threatened species, population or ecological community is at the limit of its known distribution.

The Diamond Firetail is distributed through central and eastern NSW, extending north into southern and central Queensland and south through Victoria to the Eyre Peninsula, South Australia. In NSW, it is predominantly distributed west of the Great Dividing Range, although they are also found in drier coastal woodlands of the Cumberland Plain, Western Sydney and in the Hunter, Richmond, Clarence Valleys and Snowy River Valleys (Blakers *et al*. 1984; Schodde and Mason 1999). Furthermore, this species was found to occur at two locations within the study area, outside the limits of the subject site and there are also records within the locality. It is considered *'unlikely'* that the Diamond Firetail is at *"the limit of its known distribution"* within the study area, locality or region.

<u>Conclusion</u>

It is unlikely that the proposed activity would impose a *"significant effect"* on the Diamond Firetail. Less than 1% of its known and potential habitat within the study area would be removed/modified as a result of the proposed activity. Furthermore, known and potential habitat for this species would not be removed or modified by the proposed activity for the remainder of the study area.

Superb Parrot (*Polytelis swainsonnii*)

(a) In the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction.

The Superb Parrot breeds only in the Riverina and south-west slopes of New South Wales and in northern Victoria (Webster and Ahern 1992). Virtually restricted to the interior of New South Wales, it is confined as a breeding bird to River Red Gum forests along the Murray and Edwards Rivers near Deniliquin and Mathoura, and along the Murrumbidgee River from Wagga Wagga to Darlington Point (Schrader 1980; Higgins 1999; Lindsey 1992). In Victoria it is now largely confined to the Barmah Forest area in the north, rarely to Wangaratta (Higgins 1999), having disappeared from central and southern Victoria in the early 1900s, and from northern Victoria by 1930 (Webster and Ahern, 1992). They have all but disappeared from the Australian Capital Territory in the 1950s and in New South Wales declined in the Parkes district since 1960s. However, it may have extended its range to Deniliquin and in northern New South Wales over the same period (Schrader 1980; Higgins 1999). Breeding population estimated at fewer than 5,000 pairs (Davidson and Chambers 1992). Counts in December 1998 found 200 birds at Nathalia, Victoria, 60 at Deniliquin and 100 near Wagga Wagga, both New South Wales (Anon 1999).

In the Riverina, Superb Parrots nest in loose colonies in riparian woodland of River Red Gum. A typical nest tree in the Riverina has a dbh of 1.57 m, a height of 33 m and a maximum crown width of 11m. The typical nest hollow is 17 m above the ground and around 26 m from a watercourse. Black Box, White Cypress Pine and Boree are often associated with many breeding areas (Greening Australia 1995). The majority of foraging occurs within box woodlands, particularly that dominated by Yellow Box and Black Box, on seeds of herbaceous plants, switching to lerp, mistletoe berries, eucalypt flowers and grass seed in winter (Webster 1988; Higgins 1999). On the inland slopes of the Great Dividing Range, Superb Parrots forage and nest within box woodland (Webster 1988). They forage up to 15 km from the nest, particularly on inland slopes where suitable nesting trees are widely dispersed, but rarely cross extensive open ground, using woodland remnants as corridors or flyways (Webster 1988; Davidson and Chambers 1992; Webster and Ahern 1992; Anon 1999; Higgins 1999).

The subject site does offer foraging habitat for the Superb Parrot in the form of the White Cypress Pine/eucalypt woodland areas, and associated native and introduced grassy ground cover. Potential nesting habitat is restricted to hollow bearing Bimble Box and Red Box trees within the subject site. However, it is considered very unlikely that this species would breed within the study area. This species usually breeds within River Red Gum area further to the south and fly to more northern feeding grounds in the winter once chicks have fledged and reared.

The proposed activity would remove up to 12 hectares of native vegetation across an area of 25 hectares (less than 1% of the overall potential habitat available within the study area). Compared to the remaining potential habitat within the study area (in excess of 50,000 ha) it is considered unlikely that the subject site would form an important component of habitat for this species. Consequently it is unlikely that a significant proportion of habitat (e.g. for breeding, roosting, foraging etc), particularly breeding habitat for the Superb Parrot would be removed of modified. It is also unlikely that the timing of the proposed works would affect the breeding cycle of the superb Parrot within the study area.

Given that the small extent of resources within the subject site that would be removed by the proposed activity for the Superb Parrot, and extent of the potential habitat within the remainder of the study area it is likely that this species would only use the subject site as part of its overall foraging habitat. It is considered unlikely that the "*life cycle*" of the Superb Parrot would be "*disrupted*" by the proposed activity, and no "*viable local population*" of this species would be "*placed at risk of extinction*" as a result of the proposed activity.

(b) In the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised.

There is no 'endangered population' of Superb Parrot listed under Part 2 of Schedule 1 of the *TSC Act 1995*. No evidence exists for the presence of an endangered population occurring within the study area. Consequently, there is no likelihood that the proposed activity can be regarded to involve any such populations even if individuals of such a population use the study area.

(c) In relation to the regional distribution of the habitat of a threatened species, population or ecological community, whether a significant area of known habitat is to be modified or removed.

The reference to regional within this factor refers to the regions as defined in the Interim Biogeographic Regionalisation of Australia (IBRA). Following the IBRA, the study area occurs within the Cobar Peneplain IBRA. The Cobar Peneplain Bioregion lies within the Central West of New South Wales, occupying over 73,000 square kilometres, or approximately one-tenth of the area of New South Wales. Given the small size of the area of resources offered by the subject site and extent of potential habitat in the study area, the proposed activity is unlikely to involve "*a significant area of known habitat*" for the Superb Parrot being "*removed or modified*".

(d) Whether an area of known habitat is likely to become isolated from currently interconnecting or proximate areas of habitat for a threatened species, population or ecological community.

The proposed activity would involve the removal and modification of 12 hectares of potential foraging habitat. This vegetation will be removed from across an area of 25 hectares (see figure 1and 2) within the study area of approximately 200,000 + hectares. The study area is well connected to surrounding areas of vegetation (see figure 1). It is '*unlikely*' that the proposed activity, including the removal of relevant vegetation would impose a movement barrier to the Superb Parrot. It is unlikely that the proposed activity would involve *"an area of known habitat"* for the Superb Parrot becoming *"isolated from currently interconnecting or proximate areas of habitat"*.

(e) Whether critical habitat will be affected.

There is currently no declared "critical habitat" in the area likely to be affected by the proposed activity as designated under Part 3 of the *TSC Act 1995*. No area of declared critical habitat is relevant to this proposed activity.

(f) Whether a threatened species, population or ecological community, or their habitats, are adequately represented in conservation reserves (or other similar protected areas) in the region.

Conservation reserves or other similar protected areas within the region that do contain records of the Superb Parrot include Quanda NR (within 30 km of study area) and Yathong NR (within 70 km). However, whilst they do contain known habitat for the Superb Parrot it is considered unlikely that the Superb Parrot is *"adequately represented"* within *"conservation reserves and or similar protected areas"* in the locality or region. Also, the Cobar Peneplain Bioregion has been identified as a high priority area for additional conservation assessment and action under the Commonwealth Government's National Reserve System Program (NSW NPWS 2002), as less than five per cent of the bioregion is protected by conservation reserves.

(g) Whether the development or activity proposed is ~~of~~ a class of development or activity that is recognised as a threatening process.

Whilst the proposed activity is not of a class of development or activity that is recognised as a key threatening process as listed in Schedule 3 of the *TSC Act 1995*, clearing of native vegetation and associated habitats generally is. Clearing of native vegetation has been identified as a threatening process to this species.

The greatest threat to the Superb Parrot is habitat clearance. The contraction of this species range has largely resulted from clearing for agriculture (Higgins 1999). Within the Murray-Riverina area, clearing of habitat has resulted for the development of orchards and firewood supplies (Anon 1988; Webster 1988). Much of the remaining habitat is degraded with the regeneration of nest trees prevented by overgrazing of stock and rabbits, and by inappropriate fire regimes (Webster and Ahern 1992). Live nest trees are threatened by logging, particularly on private land and artificially high water levels as a result of irrigation. Dead nest trees may not be replaced when they fall and these are also removed for firewood. Irrigation is also causing high water tables and along with drainage schemes and salinisation also degrading non-breeding habitat (Webster 1988). Competition for nesting hollows, particularly with the Common Starling may become limiting and substantial numbers of birds are killed on roadsides, particularly during periods when grain is being transported (Webster 1988).

Given the extent of potential habitat available within the study area and small extent of habitat within the subject site, the activities of the proposed development including the removal of native vegetation would not "*threaten the survival or evolutionary development*" of the Superb Parrot.

(h) Whether any threatened species, population or ecological community is at the limit of its known distribution.

The Superb Parrot is not at "*the limit of its known distribution*" in the locality of the subject site or the region. The Superb Parrot is distributed primarily on the upper and middle reaches of the Murray, Murrumbidgee and Lachlan Rivers, as well as some of their tributaries during the breeding season (e.g. Edwards River). During winter this species can be found in central northern New South Wales and along the Namoi and Castlereagh Rivers in north western New South Wales (Greening Australia 1995). Furthermore, this species was found to occur at over 14 locations within the study area and there are also records within the locality. It is considered *'unlikely'* that the Superb Parrot is at *"the limit of its known distribution"* within the study area, locality or region.

Conclusion

It is unlikely that the proposed activity would impose a *"significant effect"* on the Superb Parrot, as the subject site offers limited resources when compared to the remaining study area and is unlikely to be part of the breeding area of this species. Furthermore, ample foraging and roosting opportunities within the remainder of the study area would be unaffected by the proposed activity.

Black-chinned Honeyeater (*Melithreptus gularis gularis (eastern subspecies)*)

(a) In the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction.

This species is predominantly distributed west of the Great Dividing Range in a narrow belt through NSW and into southern Queensland, and south into Victoria and South Australia where it occupies woodlands within an approximate annual rainfall range of 400 – 700 mm (Blakers *et al.* 1984). In NSW, it is most commonly found in woodlands containing box-ironbark associations and River Red Gum. They are also found in drier coastal woodlands of the Cumberland Plain, Western Sydney and in the Hunter, Richmond and Clarence Valleys.

They build compact, cup-shaped nests and feed on arthropods, nectar and lerp from eucalypt foliage and bark (Blakers *et al.* 1984). They are widely distributed and occur naturally at low densities, ranging from 0.02 to 0.26 per hectare in box-ironbark forests in Victoria (Traill 1995) and 0.28 per hectare in northern NSW (Oliver *et al.* 1999). It has declined in numbers and has disappeared from parts of its former range, apparently not persisting in remnants less than 200 ha. Reid (1999) identified it as a 'decliner' in a review of bird species' status in the NSW sheep-wheatbelt.

The subject site provides potential habitat for this species in the form of Bimble Box/Red Box eucalypt woodland. These trees provide foraging and nesting opportunities for this species. Although potential habitat in the form of this eucalypt woodland of the subject site was recorded, no preferred habitat for this species (riparian/River Red Gum woodland) was recorded within the subject site. Potential habitat is restricted to the eucalypts woodland area of the subject site and is therefore considered limited and only part of the overall habitat for this species within the study area.

The proposed activity would remove up to 12 hectares of native vegetation across an area of 25 hectares (less than 1% of the overall habitat available within the study area) which has already been modified by existing mining operations. Compared to the potential habitat within the study area, existing impacts and modified environment of the subject site it is considered unlikely that the subject site would form an important component of habitat for this species. Consequently it is unlikely that a significant proportion of habitat (e.g. for breeding, roosting, foraging etc) for the Black-chinned Honeyeater will be removed or modified. It is unlikely that the timing of the proposed works would temporarily disrupt the Black-chinned Honeyeater as it will primarily occur during the non-breeding season. It is considered unlikely that it would cause a significant affect to the survival of the Black-chinned Honeyeater within the study area.

It is considered unlikely that the "*life cycle*" of the Black-chinned Honeyeater will be "*disrupted*" by the proposed activity, and no "*viable local population*" of this species will be "*placed at risk of extinction*" as a result of the proposed activity.

(b) In the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised.

There is no 'endangered population' of Black-chinned Honeyeater listed under Part 2 of Schedule 1 of the *TSC Act 1995*. No evidence exists for the presence of an endangered population occurring within the study area. Consequently, there is no likelihood that the proposed activity can be regarded to involve any such populations even if individuals of such a population use the study area.

(c) In relation to the regional distribution of the habitat of a threatened species, population or ecological community, whether a significant area of known habitat is to be modified or removed.

The reference to regional within this factor refers to the regions as defined in the Interim Biogeographic Regionalisation of Australia (IBRA). Following the IBRA, the study area occurs within the Cobar Peneplain IBRA. The Cobar Peneplain Bioregion lies within the Central West of New South Wales, occupying over 73,000 square kilometres, or approximately one-tenth of the area of New South Wales. On this basis, the study area cannot be construed as comprising "*a significant area of known habitat*" in respect of the "*regional distribution of habitat*" for the Black-chinned Honeyeater. Furthermore, although known and potential habitat in the form of this eucalypt woodland of the study area was recorded, no preferred habitat for this species (riparian/River Red Gum woodland) was recorded within the subject site. Potential habitat is restricted to the eucalypts woodland area of the subject site and is therefore considered limited and only part of the overall habitat for this species within the study area. The proposed activity is therefore unlikely to involve "*a significant area of known habitat*" for the Black-chinned Honeyeater being "*removed or modified*".

(d) Whether an area of known habitat is likely to become isolated from currently interconnecting or proximate areas of habitat for a threatened species, population or ecological community.

Given the limited extent and quality of available habitat within the subject site and rate of removal of this vegetation, it is unlikely that the proposed activity will involve *"an area of known habitat"* for the Black-chinned Honeyeater becoming *"isolated from currently interconnecting or proximate areas of habitat"*. The proposed activity will only involve the removal and modification of up to 12 hectares of potential habitat. The area of vegetation would be removed from each across an area of 25 hectares (see figures 1 and 2) within the study area of approximately 200,000 + hectares. The study area is well connected to surrounding areas of vegetation (see figure 1). It is '*unlikely*' that the proposed activity, including the removal of relevant vegetation would impose a movement barrier to the Black-chinned Honeyeater.

(e) Whether critical habitat will be affected.

There is currently no declared "critical habitat" in the area likely to be affected by the proposed activity as designated under Part 3 of the *TSC Act 1995*. No area of declared critical habitat is relevant to this proposed activity.

(f) Whether a threatened species, population or ecological community, or their habitats, are adequately represented in conservation reserves (or other similar protected areas) in the region.

Conservation reserves or other similar protected areas within the region that do contain records of the Black-chinned Honeyeater include Yathong and Nombinnie NR's (all within 70 km). However, whilst other similar areas probably do contain potential habitat for the Black-chinned Honeyeater it is considered unlikely that the Black-chinned Honeyeater is *"adequately represented"* within *"conservation reserves and or similar protected areas"* in the locality or region. Also, the Cobar Peneplain Bioregion has been identified as a high priority area for additional conservation assessment and action under the Commonwealth Government's National Reserve System Program (NSW NPWS 2002), as less than five per cent of the bioregion is protected by conservation reserves.

(g) Whether the development or activity proposed is ~~of~~ a class of development or activity that is recognised as a threatening process.

Whilst the proposed activity is not of a class of development or activity that is recognised as a key threatening process as listed in Schedule 3 of the *TSC Act 1995*, clearing of native vegetation and associated habitats generally is. Clearing of native vegetation and predation by introduced species have both been identified as a threatening process to this species.

The Black-chinned Honeyeater (eastern spp.) is threatened by clearance and fragmentation of habitat. Via stochastic events and loss of long-term genetic viability, the reduction in size of remnant habitat leads to the isolation of populations and increases their vulnerability to local extinction. Low population densities also exacerbate their vulnerability within a highly fragmented and predominantly cleared landscape. They are also likely to experience high levels of competition from more aggressive species, such as Noisy Miners and White-plumed Honeyeaters, which occur at relatively high densities in small remnants of box-ironbark associations and River Red Gum. Also, the increasing populations of nest predators such as Pied Currawongs and Australian Ravens is likely to cause a reduction in their breeding success, particularly in small remnants (Major *et al.* 1996).

Considering the small extent (< 12 ha) of habitat within the subject site and the availability of potential habitat within areas adjacent to the subject site, the removal of this vegetation would not *"threaten the survival or evolutionary development"* of the Black-chinned Honeyeater. Furthermore, the proposed activity would not result in any of the preferred habitat for this species being removed or modified.

(h) Whether any threatened species, population or ecological community is at the limit of its known distribution.

Predominantly distributed west of the Great Dividing Range in a narrow belt through NSW and into southern Queensland, and south into Victoria and South Australia where it occupies woodlands within an approximate annual rainfall range of 400 – 700 mm (Blakers *et al*. 1984). In NSW, it is most commonly found in woodlands containing box-ironbark associations and River Red Gum. They are also found in drier coastal woodlands of the Cumberland Plain, Western Sydney and in the Hunter, Richmond and Clarence Valleys. It is considered *'unlikely'* that the Black-chinned Honeyeater is at *"the limit of its known distribution"* within the study area, locality or region.

Conclusion

It is unlikely that the proposed activity would impose a *"significant effect"* on the Black-chinned Honeyeater. Less than 1% of its habitat within the study area would be removed/modified as a result of the proposed activity. Furthermore, no preferred habitat for this species was recorded within the subject site and ample areas of potential habitat (eucalypt woodland) within the remainder of the study area would remain unmodified by the proposed activity.

Little Pied Bat *(Chalinolobus picatus)*

(a) In the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction.

One sub-adult female *C. picatus* was captured as a result of one nights trapping at the earth tank near the house at the north-west entrance of the property. Originally thought to be an obligate cave-dwelling species and therefore thought rare due to the scattered and infrequent occurrence of suitable roosting and maternity sites across its range, colonies are now known from tree hollows and disused buildings (Duncan *et al*. 1999). In caves and mines, they occur in small colonies of fewer than 10 individuals. A colony of 38 males and females was recorded in an abandoned house (Churchill 1998). This species occurs most frequently in dry, open woodland communities throughout its range, but also has been recorded in dry sclerophyll forests, chenopod shrublands, Callitris forest, mallee (Churchill 1998; Duncan *et al*. 1999) and vine forests (Duncan *et al.* 1999). In the more arid parts of its range in New South Wales it has been recorded from Mulga woodlands, patches of Black Box Woodlands and riverine River Red Gum dominated communities. Surveys have indicated that in arid and semi-arid environments the species may be locally common near permanent or semi-permanent water (Duncan *et al*. 1999).

The subject site does support suitable habitat and resources for the Little Pied Bat and other microchiropteran bat species. The White Cypress Pine with Bimble Box and Red Box woodland areas provide foraging, roosting and breeding opportunities. This species relies upon tree hollows, fissures in branches or trunks or loose bark for roosting and breeding resources, which are generally only offered by mature and remnant trees and/or stag trees of the subject site.

Considering the small extent of relevant vegetation to be removed and extent of potential habitat within the remainder of the study area it is considered "*unlikely*" that a significant portion of any habitat or resources of any species of microchiropteran bat would be "*removed or modified*". Furthermore, the Little Pied Bat is an adaptable species, being able to use a variety of resources for its roosting requirements (i.e. colonies are now known from tree hollows and disused buildings). Given the highly mobile nature of most microchiropteran bat species and the extent of potential habitat within the study area it is considered '*unlikely*' that individuals comprising a "*viable local population*" of the Little Pied Bat are confined to the subject site. It is therefore considered '*unlikely*' that the "*life cycle*" of the Little Pied Bat would be "*disrupted*" by the proposed works, and no "*viable local population*" of this species would be "*placed at risk of extinction*" as a result of the proposed works.

(b) In the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised.

There is no 'endangered population' of Little Pied Bat listed under Part 2 of Schedule 1 of the *TSC Act 1995*. No evidence exists for the presence of an endangered population occurring within the study area. Consequently, there is no likelihood that the proposed development can be regarded to involve any such populations even if individuals of such a population use the study area.

(c) In relation to the regional distribution of the habitat of a threatened species, population or ecological community, whether a significant area of known habitat is to be modified or removed.

The reference to regional within this factor refers to the regions as defined in the Interim Biogeographic Regionalisation of Australia (IBRA). Following the IBRA, the study area occurs within the Cobar Peneplain IBRA. The Cobar Peneplain Bioregion lies within the Central West of New South Wales, occupying over 73,000 square kilometres, or approximately one-tenth of the area of New South Wales. On this basis, the study area cannot be construed as comprising "*a significant area of known habitat*" in respect of the "*regional distribution of habitat*" for the Little Pied Bat. Furthermore, given the mobile nature of this species and relatively small area of resources within the subject site (< 12 ha) in terms of the local (study area) and regional distribution of habitat, the proposed activity is unlikely to involve "*a significant area of known habitat*" for the Little Pied Bat to be "*removed or modified*".

(d) Whether an area of known habitat is likely to become isolated from currently interconnecting or proximate areas of habitat for a threatened species, population or ecological community.

Microchiropteran bats are highly mobile and wide-ranging, and generally non-reliant on continuos tracts of forest and woodland for movement. The proposed activity will involve the removal and modification of up to 12 hectares of potential foraging and roosting habitat (less than 1% of the overall potential habitat available within the study area) for the Little Pied Bat. The are of vegetation would be removed from across an area of 25 hectares (see figure 1) within the study area of approximately 200,000 + hectares. The study area is well connected to surrounding areas of vegetation (see figure 1). It is '*unlikely*' that the activities of the proposed development, including the removal of relevant vegetation would impose a movement barrier to the Little Pied Bat. Given the small extent it is unlikely that the proposed activity would involve *"an area of known habitat"* for the Little Pied Bat becoming *"isolated from currently interconnecting or proximate areas of habitat"*.

(e) Whether critical habitat will be affected.

There is currently no declared "critical habitat" in the area likely to be affected by the proposed development as designated under Part 3 of the TSC Act 1995. No area of declared critical habitat is relevant to this proposed development.

(f) Whether a threatened species, population or ecological community, or their habitats, are adequately represented in conservation reserves (or other similar protected areas) in the region.

The only protected area within the locality to have known records of this specie is Yathong NR (within 70 km). Although it is likely that the Little Pied Bat occurs within other conservation reserves from the region it is considered '*unlikely*' that the Little Pied Bat is "*adequately represented*" within "*conservation reserves and or similar protected areas*" in the locality or region. There is insufficient information to determine if the Little Pied Bat is "*adequately represented*" within these "*conservation reserves and or similar protected areas*". Furthermore, the Cobar Peneplain Bioregion has been identified as a high priority area for additional conservation assessment and action under the Commonwealth Government's National Reserve System Program (NSW NPWS 2002), as less than five per cent of the bioregion is protected by conservation reserves.

(g) Whether the development or activity proposed is ~~of~~ a class of development or activity that is recognised as a threatening process.

Whilst the proposed development is not of a class of development or activity that is recognised as a key threatening process as listed in Schedule 3 of the *TSC Act 1995*, clearing of native vegetation and associated habitats generally is. Current threats to the Little Pied Bat include: loss of habitat in timber production forests and as a result of large scale clearing for agriculture and in uncleared areas, timber harvesting, grazing and altered fire regimes (Duncan *et al*. 1999). Clearing of native vegetation is of particular importance as it has been identified as a threatening process to this species.

Considering the small extent of removal and the availability of potential habitat within the remainder of the study area, the removal of this vegetation from the subject site would not *"threaten the survival or evolutionary development"* of the Little Pied Bat.

(h) Whether any threatened species, population or ecological community is at the limit of its known distribution.

It is considered unlikely that the Little Pied Bat is at "*the limit of its known distribution*" within the study area, locality or region. The Little Pied Bat ranges from coastal and south eastern Queensland, extending across south-western Queensland, western New South Wales and far north eastern South Australia. Despite having largely an inland distribution (Duncan *et al*. 1999), and most records being west of the Great Dividing Range (Churchill 1998) there are a number of records from south eastern Queensland within 50 km of the coast. No evidence exists that the range of this species has contracted (Duncan *et al*. 1999).

<u>Conclusion</u>

The proposed activity involves the removal and/or modification of native vegetation, which supports potential roosting, breeding and foraging resources for this species. Given the small extent and availability of suitable habitat within the study area it is '*unlikely*' that the proposed development would impose a "*significant effect*" on the Little Pied Bat.

Appendix 6 – Correspondence

-----Original Message-----
From: R.W.Corkery & Co Pty Ltd [mailto:corkery@netconnect.com.au]
Sent: Wednesday, 25 January 2006 4:49 PM
To: Grabham, Craig
Cc: 'Peter Ingham'
Subject: 659 - Hera Deposit flora and fauna assessment

HI Craig
As you know I went to The Peak property on Monday with Peter Ingham to kick off the next Review of Environmental Factors. This REF is for an exploration decline to provide for further underground exploration drilling and to obtain a bulk sample of ore for further testing.

I have reviewed your draft report (prior to going on site) and have attached a version with no figures (to bring it down to emailable size) with tracked changes and comments. As a general comment, my comments are similar to last time - your report is very "green" and the reader feels as though the site is pristine native vegetation with little to no disturbance across the entire area. Having now been to the site, this is far from reality and I would appreciate it if you could please review your report, particularly the overall tone, to reflect a more realistic view of the vegetation communities on site. Additionally, suppositions about impacts without the proposal information may lead to erroneous impact assertions (such as the reptile deaths on the exploration tracks - none have been reported) and I would appreciate it if you could also review your report for that also.
Given that we now have the next lot of proposed works, we will require an impact assessment from you on the likely impact of the proposed activities on the flora and fauna of the site and provision of practical and pragmatic management recommendations (such as pre-clearing visual surveys of trees for roosting/nesting fauna). Given the changes in the legislation, I expect that 7 part tests will now be required for the threatened species. Additionally, I would like the impact to be placed into context, ie: the Company has management over the entire property, the majority of which is covered with the BB/RB/WCP vegetation community. As such, the disturbance proposed (area yet to be finalised but likely to be comparatively small) will likely not pose a significant impact to the vegetation community, any movement corridors or any threatened species (given their mobility).
I am attempting to have the detail of the proposal to you in the next week for you to complete your impact assessment. We are attempting to get this REF completed in the shortest possible timeframe to allow for the exploration works to commence in June, and given that DPI took 3 months to approve the REF last time, we need to get this REF to them ASAP.
Given the above information I would appreciate it if you could please get back to me as soon as possible regarding a possible timing for the completion of a draft report for me to review. Additionally, prior to the receipt of this, we will require a broad statement from you about the anticipated level of significance of impact resulting from this proposal for us to discuss with DPI in the next few weeks to ensure that they are not going to require further works.
Please do not hesitate to contact me to discuss the further impact assessment requirements.
Regards
Kim Ferguson
Senior Environmental Consultant
<<...>>

RW Corkery & Co Pty Limited
Geological and Environmental Consultants
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ORANGE NSW 2800
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-----Original Message-----
From: R.W.Corkery & Co Pty Ltd [mailto:corkery@netconnect.com.au]
Sent: Tuesday, 7 February 2006 4:12 PM
To: Grabham, Craig; Thompson, Leigh
Subject: 659 - Hera Deposit report

Hi Craig,
Please find attached, as discussed some weeks ago, the scope of works for the Hera report and the draft text information on the proposed exploration activities.

As discussed, this document is only a REF and as such, your report should reflect the short duration (12 - 14 months) and small amount of disturbance (approx 11-12 ha) in context of the entire property. Additionally, we only require as much assessment from you to ensure that you are comfortable making your assumptions about the significance of the impact (we anticipate that it would not be significant impact given that there is a large area of the vegetation community remaining intact and the only threatened species in the area are fauna, hence mobile.
As discussed, we require, as soon as possible, a simple letter stating that the proposed approximately 12ha (maximum) of disturbance would not be a significant impact for our discussions with Mineral Resources.
This project is running on an extremely tight time frame to allow the Company to meet their exploration obligations so I would appreciate it if you could please provide me with a cost and time estimate for completion of your assessment as soon as possible, preferably before the end of the week.
I believe that peter Ingham has supplied you with two old aerial photographs which clearly show agricultural related clearing on the property - please use this information in your report to describe context of the proposed clearing, i.e.. The vegetation in the area has been previously disturbed and regrowth appears to occur fairly well.
Please do not hesitate to contact me should you wish to clarify any information. Additionally, should it be time saving for you to base your impact assessment on the previous report, simply changing the areas and type of proposed disturbance, and hence using the 8 part test instead of the new 7 part test, the REF should definitely be submitted within the transitional period. Should this option save time and money, it would be preferable.
A figure of the likely disturbance is attached, however, this figure needs to be updated and should not be used for your report at this stage.
Regards
Kim Ferguson
Senior Environmental Consultant
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Triako Resources Limited

Hera Deposit – Category 3 Exploration Decline

Brief for Ecology Assessment for Review of Environmental Factors

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Submitted to: Charles Sturt University – Johnstone Centre

Contact Person: Craig Grabham

Contact Details: Ph: (02) 6051 9314
Fax: (02) 6051 9797
Email: cgrabham@csu.edu.au

Background: Triako intend to establish an exploration decline to the Hera deposit on "The Peak" property to enable a bulk sample to be taken for metallurgical testing. The exploration decline will require a small amount of surface infrastructure to be established.

Please note that at this stage an Environmental Impact Statement has not been commissioned, nor Director-General's Requirements sought from the Department of Infrastructure, Planning and Natural Resources.

Project Site: See attached draft REF and figures.

Specialist Consultant Study Area: The Study Area for the flora and fauna field assessment corresponds to the boundaries of "The Peak" property.

Work Required

1. Use your existing report as the basis for the flora and fauna survey and background literature review.

2. Ensure the existing literature review includes a review of all previous flora and fauna assessments (if any) undertaken in the Study Area and surrounding region. This

should include any Catchment Management Plans which include ecology assessments and any regional vegetation / habitat mapping or management plans.

3. Undertake a search of the NPWS Atlas of NSW Wildlife and the EPBC Act database to identify likely threatened species in the region to allow for targeted field survey techniques (as required) – ensure that this search is sufficiently up to date.

4. Ensure the methodology of the field assessment is detailed in the draft report and that the report includes an inventory of native and introduced flora and fauna species and communities in the Study Area. Potential fauna migration pathways on or in the vicinity of the Project Site should also be considered.

5. Ensure the report includes comment on the likelihood of species and communities identified in the desktop assessment occurring on, or in the vicinity of, the Study Area. *Please ensure ALL species are covered.*

6. Ensure the report includes comment on the condition of the vegetation communities and fauna habitats with respect to their degree and extent of disturbance.

7. Ensure the report includes comment on the local and regional extent of all vegetation communities and fauna habitats.

8. Assess (qualitatively and quantitatively where possible) the **immediate area of disturbance, local AND regional extent** of important flora and fauna species, habitats and communities.

9. Assess the conservation status of the identified species/communities at a local, State and National level.

10. Advise on any legal requirements including referrals and permits that may arise from the presence of particular flora or fauna species or communities of conservation significance. Also advise of any State or National Policies and/or Recovery or Threat Abatement Plans which may apply to the proposal.

11. Assess the potential impact of the proposal on individual flora and fauna species occurring or likely to occur, as well as habitats and vegetation communities. Impact assessment should clearly specify the predicted extent and duration of impact and **place the impact in a local and regional context.** Determine the potential significance of any impact on any threatened species as a result of the disturbance. This should include 7 part tests if required, in accordance with the amended legislation.

12. Assess the potential cumulative impact of the proposal with respect to other developments in the area, particularly with respect to habitat / community fragmentation and wildlife corridors.

13. Determine the need for biodiversity offset strategies (these should be minor and not required in depth assessment). Identify appropriate strategies (in consultation with RW Corkery & Co. and the Client). Compare the 'value' of the vegetation communities and habitats to be cleared against that of the offset strategies.

14. Provide pragmatic and realistic recommendations of any impact mitigation measures/management techniques that could be implemented. Any recommendations should be in context with the actual size, duration and local extent of any impact.

15. Provide pragmatic and realistic recommendations related to progressive and/or final rehabilitation, compensatory plantings, weed management and the like. Any recommendations should be in context with the actual size, duration and local extent of any impact.

16. Briefly assess the proposal against the objectives / requirements of any relevant State or National policies and/or Recovery or Threat Abatement Plans.

17. Review relevant sections of the draft REF for accuracy.

Reporting Requirements and Timetable:

Draft impact assessment report (incorporating 1 – 18 of Work Required): ***ASAP – please advise on available timing as this aspect is the only hold up to the REF being submitted.***
As discussed, within 1 week (if not sooner) of receiving the map of proposed disturbance areas and draft REF text, please provide an indication of likely impact, particularly in a local context (eg, Xha to be disturbed within XXha of that vegetation community within "The Peak " property) so that it can be used in discussions with Mineral Resources.

Final Report: ASAP

Information Required:

1. Personnel to be involved in the project and their curriculum vitas (please note that only authorised professional staff will be permitted to undertake work on the project).

2. Availability to undertake field work and report preparation, given the above timing.

3. Proposed approach to each of the tasks set out under Work Required.

4. An estimate of costs to complete each of the above and to produce the required output.

5. Specific information and other requirements about the Project Site and the proposal to enable you to undertake the nominated tasks.

6. A copy of all insurances held by the company.

Appendix 7 Example Fox Baiting Program

1. Introduction

Predation by the European Red Fox (*Vulpes vulpes*) is listed as a key threatening process under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* and the NSW *Threatened Species Conservation Act 1995*, with threat abatement plans prepared under guidelines set by each Act (Environment Australia 1999; NSW NPWS 2001a).

1.1 Objectives of the program:

- Formulate and implement a 3-year fox management program;
- Monitor the program to ensure an effective evaluation of the control activities can be undertaken during the implementation of the plan; and
- Re-evaluate the success of the plan after 3-years and adapt future control programs according to the evaluation of the current program.

2. Baiting methods

The most commonly used method of fox baiting over relatively small areas involves the use of bait stations. It is considered unnecessary to employ additional control methods at the subject site based upon the constraints of baiting over a relatively small area and the risk and/or restriction of non-target species. The method of shooting individuals may be adopted if considered appropriate according to the results provided by the monitoring of bait stations.

2.1 Assessment of control methods

Control method	Activity detail	Advantages	Constraints
Bait stations	Earth mound buried poison baits 15 cm depth	▪ Opportunity to free-bait; ▪ Target takes visible (easily measurable); ▪ Minimal non-target risk; ▪ Bait stations visible in field.	▪ Labour intensive and time consuming to establish and maintain; ▪ Bait shy individuals of target species.
Trail baiting	Poison baits laid along trails (buried/unburied)	▪ Cost effective (cover relatively large areas).	▪ Risk to non-target species; ▪ Target takes unknown; ▪ Bait shy individuals of target species.
Trapping	Softjaw traps	▪ Target specific; ▪ Site specific; ▪ Minimal risk to non-target species.	▪ Expensive; ▪ Specialist skills required.
Fencing	Barrier fencing	▪ Exclude fox impacts on subject site.	▪ Expense of erection and maintenance; ▪ Restricts movement of non-target species; ▪ Only controls fox predation at subject site (not study area).
Shooting	Firearms used to shoot individual target species	▪ Target specific.	▪ Not effective as primary control; ▪ Very opportunistic.

3. Control program

- Identify native species (particularly subject species) that may be at risk from the baiting program and investigate control techniques that limit possible impact upon these species;
- Establish a system of monitoring the sites to allow effective evaluation of the program;
- Establish, mark and map bait stations in the field;
- Monitor bait stations for a 4-6 week 'free-baiting' monitoring program;
- Advertise 1080 notifications in local press, erect 1080 signs in the field, and notify all neighbouring land-holders of baiting activities; and
- Commence baiting.

3.1 Identification of native species (non-target species) that may be at risk

- From survey results and subject species profiles.

3.2 Establish system to monitor program

- Sand traps placed around bait stations;
- Target species and non-target species activity at bait stations recorded through identification of scats and tracks recorded during bait replacement.
- Baiting to be suspended if non-target species present.
- Review of bait stations if classed 'inactive' (no target species for 3 months). Options include temporary shut down of bait station, removal of bait station or return to free baiting.

3.3 Establish, mark and map bait stations

- Establish free-baiting stations for the determination of the location of poison bait stations according to target species activity.
- Mark location of bait stations (free-bait and poison) on site (flagging tape, star pickets, etc).
- Map the locations of bait stations (free-bait and poison) and known 'active' fox dens on map of subject site.

3.4 Free baiting monitoring program

- Establish a number of free-baiting stations throughout subject site. This will include small earth mounds surrounded by sand traps to facilitate identification of areas of high target and non-target species activity.
- Prepare and bury free-baits (no poison) within earth mounds to a depth of approximately 10-15cm.
- Record all activity (target and non-target species) at free-bait stations on a weekly basis for a period of 4-6 weeks.
- Determine the location of poison bait stations according to the areas of highest target species activity (and lowest non-target species activity) recorded during free-baiting period.

3.5 Notification of baiting program

- Advertise baiting notification in local press.
- Erect 'notification of baiting' signs appropriately throughout subject site (including entrance to site, roadside, landfill and quarry site, speedway entrance, and border fences surrounding subject site).

3.6 Baiting program

- Bury poison baits 10-15 cm within established earth mounds.
- Under the Off-label Permit for the Use of 1080 Baits for the Control of Foxes, bait stations cannot be placed less than 100 m apart.
- Check/replace bait stations weekly to increase the exposure of foxes to baits. Checking baits regularly will also provide a coarse measure of target species activity (bait uptake rates).
- Bait type should be varied occasionally in the expectation of individual foxes showing aversion to specific bait types. The Off-label Permit for the Use of 1080 Baits for Control of Foxes lists the bait materials that may be used with 1080 poison.
- Record activity of target and non-target species at bait stations (and sand traps) on prepared field data sheets.

After 3-6 months, it may be necessary to re-establish the free-baiting program at each of the initial free-bait stations to determine changes to the areas of high target species activity within the subject site. If target species activity at free-bait stations is higher than at those stations used during the most recent poison baiting program, location of the poison bait stations should be changed accordingly.

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ANNEXURE 5

(No. of pages excluding this page = 41)

Aboriginal Heritage Assessment

Extract Relating to Hera Deposit

(Note: Only Figures and Appendices relevant to the Hera Deposit are included in this copy)

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The Archaeological Investigation for Sites of Indigenous Cultural Significance on Gold Mining Prospects at

- **'Hera', South of Nymagee**
- **Overflow Prospect', at Bobadah**
- **"Fountain Dale", Northwest of Mineral Hill**

Central West NSW

March 2004

John Appleton
ARCHAEOLOGICAL SURVEYS & REPORTS PTY LTD

for

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EXECUTIVE SUMMARY

This investigation was performed for Triako Resources Limited (Triako), which is currently undertaking an exploration programme in three locations between Condobolin and Cobar, Central, New South Wales - at Hera, south of Nymagee; at the Outflow Prospect at Bobadah; and at "Fountain Dale" north of Mineral Hill.

The scope of the work was for Archaeological Surveys & Reports Pty Ltd to conduct an archaeological investigation of the study areas with the assistance of a representative of the Condobolin Local Aboriginal Land Council, and in consultation with Wiradjuri Condobolin Culture & Heritage Company Pty Ltd, identify any Aboriginal sites and relics that might be present. The results of the investigation were to be presented in a report, which was to include an assessment of the significance of any cultural relics or places identified, an appraisal of the options and opportunities arising from the discoveries, and clear recommendations for the management of those cultural resources.

Thirteen sites (11 isolated artefacts and two scatters of 2 artefacts in each) were recorded at "Fountain Dale", distributed over an area of 30,000 sqm. No further investigation is required.

Seven artefact scatters were recorded at the Overflow Prospect, Bobadah. Although the sites occur outside the area presently being drill-tested any extension to the test area will require further archaeological investigation. In addition, the remains of the defunct Overflow Mine are of potential heritage significance and it will be necessary for a heritage assessment to be undertaken before any exploratory work or mining can proceed in areas associated with the Overflow Mine.

No sites were recorded at the Hera site and no further archaeological investigation is necessary.

The following recommendations are made as a result of the investigation:

i) Fountain Dale

The Condobolin LALC has recommended that all artefacts are to remain where they are unless they are likely to be impacted upon, but in the event that it is necessary to remove them, that arrangements should be made for them to be kept in a suitable keeping place. Consent to Destroy from NPWS will be necessary for the removal of any artefacts. In addition, initial removal of surface deposits should be monitored by a representative of Condobolin LALC. ASR agrees with the recommendations. Monitoring would only be necessary during the removal of the upper 25 cm of surface deposits.

ii) Hera

The Condobolin LALC has recommended that no further archaeological investigation of the site is necessary. ASR agrees with the recommendations.

iii) Overflow Prospect, Bobadah

ASR recommends that Triako determines the footprint of the mine impacts, from both direct and peripheral activities, and that if the footprint extends beyond the area surveyed for this investigation that further archaeological investigation of the site should be undertaken. In addition, if the proposed mine extends into the area associated with the Overflow Mine it will also be necessary for Triako to commission a heritage assessment of the mine. In the event that both should be necessary the investigation for Aboriginal sites and the heritage assessment of the Overflow Mine could be undertaken at the same time by a suitably qualified archaeologist, with the assistance of Condobolin LALC

In addition Triako are advised of the following provisions: All developers, contractors, subcontractors and their employees are bound by the provisions of the National Parks and Wildlife Act 1974 as amended, which was in part designed to mitigate impact to the Indigenous archaeological record.

Under the provisions of the National Parks and Wildlife Act 1974, all earthmoving contractors and operators should be instructed that in the event of any bone or stone artefacts, or discrete distributions of shell, being unearthed during earthmoving, work should cease immediately in the area of the find, and the Condobolin Local Aboriginal Land Council, and officers of the National Parks and Wildlife Service, informed of the discovery. Work should not recommence in the area of the find, until those officials have inspected the material and permission has been given to proceed. Those failing to report a discovery and those responsible for the damage or destruction occasioned by unauthorised removal or alteration to a site or to archaeological material may be prosecuted under the National Parks and Wildlife Act 1974, as amended.

In the event that a relic or item is discovered during earthworks details of the discovery should be communicated to: The Archaeologist, Western Region, and to The Chairperson, Condobolin Local Aboriginal Land Council (addresses at the front of this report).

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1. INTRODUCTION

1.1 Background to the investigation

This investigation was performed for Triako Resources Limited (Triako), which is currently undertaking an exploration programme in three locations between Condobolin and Cobar, Central, New South Wales.

The scope of the work was for Archaeological Surveys & Reports Pty Ltd (ASR) to conduct an archaeological investigation of the study areas with the assistance of a representative of the Condobolin Local Aboriginal Land Council, and to identify any Aboriginal sites and relics that might be present. The results of the investigation were to be presented in a report, which was to include an assessment of the significance of any cultural relics or places identified, an appraisal of the options and opportunities arising from the discoveries, and clear recommendations for the management of those cultural resources.

Triako require the results of the three investigations to be reported under one cover, but for practical purposes, namely that the three locations occur some distance apart, and on different land and soil units, and therefore are subject to different Predictive Models for Aboriginal site location, the report is written in three parts.

1.2 Potential impact of mining

The three gold prospecting localities, together with the Mineral Hill Mine presently being operated by Triako, occur along a belt of Late Silurian and Silurian-Devonian mineralised sandstone, siltstone and shale deposits in the Cobar and Mineral Hill Synclinorial Zones. Refer to the map appendix i.

Currently preliminary drill-testing is taking place at all three locations using truck-mounted drilling platforms and so the impact to date has been minimal. However, should the results of drill-testing indicate that gold deposits are viable mining development would cause significant impacts to any surficial archaeological material.

As the prospecting is only in its preliminary stages there are as yet no concept plans for the mine sites, and so there are no currently projected ‘footprints of impact’. The impacts could be extensive or minimal depending upon the size of the extraction operations, but regardless of the size of the extraction area, other significant alteration to surface deposits will result from the installation of processing plant, power installations, water, sewerage and waste installations, administration and amenities buildings, roads, mullock heaps, overburden or waste dumps, bunds, drainage channels, fencing etc. And so for the purposes of the archaeological investigation it is assumed that there is a potential for the entire survey area at each location to be subject to either direct or peripheral impacts from mining and associated activities.

As a consequence of this survey it is extremely unlikely that the same areas will ever be surveyed again, thus from an archaeological perspective, this was the only opportunity to observe and record any sites that might be present, and to propose a strategy for the management of any known or potential archaeological and/or cultural material in the future development of the areas.

2. ABORIGINAL CONSULTATION

Prior to the investigation ASR contacted Mr Dave Carter, Coordinator, Condobolin Local Aboriginal Land Council (LALC), to arrange for a Sites Officer to assist Appleton (ASR) in the fieldwork. As a consequence Peter Knight, Chairperson, Condobolin LALC assisted Appleton (ASR) in the investigation, which was performed on 18th March 2004. Peter is an experienced fieldworker, and has previously assisted ASR in other investigations in the Fifield and Condobolin areas.

Also assisting with the investigation was Mr Noel Powell, representing the Wiradjuri Condobolin Culture and Heritage Company Pty Ltd (WCCHC).

Both prior to and during the survey Peter, Noel and Appleton discussed the potential for particular site types to be present, and the particular environments in which they might occur. The survey strategy was reviewed regularly, and the results discussed at the completion of each 'section'. At the conclusion of the survey the results were discussed at length. Subsequently ASR received written statements from Condobolin LALC and WCCHC as to their recommendations for the future management of the sites recorded during the investigation. Copies of the recommendations are included in the appendices.

3. "HERA"

3.1 Site Location

The irregularly shaped area of approximately 4.9 sq km occurs approximately 4 km due south of Nymagee and 80 km south-southeast of Cobar, central west New South Wales.

The survey area is described by the following AMG coordinates (AGD66 datum)

6448100N 435400E: 6448100N 436800E: 6446800N 438000E: 6445400N 438000E: 6445400N 436500E: 6446600N 435400E (Triako 23-2-2004).

Figure 1 is a topographic map of the general region showing the survey area.

3.2 The Environmental Context

Any discussion of the likely presence of Aboriginal cultural remains or of the basis why such remains might be discovered must be within the context of the environment and the resources that would have been available to any Aboriginal occupants of the area.

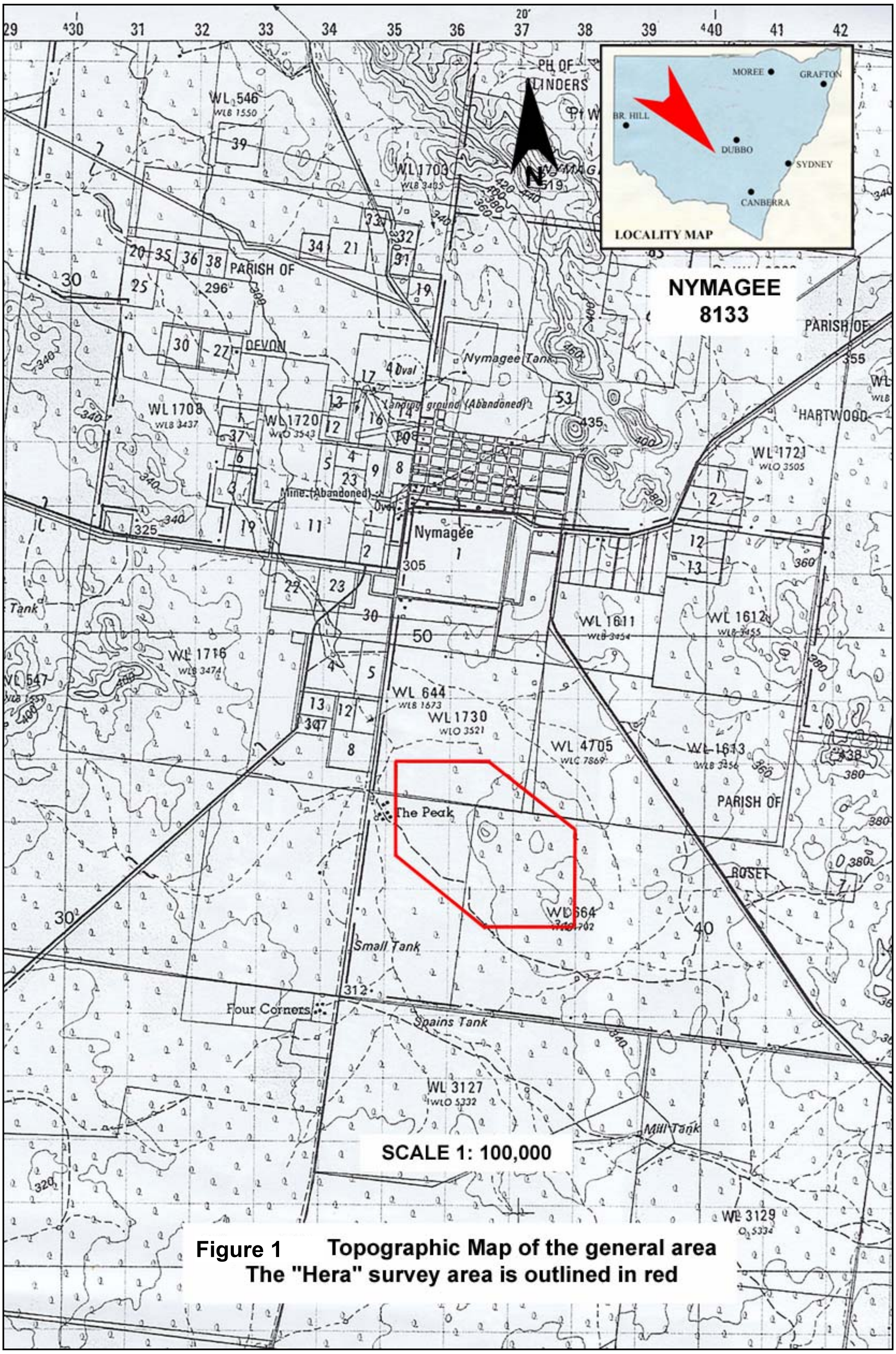

Figure 1 **Topographic Map of the general area**
The "Hera" survey area is outlined in red

3.2.1 The general geology and topography

The study area occurs in low ridge country classified as being of the Yackerboon Land System. Typically the unit comprises of ridge crests and slopes of Silurian and Siluro-Devonian siltstone and sandstone with areas of quartzite outcrop, and surface residual, and colluvial gravel band quartz. The soils are typically red earths and some lithosols, with loam to clay loam, overlying siltstone and sandstone (SCS 1991) – a more detailed description is given in appendix ii.

Elevations in the survey area generally fall within the mid 320-350 m AHD range, rising to 380 m AHD on the summit of the central peak.

Typically, erosion occurs as minor to moderate watersheeting. As the photographic record shows it was more in the moderate to severe range at the time of the survey

3.2.2 Vegetation

Vegetation on Yackerboon Land Systems typically comprise of scattered to dense white cypress pine, red box, bimble box and grey box; scattered budda, warrior bush and western golden wattle. Groundcovers include eastern cottonbush, variable speargrass, and other grasses and forbs (SCS 1991).

3.2.3 Water resources

The survey area encircles a steep-sided peak, surrounded by an apron of slopes, which give way to a gently undulating plain. There were no visible drainage lines or depressions either in or visible from the survey area. The nearest drainage lines of any significance are Crowi Creek 17 km to the south, and Pangee Creek 30 km to the east.

3.2.4 Stone resources

As described in section 4.2.2 there are residual deposits of quartz, however, the quartz is generally sub-angular, and weathered and unsuitable for knapping into tools. While the peak is composed of quartzite it is poorly silicified and similarly unsuitable as knapping material. If any artefacts are present in the survey area they were probably manufactured from material brought in from elsewhere.

3.2.5 Previous impacts.

As the photographic record shows substantial areas of the survey area support open woodland, however there is little understorey. Whether this is as a consequence of stock grazing, or whether it has been caused by extended periods of drought is unclear, but there is generally no understorey or groundcover.

The only significant impact to the survey area has been from stock grazing. The larger portion of the survey area remains uncleared and supports an open woodland or scrub, the exception being the large paddock at the southern end which appears to have been cleared for pasture improvement.

An abandoned mining shaft and whim on the summit on the ridge are evidence of small-scale mining but there has been little impact other than the shaft, a small cleared area around the shaft, and a mullock heap on the eastern side of the ridge.

Elsewhere several tracks have been cut through the scrub, but there is little evidence of significance disturbance of surface deposits.

3.3 The Archaeological Record

No previous surveys have been performed in the region and therefore no record of any sites within the general area.

3.4 Models for Site Location

3.4.1 Site types and their location

See section 3.4.1

3.4.2 A predictive model for the Project Site

Based on all of the above the following model for site distribution was proposed for the Project Site, in which there would be no shelving sandstone outcrops, and no reliable water source, but in which there are residual deposits of quartz and possibly usable siltstone, and natural woodland.

- Isolated artefacts may be present and visible in erosion features
- Low-density artefact scatters may be present and visible in erosion features, but it is unlikely that any debitage will be visible
- There is a potential for trees more than 150 years old to exhibit scarred surfaces
- There is a potential for any trees more than 150 years old to exhibit carved surfaces
- There may be stone quarries
- There may be overhangs that contain art sites
- There will be no engravings, or grinding grooves
- There will be no shell middens
- There will be no visible evidence of burials
- There will be no surviving Bora rings
- There will be no surviving stone arrangements
- There are no known cultural associations with the area

3.5 The Survey

3.5.1 The survey strategy

Prior to the investigation it was decided that as the survey area was large the survey would focus on the peak, the vast scalded areas to the south of the peak, and the general area on which the drilling programme was centred. The survey commenced at the peak, the summit, cliffline and slopes being inspected thoroughly, both for artefacts, paintings and engravings. The survey continued from a line west-east across the base of the peak-slopes to the north of the peak through to the southern boundary. The three investigators generally walked three abreast and approximately 40 m apart, from north-east to south-west and back, targeting any erosion features within the 120-150 m wide transect. Four such transects were surveyed thus covering the southern half of the survey area in which drilling was taking place.

3.5.2 Details of the survey

The survey was undertaken by ASR, assisted by Peter Knight representing the Condobolin LALC, and assisted by Mr Noel Powell, representing the Wiradjuri Condobolin Culture and Heritage Company Pty Ltd. The survey was made on foot, in dry conditions under a clear sky, in light ideal for observing any artefactual material present and observable. All of the areas shown shaded in red in Figure 2 were surveyed on foot.

3.5.3 Site recording

All relevant observations as to the topography, vegetation cover, and conditions, were recorded in a field-log, and photographs taken with an Olympus Camedia C-3030 Zoom Digital Camera, to record the character of the survey area, and to witness survey conditions.

3.5.4 Effectiveness of the survey technique

As the photographic record shows the archaeological visibility was excellent and the survey therefore highly effective.

The survey technique was the most appropriate one to use in the circumstances, and the results are believed to be generally representative of the archaeological record in the survey area, in which it was predicted there would be very little artefactual material, primarily because of the absence of a suitable knapping material.

3.5.5 Effective coverage

The table on the following page, is divided into units delimited by observed topographical features, environments, and/or land use, briefly described in terms of ‘horizontal’ or map area, soil, and archaeological visibility, and the percentage of the area actually surveyed.

Figure 2 shows the effective survey coverage based on the assumption that most artefactual material if exposed and visible can be observed for up to 5 metres to either side of the path of the observer. Clearly this would vary significantly between a path walked through dense vegetation, and a path across a claypan, and is given as a guide only. Peripheral archaeological visibility in the survey area varied from 5 m to either side on the slopes of the peak, to 10 m to either side on the flat.

The photographs on the following pages show several aspects of the survey area.

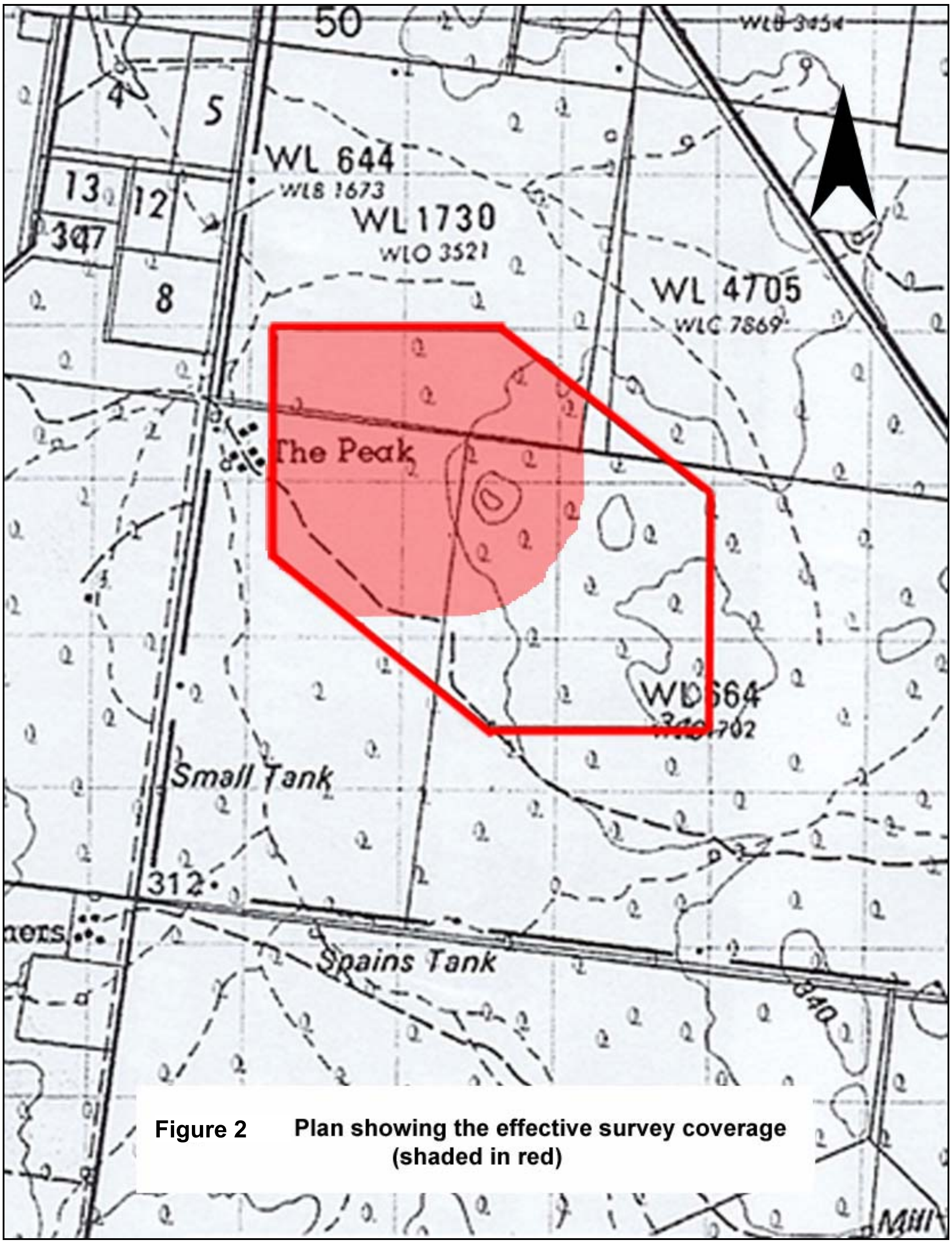

Figure 2 **Plan showing the effective survey coverage (shaded in red)**

Figure 3 – Looking northwards towards the peak.

Figure 4 – The peak viewed from the west

Figure 5 – The northern slopes of the peak.

Figure 6 – Overhanging cliff-face on the western side of the peak.

Figure 7 – Old mine shaft and whim on the summit of the peak

Figure 8 – Looking westwards from the foot of the peak.

Figure 9 – Slopes to the south of the peak.

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Figure 10 – The edge of the plain in the western section

Figure 11 – White cypress woodland in the western section.

Figure 12 – Looking eastwards along the northern boundary of the survey area.

Figure 13 – North/south fenceline in the western section

Figure 14 – Scalded paddocks in the western section.

3.6 The Results

No artefacts of Indigenous origin were observed in the survey area.

3.7 Discussion

The prediction was that there might be isolated and low-density artefact scatters, however nothing was found. Archaeological visibility was excellent so the absence of sites can be assumed to be representative of the general absence of sites in the area.

It was clear from the survey that not only was there an absence of surface water, and stone suitable for knapping, but that the predominance of white cypress meant that there were very few potential food resources in the area. Perhaps the only reason why Aboriginal people would have visited the area was for ceremonial or religious activities in which the peak played a pivotal role, or merely to use the peak as a lookout over the surrounding area from which other people's fires or animals for food might be seen. In either instance it is unlikely that artefacts would be discarded in country in which the absence of suitable knapping material meant that artefacts and material were items to retain, maintain and value rather than discard.

In summary, the fact that no artefacts were recorded is seen as being representative of the absence of artefacts in the area.

3.8 Significance Assessment

The NPWS policy to safeguard all sites, Aboriginal places, and archaeological material of significance wherever possible requires that some means of assessing the significance of the sites is necessary. This is not only for the purpose of determining whether the proposed development can proceed as proposed, but also to provide Cultural Resource Managers with the information for future management of the area.

3.8.1 Cultural significance

The Aboriginal or cultural significance of Aboriginal relics and sites can only be assessed by the Aboriginal community, and in particular, the Elders. It is the responsibility of the archaeologist to ensure that the Elders, or elected representatives of the Aboriginal community are advised of the survey results, and are consulted as to their knowledge and opinion of the significance of the area, and to transcribe and present those expressions in report form.

The recommendations of the Condobolin LALC are that no further investigation of the site is necessary.

3.8.2 Research potential

The absence of artefacts in the area which was surveyed at a time when there was excellent archaeological visibility is interpreted as being indicative that there is no research potential in the survey area.

3.9 Recommendations

The Condobolin LALC has recommended that no further archaeological investigation of the site is necessary. ASR agrees with the recommendations.

In addition Triako are advised of the following provisions: All developers, contractors, subcontractors and their employees are bound by the provisions of the National Parks and Wildlife Act 1974 as amended, which was in part designed to mitigate impact to the Indigenous archaeological record.

Under the provisions of the National Parks and Wildlife Act 1974, all earthmoving contractors and operators should be instructed that in the event of any bone or stone artefacts, or discrete distributions of shell, being unearthed during earthmoving, work should cease immediately in the area of the find, and the Condobolin Local Aboriginal Land Council, and officers of the National Parks and Wildlife Service, informed of the discovery. Work should not recommence in the area of the find, until those officials have inspected the material and permission has been given to proceed. Those failing to report a discovery and those responsible for the damage or destruction occasioned by unauthorised removal or alteration to a site or to archaeological material may be prosecuted under the National Parks and Wildlife Act 1974, as amended.

In the event that a relic or item is discovered during earthworks details of the discovery should be communicated to: The Archaeologist, Western Region, and to The Chairperson, Condobolin Local Aboriginal Land Council (addresses at the front of this report).

GENERAL GLOSSARY: The definitions that follow are for terms used in this and other reports written by the author, and do not necessarily apply to their use in different contexts.

ADZE : A modified flake with at least one steeply-retouched working edge. While all adzes are generally considered to be wood-working tools it is probable that some also served as cores and others as scrapers. Adzes with a uniform butt were frequently hafted to make a chisel-like tool, but the intended use of the adze determined the size of the adze and whether it was hafted (Flenniken and White, 1985).

AHD: Australian Height Datum

ARCHAEOLOGICAL DEPOSIT :

Sediments which contain evidence of past Aboriginal use of the place, such as artefacts, hearths, burials etc.

ARTEFACT : Any object that has attributes as a consequence of human activity (Dunnell, 1971). In this report 'artefacts' has been used generally to describe pieces of stone that have been modified to produce flakes, flaked pieces, cores, hammerstones, or axes.

BACKED BLADE :

A stone tool manufactured from a flake on which one margin has been modified by the removal of small flakes to blunt the edge or margin opposite the cutting edge.

BORA GROUND :

A ceremonial site comprising of one or two connected circles composed of compacted or mounded earth, or defined by an arrangement of stones, of 2 to 30m diameter, generally used in male initiation rites.

CAMPSITE : A place at which the density of artefacts and the variety of material indicates that people ‘frequently’ used the place as a stopping or resting place. Such places are also likely to contain or be close to water resources, food resources, or stone material resources. In this report a campsite is used to describe artefact scatters that are associated with hearths or fireplaces, as distinct from scatters that are not associated with hearths or fireplaces, which are described as Open Scatters.

CHALCEDONY :

A form of silica (partially translucent), which occurs as linings in cavities in rocks. When banded it is known as AGATE (Department of Mines, 1973). Chalcedony is uniformly coloured and agate has curved bands or zones of varying colour (Cook & Kirk, 1991).

CHERT : Another name for sedimentary chalcedony. It occurs most frequently in limestones, or in marine sedimentary rock, or as pebbles in sedimentary rock. In its depositional context it is often concentrated in bedding planes. Chert found in deep-water limestones is formed from radiolaria and diatoms (siliceous planktonic micro-organisms) (Cook & Kirk, 1991).

Chert is a form of amorphous or extremely fine-grained silica, partially hydrous, found in concertions and beds. It is classified as a chemical sedimentary rock although it may be precipitated both organically and inorganically (Department of Mineral Resources, n.d.).

CONGLOMERATE :

Naturally cemented gravel. Conglomerate is a coarse-grained clastic sedimentary rock composed of generally rounded fragments of other rock types larger than 2 mm in diameter, set in a fine-grained matrix of sand, silt, or any of the common natural cementing materials (Department of Mineral Resources, n.d.).

CORE : A piece of stone from which flakes have been removed, that cannot otherwise be described as a retouched or modified artefact.

CORTEX : The naturally altered surface of stone – eg. the water-worn surface of river pebbles.

DEBITAGE : The small waste material observed in knapping floors. Generally, waste material is described as all those fragments having a maximum dimension of less than 10mm

FLAKE : A fragment of stone exhibiting features indicating that it has been deliberately removed from a core piece. These features are evident as:

i) Platform: Plane or point at which a blow was delivered to remove the flake.
ii) Bulb of Percussion: Convex surface that occurs on the face or ventral surface of a flake, radiating from the point of impact, produced as a consequence of the force pattern.
iii) Eraillure: see below.

Other terms:

i) Dorsal: The back or outer face of a flake as it would have been prior to removal from a core. Frequently either ridged or exhibiting negative flake scars when removed in secondary flaking, with a natural weathered cortex when removed in primary flaking.
ii) Ventral: The 'chest' or inner face of a flake as it would have been prior to removal from the core. The surface upon which the Bulb of Percussion occurs.
iii) Platform Preparation: The removal of flakes from a surface to produce a level platform. May be evidenced by retouch scars to the platform.
iv) Retouch: The removal of small flakes from an edge or margin of an artefact to modify its shape or resharpen its edge.
v) Proximal: The end of a flake closest to the striking platform.
vi) Distal: The end of a flake furthest from the striking platform.
vii) Margin: The edge of an artefact.
viii) Eraillure: A small circular to elliptical negative flake scar occurring on the surface of the bulb of percussion on flakes of very fine-grained or highly silicified material. It occurs 'naturally' as a consequence of internal forces generated at the time of flake removal.
ix) Split Cone: Occurs when the flake splits down its axis frequently removing part of the striking platform. Generally believed to be produced by faulty knapping technique, but is also probably a consequence of flawed material.
x) Transverse Snap: Occurs when a flake snaps across its axis. Generally believed to be caused by post-depositional impacts such as human or stock treadage, or vehicular traffic.

FLAKED PIECE :

A fragment of stone exhibiting flake scars indicating that it is an artefact, but not displaying diagnostic features, such as a Bulb of Percussion, Striking Platform, or an Eraillure.

GREYWACKE :

A type of sandstone, grey or greenish-grey in colour, tough and well indurated and typically poorly sorted (Clark & Cook, 1986).

A generally poorly sorted, dark sandstone containing feldspar and sand-sized rock fragments of metamorphic or volcanic rocks (Department of Mineral Resources, n.d.).

Usually a dark and coarse-grained rock compared to mudstones and siltstones that are much finer-grained and better sorted.

HOLOCENE PERIOD :

The period from 10,000 years ago to the present.

IGNEOUS ROCK :

Rock formed by the cooling and solidification of magma on or below the earth's surface (Geography Dictionary, 1985).

In situ : In its original place – as deposited.

ISOLATED ARTEFACT :

A solitary stone artefact, at least 50m from its nearest neighbour. This is based on NPWS policy that two artefacts within 50m of each other constitute a site.

KNAPPING FLOOR:

A discrete scatter of artefacts in which at least two artefacts are recognisably of the same material, and derive from the same piece of stone. Also described as a stone tool manufacturing site or floor.

LOCATION : The place at which an artefact is found, or a place identified as having either archaeological or Aboriginal significance.

MEASUREMENT :

I) Flake:
  i) Length: Measured along the percussion axis at right angles to the platform.
  ii) Width: The greatest width measured at right angles to the percussion axis.
  iii) Thickness: The greatest thickness measured at right angles to the percussion axis.
II) Flaked piece:
  i) Length: The longest dimension
  ii) Width: The greatest width measured perpendicular to the length.
  iii) Thickness: The greatest thickness measured perpendicular to the length.
III) Core:
  i) Length: The longest dimension.
  ii) Width: The greatest width measured perpendicular to the length.
  iii) Thickness: The greatest thickness measured perpendicular to the length.

MIDDEN : A refuse heap or stratum of food remains, such as mollusc shells, and other occupational debris (Dortch, 1984 – see also Meehan, 1982).

MUDSTONE : A fine-grained detrital rock, usually quite massive and well consolidated. May be black through grey to off-white, browns, reds and dark blues/greens. Frequently found in association with sandstones (Cook & Kirk, 1991).

Identification is often aided by colour variations in layering. A source for stone material tool manufacturing material found as river pebbles in creek beds, and artefacts often display a water-worn cortex.

NEGATIVE FLAKE SCAR :

A concave surface resulting from the removal of a flake, occurring on the surface of the rock from which a flake has been removed.

PLEISTOCENE PERIOD :

The period from about 10,000 years ago to 2 million years ago.

POTENTIAL ARCHAEOLOGICAL DEPOSIT (PAD) :

Synonymous with Potentially Archaeologically Sensitive : Having the potential to contain archaeological material although none is visible.

QUARTZITE :

Quartzites are formed by the regional or contact metamorphism of quartz arenites, siltstones, and flints (cherts). They are composed essentially of quartz, and usually have a fine-grained granoblastic (grains are roughly the same size) texture. Generally massive, but may sometimes show sedimentary structures (Cook & Kirk, 1991).

ROTATION :

The removal of flakes from a core by blows directed at different angles, to different platforms. May be evident on the dorsal surface of a flake as negative flake scars, which do not follow the same direction as the percussion axis of the flake. This may be confused with scars produced during core preparation.

SCAT : The solid waste material produced by an animal – dung, droppings, manure (Triggs, 1985).

SCATTER : Two or more artefacts occurring within 50 metres. Scatter may also be used in the context of 'background scatter', meaning the general distribution of artefacts across the landscape that cannot be recognised as discrete concentrations.

SILCRETE : A near surface or surface siliceous induration (Desen & Peterson, 1992).

A conglomerate consisting of surficial sand and gravel cemented into a hard mass by silica.

A siliceous duricrust (Bates & Jackson, 1980).

Crusts may form as a result of low, infrequent rainfall, on reasonably flat surfaces. These are known as duricrusts – those cemented by silica are known as silcretes (Clark & Cook, 1986), sometimes referred to locally as 'billy' (Gentilli, 1968), or 'grey billy'.

Silcrete on the northern tablelands of NSW forms at the surface contact between sediments of the Sandon Beds and the Armidale Beds with overlying basalt, where groundwater (more rich in silica than surficial water) interacts with surficial water and precipitates new quartz as the matrix to the sediments (N.D.J. Cook, Dept. of Geophysics, UNE, pers. Comm.).

In softer formations of quartz sands, groundwater has apparently been responsible for the formation of concretionary layers of silcrete. Under altered climatic conditions, the less competent beds erode away leaving concretions. Since they are often the size of old-fashioned woolsacks and are greyish and white, they are popularly known as gray billy (slang for billy goat) (Fairbridge, 1968).

SITE : A discrete area or concentration of artefactual material, place of past Aboriginal activity, or place of significance to Aboriginal people.

SOIL SCIENCE TERMS (taken from Banks, 1995, and others as referenced).

BEDROCK : Outcrop of *in situ* rock material below the soil profile.

BENCH : A strip of relatively level earth or rock breaking the continuity of a slope.

BLOWOUT : A closed depression formed in the land surface by wind eroding sands and depositing them on adjacent land.

CLAYPAN : A depression caused by the aeolian deflation of sediments, or by the presence of a prior lake.

DUNE : A ridge built up by wind action composed of sands, silts, or sand-sized aggregates of clay.

FLOODPLAIN : A large flat area, adjacent to a watercourse, characterised by frequent active erosion and aggradation by channelled and overbank stream flow.

GIBBER : A level surface covered by a thick deposit of gravel or broken siliceous pebbles, occurring in the more arid parts of the continent, thought to have been formed from the break-up of a siliceous (silcrete) surface crust, and termed gibber plains (Whittow, 1984) – see also silcrete.

GILGAI : Surface microrelief associated with soils containing shrink-swell clays. Gilgai consists of mounds and depressions, or irregularly distributed small mounds and subcircular depressions varying in size and spacing. Vertical interval usually <0.3m; horizontal interval usually 3-10m, and surface almost level.

Sometimes called 'crab-hole' soils.

GULLY : An open incised channel in the landscape generally greater than 30cm deep and characterised by moderately to very gently inclined floors and steep walls.

HUMMOCK : A small raised feature above the general ground surface.

LANDFORM ELEMENTS :

Crest : Landform element standing above all points in the adjacent terrain.

Flat : Neither a crest or a depression <3% slope.

Upper slope : Adjacent to and below a crest or flat but not a depression.

Midslope : Not adjacent to a crest, a flat or a depression.

Lower slope : Adjacent to and above a flat or a depression but not a crest.

LITHOSOLS : Shallow soils showing minimal profile development and dominated by the presence of weathering rock and rock fragments.

RILL : A small channel cut by concentrated runoff through which water flows during and immediately after rain.

RUNOFF : That portion of precipitation not immediately absorbed into or detained upon the soil and which thus becomes surface flow.

SCARP/CLIFF : A steep slope terminating a plateau or any level upland surface.

SCRUB : vegetation structure consisting of shrubs 2-8m tall.

SHEET EROSION : The removal of the upper layers of soil by raindrop splash and/or runoff.

SOIL PROFILE :

"A HORIZON" : The top layer of mineral soil. This may consist of two parts:

A_1 HORIZON: Surface soil and generally referred to as the topsoil.

A_2 HORIZON: similar in texture, but paler in colour, poorer in structure, and less fertile.

" B HORIZON" : The layer below the A Horizon. This consists of 2 parts:

B_1 HORIZON: A transitional horizon dominated by properties characteristic of the underlying B_2 horizon.

B_2 HORIZON: typically contains concentrations of silicate clay and/or iron, and/or aluminium and/or translocated organic material.

"C HORIZON" : The parent rock. Recognised by its lack of pedological development, and by the presence of remnants of geologic organization.

"R HORIZON" : Hard rock that is continuous (Charman & Murphy, 1993; 350-1).

SPUR : A ridge which projects downwards from the crest of a mountain as a water-parting (Whittow, 1984).

SUBSOIL : Sub-surface material comprising the B and C Horizons of soil with distinct profiles; often having brighter colours and higher clay contrasts.

SURFACE CONDITION :

Gravelly : Over 60% of the surface consists of gravel (2-69mm).

Hardsetting : Soil is compact and hard.

Loose : Soil that is not cohesive.

Friable : Easily crumbled or cultivated.

Self-mulching : A loose surface mulch of very small peds forms when the soil dries out.

SWALE : A linear level-floored open depression excavated by wind or formed by the build-up of two adjacent ridges.

SWAMP : Watertable at or above the ground surface for most of the year.

TERRACE : A flat or gently inclined surface bounded by a steeper ascending slope on its inner margin and a steeper descending slope on its outer margin (Whittow, 1984).

TOPSOIL : A part of the soil profile, typically the A_1 horizon, containing material that is usually darker, more fertile and better structured than the underlying layers.

UNDERSTOREY : A layer of vegetation below the main canopy layer.

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APPENDICES

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Appendix i – Cobar & Mineral Hill Synclinorial Zones

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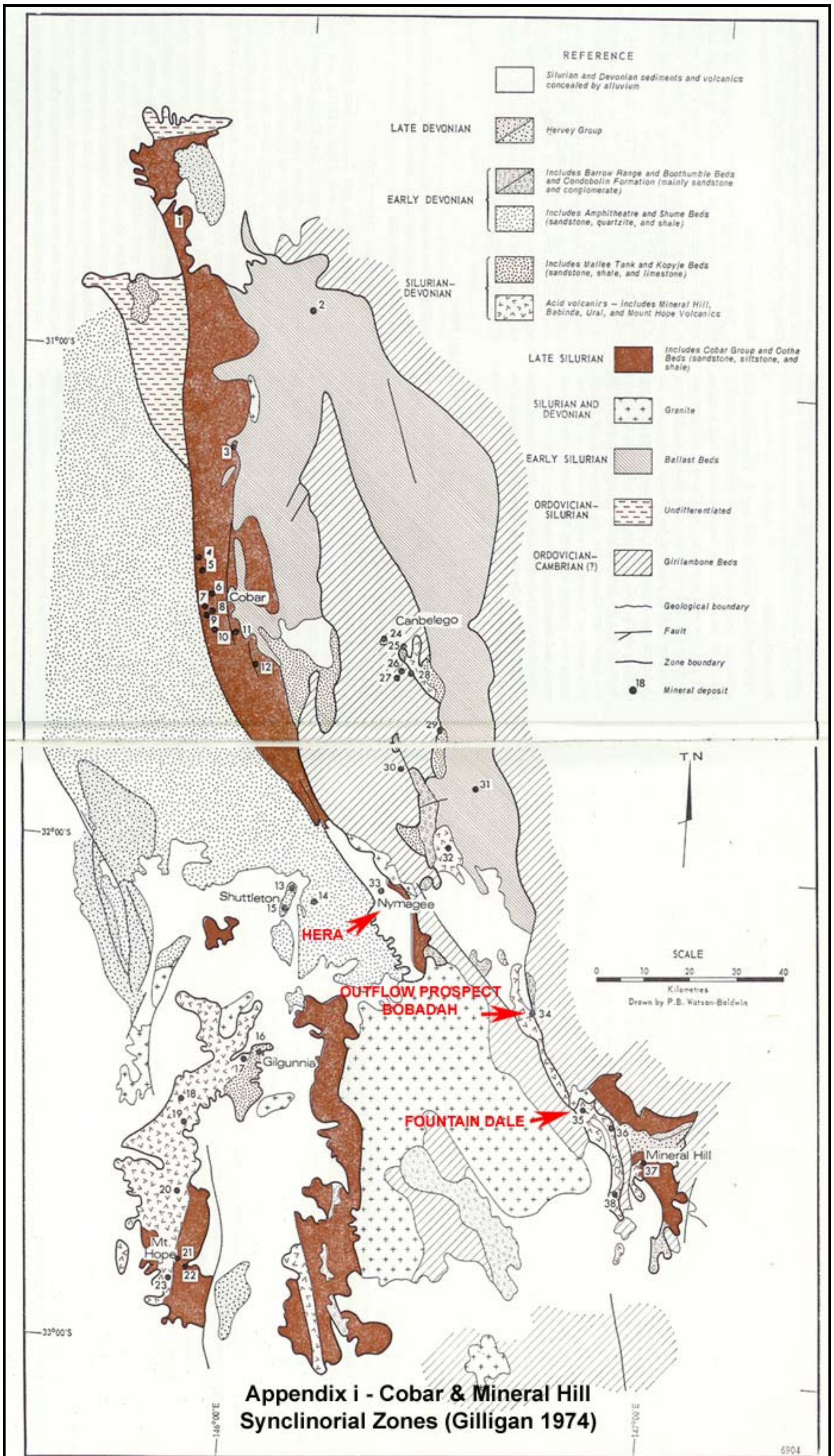

Figure 4.8 Mineralization in the Cobar and Mineral Hill Synclinorial Zones

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Appendix ii – Site types

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Site types associated with Indigenous activities and culture

The definitions that follow are for terms used in this report, and do not necessarily apply to their use in different contexts.

Art sites are defined as places where any medium has been applied to a rock surface either as symbols, characters, drawings, paintings, or any other rendition, recognisable as not being a natural discolouration or feature. They also include markings to a rock surface, either by engraving, abrading, or pecking, and which cannot be identified as being a natural feature.

Bora rings are circles of 2-30 metres diameter of compressed earth (from repeated treading or dancing), or stone arrangements, at which men performed initiation ceremonies, and are the most frequently recorded ceremonial sites. Sometimes they occur as two rings joined by a central track in a barbel configuration. They usually occur on level or low-lying country, which is usually the first topographical unit to be cultivated, or utilised for highways and roads, but they may also occur as circular stone arrangements on elevated rock platforms and hilltops. If they are or were present then they are usually either already known and have been recorded, or they have long since been destroyed.

Carved trees are readily recognised by even the untrained observer. The carving is incised either into the outer bark, or more commonly, into the living wood after removal of a section of the bark. The designs frequently consist of ‘diamond cross-cuts’, but may also consist of stylised animal motifs. Previously unrecorded carved trees are still discovered in relatively remote or inaccessible areas. Carved trees frequently occur near burial sites and/or Bora rings, but in some regions they may have been tribal boundary markers.

Fish traps may occur either in rivers or on seashores. They are recognisable as unnaturally formed stone arrangements that were constructed to trap fish (or eels or turtles) carried into the enclosure in deep water, and which are left stranded within the enclosure as the water level drops. The fish were then caught by nets, hand, or by spear.

Grinding grooves are usually observed on the surfaces of large sedimentary boulders or exposed shelves and outcrops of sedimentary rock along creek banks and beds, or near water. They have been produced by Aborigines using the rock surface to shape and sharpen the edges of stone to produce ground-edged axes, or to sharpen wooden spears (the latter tend to be narrow and deep). Water was used to lubricate the surface of the rock. The grooves frequently occur as linear abraded depressions in the rock, and may each be between 10 and 50 centimetres long, up to 15 centimetres wide, and 2 to 5 centimetres deep. Some sedimentary rock surfaces may exhibit shallow ground depressions of roughly round or elliptical shape, and these are more likely to be associated with seed grinding, root crushing, or other food preparation.

Middens may be identified variously as beach, lagoon, lacustrine, or estuarine, and are most likely to be observed at or above the water line where erosion, topsoil removal, or mining has exposed the shell. The size of the midden can vary enormously, with the smallest comprising a ‘one off’, “dinner-time camp” (Meehan. 1982), with as few as two or three shells, or a shallow lens of only a few centimetres. The largest middens may extend for many kilometres and may comprise of a number of lenses and layers of shell and ash up to several metres deep. These large middens may be evidence of continuous exploitation of the resource over many thousands of years. Middens of fresh water mussel shell may be found in eroding creek banks or in eroding terraces, particularly near both existing and defunct water holes.

Isolated shell or fragments may occur on any surface and in any situation. A single shell may have been discarded by a bird, but the presence of use-wear would indicate Aboriginal use of the shell as a tool, which was discarded after use. Such occurrence is likely to be where there is no immediate source of stone material suitable for tool manufacture.

Natural Mythological sites are places of significance to Aborigines, either because they are described in mythological stories or songlines, or because they were used in religious ceremonies. They may occur anywhere and while some are more predictable than others – as for example, permanent water holes, waterfalls, rock promontories, etc., others may have no particularly remarkable features. Seldom is there any recognisable artefactual evidence or anything to distinguish it from similar features in the vicinity. These sites must of necessity be identified by Aboriginal people with an association with the place.

Open sites, campsites, knapping floors, scatters, and isolated artefacts, are most likely to occur on eroded and exposed creek banks, particularly where slope wash or stock trails has removed the humic layer, or on eroded ridges and spurs, particularly near the junctions in watercourses.
Open sites are most likely to be present in greatest numbers near a source of either raw stone material, or potential food resources, or in a natural corridor between two differentially preferred environmental zones, or at the contact between two environmental zones containing different resources.
Artefacts in open scatters are likely to be manufactured from the dominant raw material available; i.e. Greywacke on greywacke-sourced soils, quartz on granite-sourced soils, silcrete and chert on relict sedimentary soils.
Artefact assemblages in open scatters are likely to consist predominantly of discard material, i.e., cores, flakes, flaked pieces, and debitage.
Artefacts exhibiting retouch scars and backing are most likely to occur in sites where secondary activity took place peripheral to the central camp site, although this is a generality and can only be observed where there is sufficient surface visibility to identify peripheral sites.
Fragments of flakes with retouch or backing may occur on knapping floors indicating breakage occurring during manufacture, or maintenance areas in which damaged tools have been replaced and discarded.
Isolated artefacts are likely to be most frequently observed where the groundcover obscures all but the larger artefacts, such as cores, and large flakes, or where there is little contrast between the texture of artefactual material and the surface upon which it lies. Artefacts of materials contrasting with the matrix may be visible regardless of size; eg. quartz artefacts may be far more visible than much larger basalt artefacts against a background of dark humic terrace soils.

PADs or Potential Archaeological Deposits are deposits, usually in shelters (but they may also be identified where there are intact deposits in open areas), which although not containing any visible archaeological material, are considered likely to contain archaeological material below the surface. These 'sites' are not recorded as sites on the Aboriginal Site Register, but are identified as places that require subsurface testing to establish whether a site exists or not.

Rock shelters with art or occupation deposits, are most likely to occur where the character of the parent rock is sufficiently massive or consolidated for it to retain a structure that weathers differentially to form shelters and overhangs.

Scarred trees are perhaps the most difficult site type to determine as having been caused by deliberate removal of the bark by humans and not as a consequence of natural events; such as abrasion from falling trees or branches, natural branch attrition, fire damage, or contact from vehicles or stock. They may occur in places wherever there are tree species that produce bark suitable for tool and implement manufacture. While some scars are clearly the consequence of deliberate bark removal by Aborigines (either evidenced by stone axe marks, or identified by Knowledge Holders), some scars were made by settlers, and stockmen, and surveyors who frequently blazed trails and property boundaries by scarring the trees, and by timber men who removed a strip of bark to test the suitability of a tree for logging.

Other site types such as hearths, burials, etc., are less easily predicted, although burials are frequently associated with carved trees, and Bora rings, and hearths with campsites, shelters, and shell middens.

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2nd Feb 2006

Attn: Kim Ferguson

Re: Archaeological investigation:
"The Peak" Exploration (Hera Deposit)

Dear Kim

As requested I have reviewed my report:

> The archaeological investigation for sites of Indigenous cultural significance on gold mining prospects at 'Hera', south of Nymagee, 'Overflow Prospect', at Bobadah, "Fountain Dale". North-west of Mineral Hill, Central West NSW. Dated March 2004 , for Triako Resources Limited.

- with particular attention to the 'Hera' site.

The mine impact area as described in the "Hera Deposit Site Conceptual Layout Plan" dated 27/1/2006, Ref: TR081HR, falls within the boundaries of the area surveyed in the 2004 investigation.

My assessment is that no further investigation is necessary and that the contents of the report are valid and do not require any further description, discussion or amendment.

However, you should be aware that the report was dated March 2004, and so from a DEC point of view, is only valid until March 2007, after which DEC may require a new investigation.

Yours faithfully

ANNEXURE 6

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Preliminary Soils Assessment

Hera Project, Nymagee

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TRIAKO RESOURCES – HERA PROJECT, NYMAGEE

PRELIMINARY SOILS ASSESSMENT

1 INTRODUCTION

This preliminary soils assessment was prepared for R W Corkery and Co. Pty Limited on behalf of Triako Resources Limited [the Company].

It is based on laboratory analyses of four soil samples from two pits at the Company's Hera Exploration Site at Nymagee, New South Wales. The samples were analysed at the Department of Lands [Soil Conservation Service] Soil and Water Testing laboratory at Scone.

The samples were collected by Company personnel.

2 DETAILS OF THE SOIL SAMPLES

The samples that were analysed were obtained from two locations within the Hera Exploration Site. These were the settling ponds site [approx 7070E; 2220N on the HMG] and the WRD [approx. 7740E; 2380N on the HMG].

2.1 The Settling Ponds Site

A backhoe pit was dug to a refusal depth of 180cm and two samples were obtained. The boundary between the two samples was determined according to the Company personnel, by 'a reduction in root material and an increase in clay and pebble content'.

The samples were:

0-30cm [NO21501]; and
30-180cm [NO21502].

Three photographs were supplied showing the soil profile over the two separate sampled depths and third showing the overall profile.

2.2 The Waste Dump Site

A backhoe pit was dug to a refusal depth of 70cm and two samples were obtained. The top sample represented the soil to 15cm depth and the lower sample the weathered basement rock comprising siltstone and sandstone.

The samples were:

0-15cm [NO21503]; and
15-70cm [NO21504].

Three photographs were supplied showing the soil profile over the two separate sampled depths and third showing the overall profile.

3 THE ASSESSMENT

As a field survey was not carried out, there was no opportunity to examine the sampled profiles in detail or the assess structure grade, colour, fabric, consistence, pedality, inclusions and field texture or to examine the soil surface characteristics. Consequently, this preliminary assessment is based solely on laboratory analysis data.

The four samples were analysed to determine the following properties.

- Range of particle size [particle size analysis].
- Dispersion percentage.
- Coherence [Emerson aggregate test].
- Electrical conductivity.
- pH.

3.1 Soil Laboratory Analyses

The tests performed aimed at assessing the potential erodibility of the soils [Particle Size Analysis [PSA], Dispersion % [D%] and Emerson Aggregate Test [EAT]] and the likely salinity risk using Electrical Conductivity [EC] as a primary measure. In addition pH was measured.

3.1.1 Soil Physical Analyses

Tables 1 and **2** show the results obtained from laboratory analysis of the samples from the two pits.

Table 1

Physical Laboratory Analysis Data for Selected Soil Profiles [Whole Soil Particle Size Analysis]

PIT NO.	LAYER	TEXTURE [fine earth]#	DEPTH [cm]	PSA % CLAY	PSA % SILT	PSA % FINE SAND	PSA% COARSE SAND	PSA % TOTAL SAND	PSA % GRAVEL
PIT 1 [Settling Pond]	1 N021501	Loam / clay loam	0-30	22	13	38	23	61	4
	2 N021502	Clay	30-180	34	11	28	13	41	14
PIT 2 [Waste Dump]	1 N021503	Silt Loam	0-15	13	14	39	12	51	22
	2 N021504	Loam	15-70	8	8	18	11	29	55

Note: PSA = Particle Size Analysis # texture based on laboratory measurements

Table 1 [cont]

Physical Laboratory Analysis Data for Selected Soil Profiles [Whole Soil Particle Size Analysis]

PIT NO.	LAYER	TEXTURE [fine earth]#	DEPTH [cm]	D %	D% level of dispersion	EAT	EAT level of dispersion
PIT 1 [Settling Pond]	1 N021501	Loam / clay loam	0-30	7	slight	3[2]	slight
	2 N021502	Clay	30-180	12	slight	4	negligible
PIT 2 [Waste Dump]	1 N021503	Silt Loam	0-15	22	slight	3[1]	slight
	2 N021504	Loam	15-70	29	slight	3[2]	slight

Notes: D = Dispersion EAT = Emerson Aggregate Test # texture based on laboratory measurements

3.1.2 Soil Chemical Attributes

Laboratory testing of the samples extended to an examination of the electrical conductivity and soil pH. The results of these laboratory analyses are contained in **Table 2**.

Table 2

Chemical Laboratory Analysis Data for Selected Soil Profiles

PIT NO.	LAYER	TEXTURE [fine earth]#	DEPTH [cm]	pH	EC [dS/m]#
PIT 1 [Settling Pond]	1 N021501	Loam / clay loam	0-30	7.4	0.03
	2 N021502	Clay	30-180	8.9	0.13
PIT 2 [Waste Dump]	1 N021503	Silt Loam	0-15	7.0	0.01
	2 N021504	Loam	15-70	6.7	0.01

based on fine earth fraction

3.2 Discussion of Soil Physical Attributes

The laboratory analysis data contained in **Table 1** are important in assessing the erodibility of the soil units found within the footprint of the proposed activities.

The three tests [Particle Size Analysis, Dispersion %, Emerson Aggregate Test] carried out on samples from each of the horizons within the nominated soil profiles, when considered together, provide a good indication of the soil's likely behaviour in relation to the erosive forces encountered in the field.

3.2.1 Particle Size Analysis

*The Particle Size Analysis [PSA] test (**Table 1**) shows the amounts of gravel, clay, silt, fine sand and coarse sand contained within each sample.*

From this data it is evident that the topsoil at the settling ponds site contains relatively low levels of gravel while that from the Waste Dump site contains considerably more. Both samples would be suitable for use in rehabilitation works despite the higher level of gravel in the latter profile.

The settling ponds site subsoil also contained a relatively low gravel content while that from the Waste Dump contains a level of gravel that makes it marginal for use in rehabilitation.

*The texture class of each soil layer is determined by analysis of the material that is less than 2mm in size [fine earth fraction] – i.e. the sample from each tested horizon with the gravel removed. The calculated texture of the fine earth fraction of each of the layers tested in the laboratory is shown in **Table 1**.*

3.2.2 Dispersion Percentage

The Dispersion Percentage [D%] test indicates the proportion of the soil material less than 0.005 mm in size that would disperse on wetting [i.e. the clay and some of the silt fractions].

Hazelton and Murphy [in press] provide the following guides to the interpretation of D% values [**Table 3**].

Table 3

Interpretation of Dispersion Percentage Values
[after Hazelton and Murphy, in press]

D% Value	Dispersion Rating
< 6	Negligible
6 – 30	Slight
30 – 50	Moderate
50 – 65	High
> 65	very high

In interpreting the results of the values of dispersion percentage obtained in laboratory testing, it is important to consider other related soil attributes such as the Particle Size Analysis [PSA] and Emerson Aggregate Test [EAT] data.

Soil horizons with high clay contents and high Dispersion % values will be more dispersive in practice than those with a high Dispersion % value and a low clay content in the soil.

The D% values shown in **Table 1** indicate that the topsoil and subsoils from both sites have slight dispersibility. Even so, there is a need for appropriate measures to be taken to protect any stockpiles of stripped soil should the project proceed and for the same material, when respread, to be afforded rapid protection from soil erosion in the form of vegetative cover.

3.2.3 Emerson Aggregate Test

This test provides a measure of the coherence of soil aggregates when they are immersed in water. Natural peds are used [Houghton and Charman, 1986] and the method used by the Department of Land and Water Conservation to determine the Emerson Class Number is fully described in Craze et al [1993].

Basically, the degree of soil aggregate stability increases from Class 1 through to Class 8. Classes 2 and 3 have a number of subclasses based on the degree of dispersion.

Aggregates in Emerson Classes 1 and 2 are generally regarded as being unstable while those in classes 4 to 8 are considered to be stable. Hazelton and Murphy [in press] present a summary of the Emerson Aggregate Classes. This is contained in **Table 4**.

Table 4

Comparison of Aggregate Dispersibility and Emerson Aggregate Classes [after Hazelton and Murphy, in press]

Aggregate Dispersibility	Emerson Aggregate Classes*
Very High	1 and 2[3]
High	2[2]
High to Moderate	2[1]
Moderate	3[4] and 3[3]
Slight	3[2], 3[1] and 5
Negligible / Aggregated	6,7,and 8

* NOTE – the subclasses of the Emerson Aggregate Test [EAT] Classes are as follows.

[1] slight milkiness immediately adjacent to the aggregate

[2] obvious milkiness, less than 50% of the aggregate affected

[3] obvious milkiness, more than 50% of the aggregate affected

[4] total dispersion, leaving only sand grains [NB – Class 2[4] is equivalent to Class 1]

The measured EAT values in **Table 1** for the topsoils and subsoils for both profiles indicate that the soil materials exhibit slight or negligible dispersibility as measured by this test. Again, despite this finding, there is a need for appropriate measures to be taken to protect any stockpiles of stripped soil should the project proceed and for the same material, when respread, to be afforded rapid protection from soil erosion in the form of vegetative cover.

3.3 Discussion of Soil Chemical Attributes

3.3.1 Soil pH

In general, the pH [water] range in most soils is between 4.0 and 8.5 although pH values above and below this range are measured at times [Glendinning, 1990].

This range of soil pH levels is generally accepted as being one that is suitable for plant growth.

The pH 6.0 to 6.5 range is usually regarded as the optimum for growth of most plants and there are some more serious impacts on the growth of many species at the lower, or acid, end of the range.

As the pH scale [between 0 and 14] is a logarithmic one, a soil with a pH of 5.0 is ten times as acid as a soil of pH 6.0 and 100 times as acid as one with a pH of 7.0.

Perusal of the data in the pH column in Table 2 indicates that both of the topsoil samples tested showed pH levels within the 4.0 to 8.5 range.

The subsoil at the settling ponds site was outside the acceptable range while that from the Waste Dump site is within the range.

This highlights, in the case of the settling ponds site the problems associated with bulked samples taken over a wide depth range [ie. a range of 150cm] and not sampled on a distinct horizon basis. It is likely that under normal soil sampling circumstances that there would be a number of distinct horizons within the profile between 30cm and 180cm depth. It is again likely that the upper horizons that would be likely to be stripped for use in rehabilitation would have more acceptable pH levels that those shown in the bulk sample.

3.3.2 Electrical Conductivity

Soil salinity is a measure of the presence of water-soluble salts, mainly of sodium, calcium and magnesium in the soil solution. These salts may be chlorides, sulphates or carbonates and can have a major impact on plant growth if they occur in sufficiently large quantities.

The level of salinity in a soil sample is determined by measuring the electrical conductivity [EC] of a 1:5 soil / water suspension.

As the published salinity tolerance data for crops and pastures is based on the electrical conductivity of a saturated extract of the soil solution, a series of conversion factors, based on the estimated water holding capacity of soil sample, are used to convert the measured EC value to one for the conductivity of the saturated extract [EC_e].

The electrical conductivity of the 1:5 soil / water suspension and that of the saturated extract are measured in units called deciSiemens / metre [dS/m].

The measured level of electrical conductivity of the 1:5 soil / water suspension is multiplied by the appropriate factor in **Table 5** [extracted from Hazelton and Murphy, in press] based on the measured soil texture.

Table 5
Texture Class Multipliers for Calculating EC_e Values

Soil Texture Class	Multiplier Factor
loamy sand, clayey sand, sand	23
sandy loam, fine sandy loam, light sandy clay loam	14
loam, loam fine sandy, silt loam, sandy clay loam	9.5
clay loam, silty clay loam, fine sandy clay loam, sandy clay, silty clay, light clay	8.6
light medium clay	7.5
medium clay	5.8
Heavy clay	5.8

Table 6 shows the calculated EC_e values for the samples analysed in the laboratory and shows the salinity status of the various samples based on these EC_e values.

Hazelton and Murphy [in press] note that EC_e values below 2.0 indicate non-saline horizons while values between 2 and 4 indicate slight salinity. Values between 4 and 8 indicate moderate salinity while those between 8 and 16 indicate high salinity.

The data in **Table 6** indicate that the topsoils and subsoils in both profiles are non-saline

Table 6

Calculated EC_e Values and Salinity Status for Selected Soil Profiles

PIT NO.	LAYER	TEXTURE [fine earth]#	DEPTH [cm]	EC [dS/m]#	MULTI-PLIER	CALCU LATED EC_e	SOIL SALINITY STATUS
PIT 1 [Settling Pond]	1 N021501	Loam / clay loam	0-30	0.03	9.5	0.29	Non-saline
	2 N021502	Clay	30-180	0.13	7.5	0.98	Non-saline
PIT 2 [Waste Dump]	1 N021503	Silt Loam	0-15	0.01	9.5	0.095	Non-saline
	2 N021504	Loam	15-70	0.01	9.5	0.095	Non-saline

4 Erosion Potential - SOILOSS Program

An appropriate method of assessing the erosion hazard associated with the soils of the area of proposed activities is to use the SOILOSS computer program devised by Rosewell and Edwards [1988] and updated by Rosewell [1993].

This program computes soil loss values for a given site under various land uses and climatic [rainfall] conditions and so provides an indication of erosion hazard.

SOILOSS is based on the Universal Soil Loss Equation or USLE described by Wischmeier and Smith [1978] and subsequently updated as the Revised Universal Soil Loss Equation or RSLE [Renard et al, 1993].

The USLE is

$$A = R * K * L * S * P * C$$ where

A is the average annual soil loss [tonnes / hectare]
R is the rainfall erosivity factor, a measure of the erosive power of the rain
K is the soil erodibility factor, a measure of the resistance of the soil to erosion
L is the slope length factor
S is the slope steepness factor
P is the support practice factor, a measure of the effect on erosion of soil conservation measures such as contour cultivation and bank systems
C is the crop and cover management factor

In using SOILOSS, the rainfall erosivity factor is obtained from maps provided with the program manual [Rosewell, 1993].

Soil erodibility is either estimated from details of the soil type and soil surface texture by comparison with a table of soils presented by the program or is derived from a knowledge of soil particle size analysis, organic matter content, surface soil structure and profile permeability.

Slope length and steepness factors are derived from field measurements and / or examination of topographic maps or airphotos.

The support practice factor is estimated by the program from a description of the land management practices in use, details of cultivation direction and information on bank systems if these are present.

To determine the value of the 'K' factor for use in the program, a generic or standard method can be utilised from within the program to indicate the likely soil losses from a range of crop rotations and management practices.

In addition, a more detailed approach can be used to determine likely soil loss given the availability of precise detail relating to sowing dates, cultivation practices etc.

Provision is made within the program for estimating soil loss from areas with a range of non-arable uses.

Table 7 provides details of the calculated erodibility values [K] and erodibility ratings for topsoils and subsoils from the two soil profiles in the area of proposed activities that were tested in the laboratory. The shallow soil materials from the area associated with the proposed ventilation shaft were not laboratory tested.

The erodibility estimates contained in **Table 7** for the four samples from the area of proposed activities have been calculated using part of the overall SOILOSS program capability and the Particle Size Analysis and other data.

The only values for which estimates were used in the calculations were those for organic matter %. Estimates for these values are based on soil sampling in similar areas in the Mount Hope district [G.M.Cunningham pers.comm.]. Mean values of 1.7% [topsoil] and 0.7% [subsoil] were chosen.

The Erodibility classes used were < 0.020 = LOW; 0.020 – 0.040 = MODERATE; > 0.040 = HIGH.

Table 7

Soil Erodibility Values and Ratings for a Selection of Soils

PIT NUMBER	TOPSOIL LAYER [cm]	TOPSOIL 'K' RATING	SUBSOIL LAYER [cm]	SUBSOIL 'K' RATING	AVERAGE 'K' RATING [WHOLE SOIL]	SOIL MAPPING UNIT ERODIBILITY
PIT 1 [Settling Pond]	0-30	0.038	30-180	0.029	0.034	moderate
PIT 2 [Waste Dump]	0-15	0.052	15-70	0.052	0.052	high

The soil from the settling ponds site was allotted a MODERATE erodibility by the SOILOSS model based on its physical characteristics while that from the Waste Dump site was classed as having a HIGH erodibility.

Because of this MODERATE to HIGH erodibility, as assessed by the SOILOSS analysis and field observations, the soils from both site should be managed carefully during the stripping and rehabilitation stages to ensure that soil structure damage is minimal and that they are suitably protected by vegetation or some other medium at all times.

5 SUMMARY

This preliminary soils assessment is based solely on laboratory data obtained from samples supplied by the Company.

It should be noted that the samples are bulk samples not taken on a traditional soil horizon basis and consequently the results of the laboratory analyses may be misleading.

Overall, the soils analysed from the Settling Ponds and Waste Dump sites showed a moderate to high erodibility as assessed by the SOILOSS model.

All four samples were non-saline and showed negligible to slight dispersibility [D% and EAT]

The measured pH of both topsoils and the subsoil from the Waste Dump were within the acceptable pH range but the subsoil of the Settling Pond soil had a pH outside the range. This latter result is probably distorted by the bulk nature of the sample.

All samples showed gravel percentages within the range [Elliott and Veness,] although the subsoil [weathered rock] of the settling Pond soil was extremely marginal and preferably should not used as subsoil.

No additional assessment of the soil samples can be made from the data supplied without further field testing to develop an adequate overview of relevant additional properties of the range of soil profiles at the Project Site.

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Addendum to the

REVIEW OF ENVIRONMENTAL FACTORS

for the

Exploration Decline at the Hera Deposit

within Exploration Licence 6162

Via Nymagee

Prepared by:

R.W. CORKERY & CO. PTY. LIMITED

Date: February 2007

INTRODUCTION

This Addendum has been compiled to provide a range of supplementary information requested by the Department of Primary Industries (Mineral Resources) for its consideration of the application by Triako Resources Limited for the Hera Project.

1. Water Supply

Reliance would be preferentially placed upon surface water collected on site and any water pumped from the decline although reliance would also be placed upon groundwater drawn from the "Back Bore" and Skirka's Bore identified on **Figure 3.1**. The Company applied for a licence for Skirka's Bore on 26/10/2005 – for 18.5ML/year. The flow rate within the Back Bore has been recently confirmed at 6 litres per second which exceeds the 2 to 4 litres per second required for the exploration decline phase of the project. Hence, with both surface water and groundwater sources, all project water requirements would be satisfied. A Part 5 Water Licence will be sought from DNR for the pumping of any water from the decline. A licence to utilise water from the Back Bore will be lodged with the DNR concurrently with the Part 5 Water Licence. A copy of all licences received will be provided to the DPI (MR) following their receipt.

2. Sediment Basin Management

Section 2.12 of the Review of Environmental Factors (REF) has been amended to reflect the updated copy of the Environmental Management Plan (EMP) 5 – Water Erosion and Sediment Management specifically to provide for management of the storage capacity of the sediment basins. A copy of the adjusted text is set out below.

> "Two sediment basins would be constructed to hold the surface water runoff from the areas of disturbance. These sediment basins are illustrated on **Figure 2.5** and the indicative specifications are provided in **Table 2.6**. The sediment basins have been designed to allow for settling and short-term storage of "dirty" water.

Table 2.6
Sediment Basin Indicative Specifications

Sediment Basin ID	Catchment Area (ha)*	Volume (m^3)	Dimensions length *x* width *x* depth (m *x* m *x* m)	Outlet Width (m)	Sill Width (m)
SB1	5	800	50 x 20 x 1	3	6
SB2	6	800	50 x 20 x 1	3	6

Source: Department of Lands Soil Conservation Service (2006) – Table 1.3

> Water would usually evaporate from these sediment ponds, however, during large or prolonged rainfall events, the sediment ponds may overflow and flow via the existing drainage channels or overland to the broader catchment dam, ie. Three Gates Tank (**Figure 2.5**). It is anticipated that, given the water management structures proposed to remove the majority of sediment from the water prior to it reaching Three Gates Tank, that the quality of the overflow water would be consistent with that of the other dams on the property. Additionally, if there is a

> rain event of such magnitude, then there would be natural erosion of the undisturbed soils across the Project Site in areas disturbed by feral goats and the removal of groundcover, hence increasing the background sediment level. An important feature of the management of the sediment basins would be the progressive emptying of water from the basins within 20 days of the cessation of a rainfall event. This activity is proposed to retain the significant storage within the basins, thereby retaining their effectiveness during substantial rainfall events. Furthermore, each basin would be cleared of accumulated sediment once 25% of its capacity has been reduced. EMP 5 records the procedures to be adopted in the event any water is discharged from site which exceeds the 50mg/L concentration of total suspended solids.
>
> Water monitoring (as detailed in Section 5 - EMP 5) would be undertaken to ensure this is the case. Additionally, as an added contingency, water from the sediment basins and / or Three Gates Tank would be pumped to the settling ponds as required to provide additional operational water. In this manner, the capacity of both the dam and the settling ponds can be maintained while providing maximum operational water."

EMP 5 has been updated to reflect the proposed management of the sediment basins.

3. Greenhouse Gas Usage

The primary fuel source for vehicles and equipment operating on site would be Automotive Diesel Oil. The annual emission of CO_2 and other greenhouse gases has been estimated using the Australian Greenhouse Office document entitled "*Australian Methodology for the Estimation of Greenhouse Gas Emissions and Sinks 2002*".

The monthly usage of Automotive Diesel Oil for the Hera Exploration Decline Project will be approximately 107 000 litres, ie. comprising:

- 69 700 litres/month for electrical power generation; and
- 37 500 litres/month for surface and underground vehicles and equipment.

The annual usage of Automotive Diesel Oil of 1.286 million litres would generate approximately 5 500 tonnes of CO_2 annually.

4. Part 5 Licence under the *Water Act 1912*

The Applicant is currently finalising its application for a licence to remove any groundwater encountered during the dewatering of the decline. A copy of the licence received from the Department of Natural Resources will be provided to the Department of Primary Industries (Mineral Resources).

5. Bore Licences

Reliance will be placed on groundwater recovered from either or both the Skirka's Bore or Back Bore, which has recently been tested to yield up to 6 litres per second. The Company applied for a licence for Skirka's Bore on 26/10/2005 – for 18.5ML/year. A licence application for the use of water from the Back Bore will be lodged shortly with the Department of Natural Resources, ie. in conjunction with the Part 5 Licence application.

6. Maximum Harvestable Right Dam Capacity

The four dams on "The Peak" collectively have a storage capacity of 35.8ML. This quantity is lower than the 130ML maximum harvestable right dam capacity, ie. based upon 0.06ML/ha.

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