AUDIT OF 1990's MINING AND EXPLORATION ACTIVITIES WITHIN DUNDAS AND JILBADJI NATURE RESERVES - REPORT TO NPNCA

Introduction

Jilbadji Nature Reserve 24049 and Dundas Nature Reserve 36957 are large, relatively remote Goldfields nature reserves vested in the National Parks and Nature Conservation Authority (NPNCA) and managed by the Department of Conservation and Land Management (CALM) (location map, Appendix 1). Jilbadji and Dundas NRs are both quite arid, receiving an average of less than 300 mm rainfall per year. Vegetation is to some extent similar, with Eucalypt woodlands and mallee predominating in a complex of vegetation types. Heath is an important component of the vegetation in Jilbadji NR, and many salt lakes are present in Dundas NR. Both reserves have experienced substantial exploration activity within the last decade.

Field inspections were undertaken by relevant CALM District Managers and Environmental Protection Branch, the Department of Minerals and Energy (DME) and in the case of Dundas NR, NPNCA representatives. CALM Wheatbelt Regional Manager, and Narrogin and Katanning District Managers also attended part of the Jilbadji inspection. Mining company representatives were available in most instances to assist with inspections. Due to the large size of the reserves, extent of exploration activities and access difficulties, inspections were representative rather than all-inclusive.

Prior to inspection, aerial photographs, DME's Tengraph system and exploration maps were used to select appropriate sites and plan routes. In the field, audit sheets were completed by CALM and DME for a limited number of individual exploration sites. Choice of sites was based on stratified random sampling. Both objective and subjective methods were used to measure compliance issues. Time constraints precluded the use of statistically valid monitoring of rehabilitation.

Jilbadji Field Inspection (10th and 11th March 1999)

Jilbadji NR was initially reserved in 1954 as an unvested reserve for flora and fauna (then known as Lake Barker, or Barker Lake, Wildlife Sanctuary). In 1977 the reserve was vested in the Western Australian Wildlife Authority (WAWA), with the purpose of "Conservation of flora and fauna". (Former WAWA nature reserves are now vested in the NPNCA.) Jilbadji NR is approximately 40 km south of Marvel Loch, in CALM's Merredin District, and has an area of 208, 866 hectares.

In the 1960's and 70's, extensive exploration for nickel and other base metals was carried out within Jilbadji NR. Many cleared lines are visible on aerial photographs. Both environmental disturbance exploration and active mining have occurred at Jilbadji Nature Reserve in the 1990's. Over thirty exploration or prospecting applications, and four mining lease applications, have been processed by CALM since 1991. Processing of another four mining lease applications is awaiting further information from the applicants (preliminary notification of mining). Gold has been mined in the Cheritons area this decade (Cheritons area, Appendix 2).

Mined and rehabilitated sites at Cheritons and West Cheritons were inspected.

- West Cheritons open cut gold mine on Mining Lease 77/ 423 was both mined and rehabilitated in 1993, by Nevoria Joint Venture under an agreement with the tenement holders (Gwalia Minerals NL). A total of approximately 3 hectares was disturbed. The site was not seeded, but topsoil was not old and a good amount of vegetation debris was left for habitat. Soil is fine and clayey. Currently, density appears to be about 1 perennial plant/m^2 and various species are present. Initial monitoring of rehabilitation has been undertaken at West Cheritons, further formal monitoring is required. CALM's requests for the company to organise monitoring have

not been heeded, and it may be necessary for DME to source funding for this work from the performance bond which is in place for the tenement. Open drill holes were found on the access grid (may have been done by other than Nevoria). Sons of Gwalia are the new owners of this tenement, and they have agreed to voluntarily cap and fill these holes when working in the area.

- Cheritons open cut gold mine (ML 77/390) was also mined and rehabilitated in 1993, by Nevoria. The pit covered less than 3 hectares, with a total of approximately 5.5 hectares being disturbed in total. The site is lateritic, with a low waste rock to ore ratio. Processing of the ore occurred off site. Although the site was not seeded, rehabilitation is reasonably dense, and appears quite varied. The soil here is coarse gravel, which is generally conducive to successful rehabilitation. Gridlines have not regenerated very well (reasons could include competition from surrounding vegetation, and compaction of tracks).
- Rehabilitation at Cheritons and West Cheritons mine sites generally appears to be proceeding at an acceptable rate.

Several exploration programs were inspected:

- Forrestania Gold (Bounty Gold Mines) is currently operating south of Jilbadji, but also has interests in the southern part of Jilbadji and has recently undertaken low impact (foot traverse) soil sampling (site A on Appendix 2).
- Lines cleared for previous exploration work at the Turkish Delight (site C App.2) and Leeuwin (site D App.2) prospects were audited. Some of these were cleared earlier by Aztec, some by Normandy, and most were drilled in 1996. While the lines were generally of acceptable width (approximately 3m), some windrows and heaps of vegetation were present, compaction in wheel ruts was evident, and entrance to lines had not been disguised. CALM will review management access requirements, and then discuss with Bounty which tracks may be needed for further exploration access. The company may be willing to close off unnecessary tracks when they have machinery working in the vicinity for future exploration programs, to prevent access by third parties while the lines are rehabilitating. For example, the access road to the Turkish Delight prospect has some severe erosion, and needs repair, or rehabilitation and closure.
- A program near West Cheritons (completed by Westmin in 1993-4) was inspected (site E App.2). CALM had previously found the lines to be unacceptable (compaction, rutting, too much soil disturbance, windrows, vegetation heaps). This was a major prompt to CALM's requesting that bonds be put on exploration tenements in nature reserves when environmental disturbance programs are undertaken. Disturbance at this particular site is still highly visible.
- Sons of Gwalia have begun operating in Jilbadji recently, and have carried out low impac bobcat mounted drilling (site B App.2). The company will discuss the need for future management and exploration access with CALM, and once this has been determined will consider closing off unnecessary old tracks when machinery is working nearby. As well as blocking track entrances, this may entail ripping the 100m closest to public access road to encourage regeneration.
- Sons of Gwalia and Forrestania Gold have both provided maps of their areas of interest within Jilbadji, and copies of their operating procedures manuals for exploration (extracts attached as Appendix 3 and 4 respectively).
- Separate audit sheets were completed for low impact and some environmental disturbance exploration programs (examples in Appendix 2). The sheets were developed from DME and CALM audit sheets.

<u>Dundas NR Field Inspection</u> - (22nd and 23rd April 1999)

Dundas NR is within CALM's Esperance District, has an area of 780, 883 hectares, and is south and east of Norseman. The Eyre Highway forms much of the northern boundary of the reserve. Dundas NR was vested in the WAWA in 1981, for "Conservation of flora and fauna".

Dundas NR is much less visibly affected by previous exploration activity than is Jilbadji. However, more than 50 applications for exploration licences have been referred to the Minister for the Environment for access for mining (exploration) within Dundas NR since 1991. No applications for Mining Leases have been received in that time. Five proposals for environmental disturbance exploration, involving ten exploration tenements, have been approved by CALM and the NPNCA.

Exploration site inspections:

- Exploration work undertaken by Pan Australian Exploration was inspected. This exploration has concentrated on the area between the Eyre Highway in the north and south to Clear Streak Well (just south of the Old Telegraph Line which bisects the reserve east to west) (see Appendix 5). While there was one area of deeper drilling at T4 (site C, App.5) which necessitated cleared drill lines, a bobcat mounted auger drill rig was utilised for the majority of the exploration. Widely spaced grid lines were cleared using a rubber front end loader (blade above ground), and the bobcat operated within this grid. While the standard of much of the work was found to be acceptable, discussion were held with the company representative regarding some less than satisfactory aspects of the program, especially in the intensively drilled area. Pan Australia has agreed to undertake reparation work, in consultation with CALM and DME (copy of company report attached as Appendix 6).
- Necessary rehabilitation work includes burying of sample bag collection close to Old Telegraph Track, ripping of compacted drill pads and wheel ruts, and closing turn offs from access tracks to exploration lines.
- It was intended to inspect exploration work by Mt Burgess Gold Mining Company south of the Old Telegraph Track, but access to the site was precluded by wet, boggy tracks. A report on the exploration program will be submitted by the company once their botanist's report is available.
- The layout of the audit sheets was revised following the Jilbadji inspection. As programs often involve both low impact and environmental disturbance aspects, it was found to be more useful to have one standard audit form which encompasses both types of program (see Appendix 5).

Summary of important issues

- Initial exploration using a bobcat mounted drill rig can be accomplished with very little impact, providing weed and plant disease hygiene during exploration is satisfactory. This minimises vegetation disturbance as cleared or rolled drill lines are then targeted to more prospective sections of the project area.
- In general, gridlines appear to be fairly slow to revegetate. This may be due to competition from mature vegetation adjacent to lines, loss of seed and rootstock due to excessive clearing, limited rainfall and/or compaction of tracks. Minimising area of disturbance (for example by using bobcat mounted rig in preference to line clearing as much as possible) is first priority. Ripping of compacted areas (eg drill pads, wheel ruts) may be necessary to improve conditions for regeneration.
- It is possible that cleared exploration lines (in particular the old, heavily cleared lines in Jilbadji) have encouraged feral animals such as foxes into the reserves by opening up easy access. Historical impacts would be extremely difficult to quantify. To slow down development of the feral animal problem. future exploration programs may need to close of the majority of exploration lines (encouraging exploration companies to contribute to baiting programs would also be beneficial).
- Draft guidelines have been developed by CALM for Rudall River National Park, and these include a requirement to rehabilitate and close all tracks at the end of the exploration season. Tracks can then begin regenerating, and be opened again if warranted by results of the previous season's exploration. Such a system may well be appropriate for future exploration programs in Jilbadji and Dundas Nature Reserves. (There may be some exploration tracks in Jilbadji which could be left open to aid CALM's fire management, and this will be determined in consultation

with the District Manager. At present there is no need for any exploration tracks to remain open to aid CALM management in Dundas NR.)

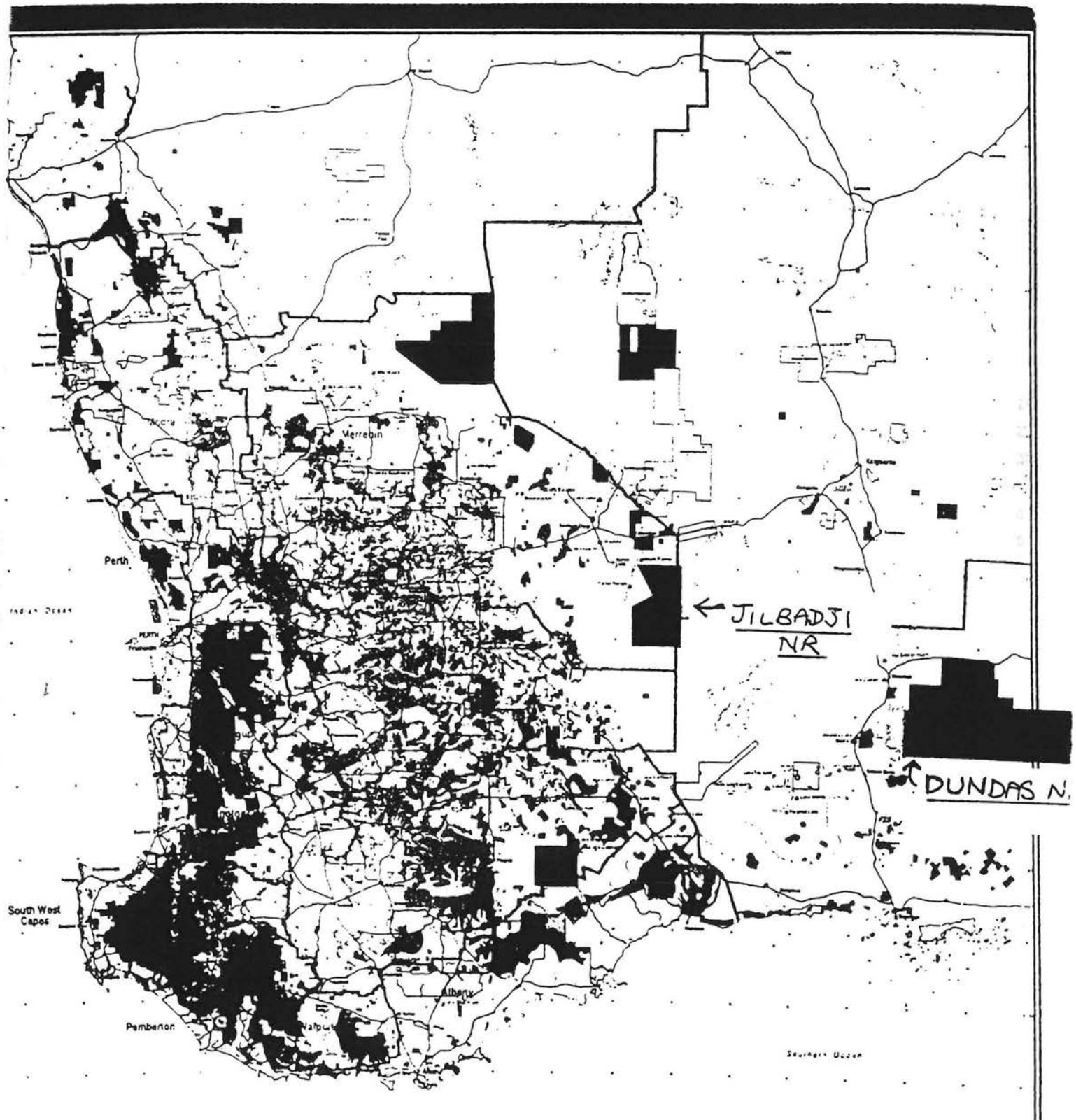
- Given the prospectivity of the reserves, and ongoing interest as indicated by tenement applications. CALM will liaise with DME and the relevant exploration companies, to develop individual exploration guidelines for Jilbadji and Dundas Nature Reserves. These guidelines will be of use for current operations, and also future proposals.
- Some drill holes had been left uncapped, particularly in the Cheritons area of Jilbadji NR. It is difficult to be sure which company left the drill holes open (may have been "pirate" drilling). However Sons of Gwalia have undertaken to cap and fill the holes when working in the vicinity.
- Some capped drill holes in both Jilbadji and Dundas NRs had been uncovered by erosion. This emphasises the importance of cutting the original collar off neatly, ensuring concrete cone is the correct shape to seal hole, and placing the cones deep enough so they are not dug up by rehabilitation ripping, or by vehicles using drill lines for access.
- Audit sheets appear to be a useful method of assessing the impact of exploration programs, allowing some consistency over time, locations, programs, sites and assessors. The sheets are also a convenient historical record of activities for each nature reserve.
- Two days at each reserve was not enough time to develop a quantitative evaluation of cumulative impacts of exploration and mining on Jilbadji and Dundas Nature Reserves. The most recently undertaken environmental disturbance exploration has been in Dundas NR (completed late 1997). Most of this has been to an acceptable standard, and necessary rehabilitation work will be completed by the company in the near future. Success of rehabilitation will depend to a great extent on favourable seasons in the subsequent few years.
- Under the Mining Act CALM receives compensation for active mining on conservation reserves, based on area of vegetation disturbed by, and in support of, mining. The standard compensation rate is currently $5, 328 per hectare and is subject to the Perth Consumer Price Index. Compensation goes some way to balancing the environmental resources lost due to mining, and can be put towards programs such as feral animal baiting and biological surveys.
- There is no similar provision in exploration licence conditions for clearing compensation. Therefore it is particularly important that bonds are in place prior to start up of projects, and that exploration companies be required to contribute to the cost of CALM inspections.
- Need to have bonds in place over tenements when environmental disturbance exploration or active mining is to occur. In the unusual circumstance that the company is unable or unwilling to carry out reparation, funds for this can then be obtained via DME. Bonds are not in place on any of the Dundas NR tenements. CALM had requested bonds on the Pan Australian work, but apparently it is difficult for DME to apply bonds retrospectively. In this instance, the company is cooperating with CALM and DME by undertaking rehabilitation. Only two of the Jilbadji tenements are bonded ($ 10,000 each). CALM is negotiating with DME regarding bonds, and the Kalgoorlie DME office has advised that from now on bonds will be placed on tenements in conservation reserves prior to disturbance exploration, where more than half a hectare of clearing is proposed.

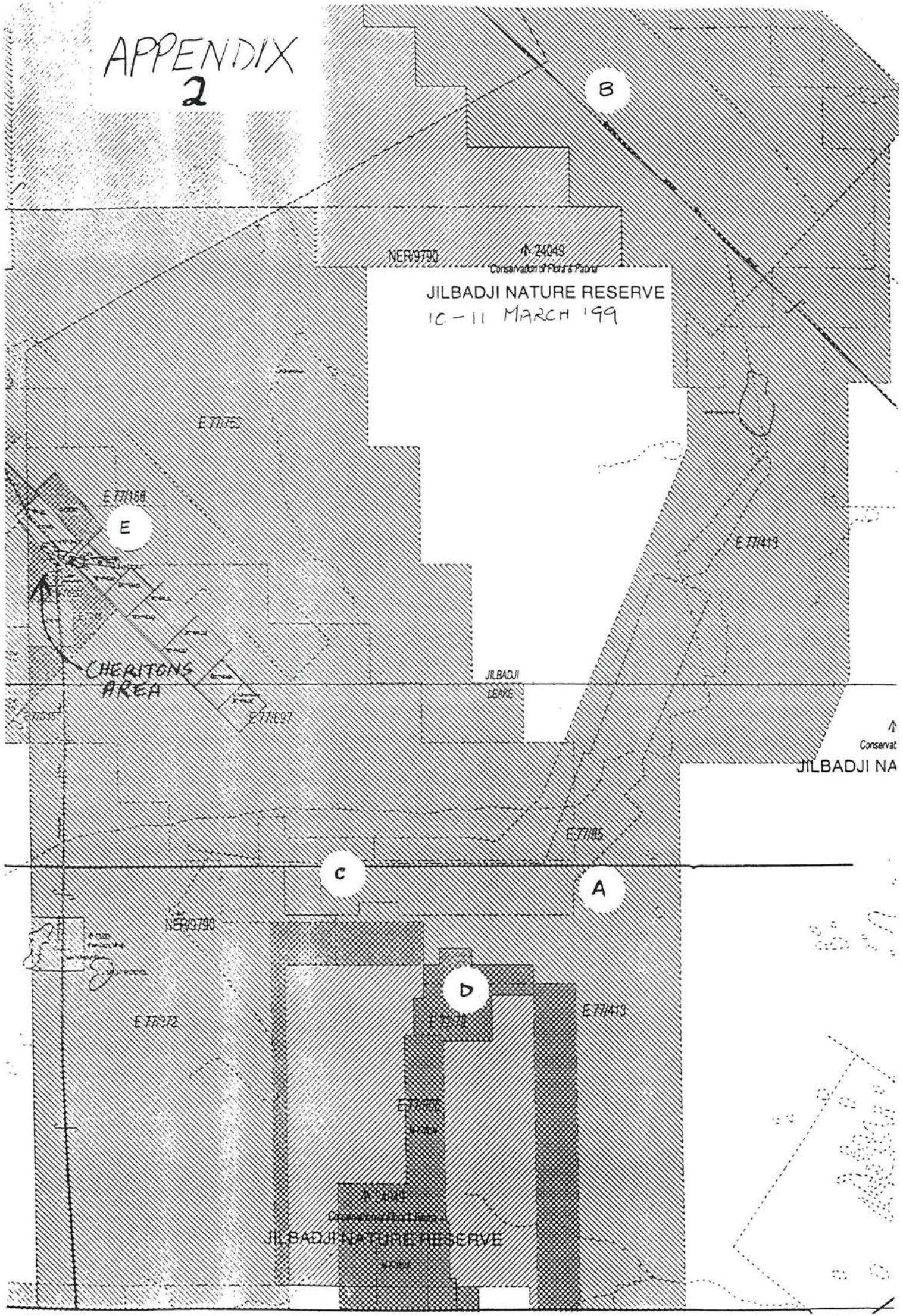
JA/FB

APPENDIX 1

LOCATION MAP

DUNDAS & JILBADJI NRs.




APPENDIX 2
B
NER/9790
A 24049
Conservation of Flora & Fauna
JILBADJI NATURE RESERVE
IC - 11 MARCH '99
E77/65
E77/158
E
E77/413
CHERITONS AREA
E77/97
JILBADJI LEASE
Conservat
JILBADJI NA
E77/85
C
A
NER/9790
D
E77/372
E77/372
E77/413
E77/372
A 4145
JILBADJI NATURE RESERVE

JILBADJI HUDIT SHEETS - SITE B

CHECKLIST FOR LOW IMPACT EXPLORATION PROGRAMMES (NON-REFERRABLE TO NPNCA) ON NATURE RESERVES

TENEMENT NUMBER: **E 77/ 543** COMPANY NAME: **SONS OF GWALIA**

RESERVE NAME AND NUMBER: **JILBADJI 24049**

HAS A LOW IMPACT EXPLORATION PROGRAMME BEEN UNDERTAKEN PREVIOUSLY?

NO	
YES	X
WHEN? (M/Y)	10 / 98

DATE OF APPROVAL BY REGION/DISTRICT: 17 / 7 / 98

IS THERE A CURRENT LOW IMPACT PROGRAMME? NO [X] YES [ ]

WHAT WAS/IS BEING UNDERTAKEN?
(TO YOUR KNOWLEDGE)

	CURRENT	PREVIOUS
AIRBORNE SURVEYS		
LIGHT VEHICLE RECONNAISSANCE		
> ON TRACKS		
> OFF TRACKS		
GEOPHYSICAL (eg. magnetometer)		
GEOCHEMICAL (eg. sampling)		
SCOUT DRILLING		
> ON TRACKS		
>OFF TRACKS		X

COMMENTS:
Work done by bobcat (Harley Johnson). 1.5m deep holes. Only bobcat and walkers went off track. Can't see where some lines leave track. Clay areas slightly visible, sandy areas very hard to see. Botanist gave field demonstration to company people. Field handbook showing threatened flora.

DATE OF CURRENT PROPOSAL: _____ DATE OF APPROVAL: _____

DATE OF COMPLETION/PROPOSED COMPLETION _____

HAS PROGRAMME BEEN INSPECTED? YES [X] NO [ ]

1. HOW WOULD YOU RATE THE ACTUAL DISTURBANCE? (2= ACCEPTABLE)

0	1	2	3	4	5
EXCESSIVE				X		MINIMAL

SCORE: 4

IF SCORE IS BELOW 2, ANSWER FOLLOWING THREE QUESTIONS ALSO:

DO ANY OF THE TRACKS REQUIRE REHABILITATION OR RESTORATION? N/A [ ] YES [ ] NO [ ]

DO CAMPSITES OR ANY EXPLORATION SITE REQUIRE REHABILITATION? N/A [ ] YES [ ] NO [ ]

HAS THE REHABILITATION/RESTORATION BEEN DONE? N/A [ ] YES [ ] NO [ ]

2. COMPANY LIAISON:

0	1	2	3	4	5
VERY POOR				X		EXCELLENT

SCORE: 3

3. HAS THE COMPANY BEEN CO-OPERATIVE? (eg. extra rehabilitation work performed etc.)

0	1	2	3	4	5
INADEQUATE				X		EXCELLENT

SCORE: 3

4. WHAT LEVEL OF CALM MANAGEMENT WAS REQUIRED?

0	1	2	3	4	5
EXCESSIVE				X		MINIMAL

SCORE: 4

AVERAGE SCORE 3.5 ASSESSOR ..... DATE:..... **11 March '99**

TENEMENT INSPECTION AUDIT SHEET **ENVIRONMENTAL IMPACT EXPLORATION**

NOTE: THERE IS A DIFFERENT FORM FOR LOW IMPACT EXPLORATION)

TENEMENT NUMBER **E77/85**.....DATE OF INSPECTION **10/3/99**.....RESERVE NAME/NUMBER.....**JILBADJI 24049**

PROSPECT: **Turkish Delight prospect - Old line on north side of east-west road, cleared by Aztec, not certain it was drilled. Normandy used this line '96 for drilling.**

STATUS OF TENEMENT (current, surrendered, expired):...**current**.....LOCATION (GPS?)....**E 758879 ..N.6465356**.....

TENEMENT HOLDER:

COMPANY:.... **(Now) Bounty .(was Normandy)**.....CONTACT PERSON...**Dilip Henderson**.....

ADDRESS: ....**PO Box 585 Victoria Park WA 6979**.....PHONE NUMBER.....**9039 4555**.....FAX **9039 4556**.....

CONTRACTOR..... PERSON RESPONSIBLE FOR ON GROUND WORK.....**?**

REASON FOR INSPECTION:

(eg routine during or after exploration program, retirement of bond).....**Checked during routine inspection of later work**.....

ANY SPECIAL CONDITIONS ON THIS TENEMENT?.....

ANY SPECIAL CONDITIONS FOR THIS ACTIVITY/PROGRAM?.....

DATE OF CALM AND NPNCA APPROVAL FOR THIS PROGRAM.....

DATE PROGRAM COMMENCED.....DATE PROGRAM COMPLETED.....**1990-95**.....

TYPE OF DRILLING .....INTENSITY.....

CAMP SITE?.....ACCESS ROADS?.....KMS ACCESS ROADS?.....

COMMITMENT/CONDITION	**SCORE 0 to 5** (0 = UNACCEPTABLE 2 = ACCEPTABLE 5 = EXCELLENT)	**AMELIORATION WORK REQUIRED**	**COMMENTS**
ACCESS			
Blade above soil	**0**		
Line width (generally one vehicle width, unless specified)	**2**		
Windrows not present	**1.5**		
Heaps of soil/vegetation not present	**1.5**		
Line doglegged where intersecting public tracks	**0**	**Needs screening/blocking off**	**Subject to future exploration programs and CALM's access requirements.**
Entrance points closed and rehabilitated (usually with vegetation debris)	**0**	**Needs screening/blocking off**	**Subject to future exploration programs and CALM's access requirements. (There is some bad erosion on the access road which should also be considered.)**
Botanist (prior to program, or supervising line clearing)			

JILBADJI

SITE C

TENEMENT INSPECTION AUDIT SHEET - ENVIRONMENTAL IMPACT EXPLORATION

NOTE: THERE IS A DIFFERENT FORM FOR LOW IMPACT EXPLORATION)

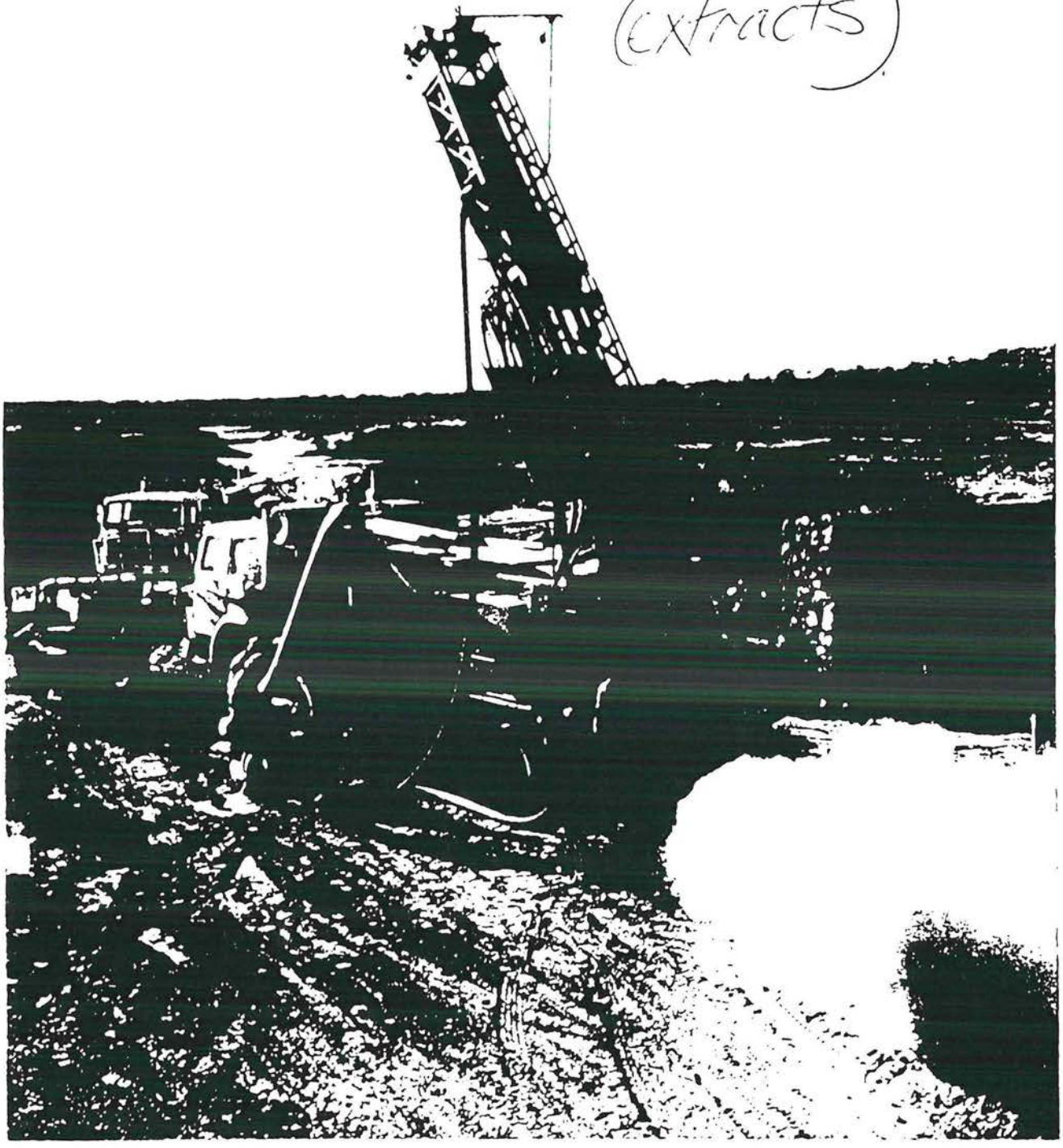
COMMITMENT/CONDITION	SCORE 0 to 5 (0 = UNACCEPTABLE 2 = ACCEPTABLE 5 = EXCELLENT)	AMELIORATION WORK REQUIRED	COMMENTS
OPERATIONS			
Operations occurred in dry soil conditions only			
Operations stopped in wet conditions if soil rutting			
Compacted or rutted areas treated by ripping	**0**	**Rip or at least close**	**Consider requesting that Bounty close these lines off.**
Drill holes plugged	**1.5**		**"Octopus" plugs were used, some of these have blown out of holes**
Sample bags removed	**2**		
No rubbish	**2**		
CAMP SITE	**Not inspected**		
Minimal clearing			
Acceptable waste disposal			
Tidy (if ongoing)			
Rehabilitated (if close-out)			
BOND			
Current bond on tenement	**$ 10,000**		
Suggested bond following inspection	**$**		
Average score	**1.05**		

APPENDIX 3

SONS OF GWALIA LTD

GWALIA

(extracts)



Exploration Division
Environmental Procedures

2. MANAGEMENT OF THE ENVIRONMENTAL IMPACTS OF EXPLORATION

2.1 General

The impacts of exploration depend on the activities to be carried out, the specific location and the level of planning and management applied to these activities. The impacts of historical exploration activities undertaken without the implementation of environmental management measures can be observed not only by industry but also by the wider community. Open costeans and uncapped drill holes, eroded tracks and gridlines are the constant reminders of poor environmental planning and management.

Open costeans and uncapped drill holes have the potential to trap and kill animals and if left open for some time could have a significant effect on the local fauna.

The basic principles of environmental management for exploration is to minimise disturbance and to return the disturbed areas to near original condition or to a condition which will allow rehabilitation to continue naturally. This can be achieved by the incorporating the following measures.

- Maximising the use of non-intrusive exploration techniques.
- Minimising intrusive exploration by:
  - minimising or avoiding, where possible, the clearing of vegetation;
  - retaining and restoring the original ground contours, where appropriate;
  - preparing the ground for rehabilitation;
  - preventing erosive water flow on disturbed ground.
- Dust suppression.
- Preventing contamination of soil, surface and ground water, and plants and animals.
- Protecting animals from human-made obstacles such as drill holes and costeans and destruction of their habitats.
- Having an awareness of the threats to plants and animals from accidental introduction of exotic diseases and feral species.

2.2 Planning

An appropriate planning phase is critical for successful rehabilitation. Planning will also assist in minimising the level of environmental impact during exploration.

Rehabilitation programs for sites disturbed during exploration should be designed to establish conditions which will allow for the re-establishment of local vegetation and fauna communities. Where possible, original landforms and drainage patterns should be re-established and sites should be made safe, stable and not susceptible to erosion.

The rehabilitation procedures described in this document are intended to be applicable in most cases. However, situations will arise that are not covered by the guidelines, therefore, on-site decisions will need to be made by exploration personnel.

Responsibilities will be designated in the planning phase for the implementation of the various stages of the exploration program. The designated personnel should ensure that there is an understanding by both site personnel and contractors of the environmental issues involved in the proposed program. If necessary the field staff and the contractors should be given appropriate environmental induction or training.

Considerations should also be included in the planning phase for any special requirements or restrictions which may apply to exploring in the proposed area. For example, if the area is considered unique or special in any way appropriate clearances or approvals may be required.

It is important to consider the needs of stakeholders such as pastoralists, farmers, Aboriginal people, townspeople and Government authorities with interests in the proposed exploration areas. Before commencing exploration the field crew should be well briefed on the procedures required to minimise the extent of environmental impact during exploration.

A reconnaissance survey of the proposed area should be undertaken to review the presence of roads or tracks, which could be used for exploration activities. This will minimise the requirement for clearing of new access routes. The survey should also provide information on any other issues which need to be considered before exploration commences.

Specific procedures which should be followed for the rehabilitation of disturbed areas are described in the following sections.

2.14 Exploration in Environmentally Sensitive Areas

While it is important to recognise that all lands have environmental sensitivities there are some areas where specific environmental management measures should be implemented.

If the exploration area includes a Nature Reserve or some other area of specific tenure there may be a requirement to undertake more detailed planning. It may also be necessary to prepare environmental documentation for submission and approval by the regulatory authorities before exploration activities can commence.

Some baseline surveys such as flora and fauna surveys may also be required prior to exploration. In some areas it may be appropriate to use environmental protection strategies, such as the use of decking, to minimise impacts. The use of above ground tanks rather than below ground sumps for the retention of groundwater and drill fluids may also be considered necessary in some exploration areas. Access to these areas and plans for conservation and rehabilitation practices should be developed with assistance from the Environmental Management Co-ordinator and discussed with the various regulatory authorities before exploration is commenced.

Responsibilities

Regional Exploration Manager must ensure that consideration is given to the sensitivity of the area to be explored and must where necessary seek assistance from the **Environmental Management Coordinator** to prepare management guidelines and procedures for the exploration program.

Geologists and Senior Field Assistant must ensure that the management procedures are implemented as required.

(JILBADJI) (extract) APPENDIX 4

FORRESTANIA GOLD NL

Bounty Gold Mine - Environmental Operating Procedure

Environmental Management – Exploration Activities

EOP – 03

1 Purpose

Forrestania Gold is fully committed to effective management of environmental aspects throughout its operations. The aim of this procedure is to ensure that Forrestania's exploration activities have little or no impact on the environment. This will be achieved through environmental planning and management to produce exploration programmes that:-

- Protect the environment in the general vicinity of exploration areas
- Avoid or minimise disturbance and contamination within exploration areas; and
- Restore areas after exploration.

Anything less than firm commitment and exceptional practice could produce enduring reminders of disturbance physically etched into the landscape.

This procedure systematically addresses all phases of exploration activity, including planning, access, drilling and costeaning and then post exploration requirements and restoration. Specific work instructions are appended.

Generally, Forrestania depends on common sense, awareness of potential impacts and good housekeeping practices to achieve sound environmental outcomes with regard to exploration activities.

2 Responsibility

The Environmental Manager and Exploration Superintendent shall be responsible for

- the contents of this procedure
- ensuring it is distributed, and
- revision of the procedure as required.

Area Managers and Superintendents, including the Environmental Manager and Exploration Superintendent shall ensure this procedure is followed.

3 Actions and Methods

3.1 Planning

Sound environmental planning and management minimises or avoids environmental impacts. It also reduces overall expenses through avoiding costly environmental damage and resultant remedial works. Planning includes education as well as ensuring employee and contractor awareness of Forrestania's environmental philosophy, objectives and practices. Planning also acknowledges and adopts industry codes of practice together with statutory consultation and requirements. Other bodies including the Chamber of Minerals and Energy and the Land Conservation District Committee can provide useful sources of information.

The following principles will be adopted even though specific details of each exploration programme will vary:

- Movement of vehicles in wet weather should be avoided to minimise damage to tracks and other areas, avoiding erosion problems later.
- Common terrain or vegetation types should be favoured for access and physical activity because they will be generally of lower conservation value and less sensitive to disturbance.
- Specific natural, biological or cultural features will be assessed on a case by case basis.
- Seasonal factors may dictate when activities can take place. (eg. Drilling near watercourses).

Once an area is targeted for exploration, approval for conducting any ground disturbing activities must be given by the Environmental Manager. Given the species diversity within the area of tenements controlled by Forrestania, an examination of the proposed target area is conducted by botanical professionals for any botanical values. Exploration field staff are encouraged also to be involved with this work.

All involved in exploration will be made aware of the location of any rare or endangered flora and fauna. The specific location of Declared Rare Flora (DRF) is confidential and not to be supplied to any person or organisation without the written approval of the Environmental Manager, who in turn will liaise closely with CALM.

Following internal approval from the Environmental Manager and external approval (DOME and CALM if required), the Exploration Superintendent shall direct work to commence. All personnel are to be aware of, and are required to abide by lease and/or specific environmental conditions.

3.2 Access

The first priority in any exploration programme for both environmental and cost benefits is to use existing tracks, fence lines and fire breaks as far as practicable. Grid lines for geological, geochemical or geophysical surveys are rarely bulldozed, but marked out with wooden pegs and/or biodegradable flagging tape. In heavily wooded areas, these gridlines may need to have lines of sight established by cutting vegetation, but no trees should be felled and there should be little soil disturbance.

Whenever possible vehicle routes should avoid areas of particular environmental sensitivity. If tracks must be constructed, field visits and advance planning will minimise environmental disturbance by:

- Positioning tracks along ridge tops or on bottom slopes some distance from watercourses. Access on slopes should follow the contour wherever possible or the most gentle gradient wherever available.
- Clearing with a rubber tyre loader, bucket set 300 mm above ground level. Self repair, especially in arid landscapes is relatively rapid if damage to vegetation cover and the topsoil and rootstock horizon is minimised.
- Avoiding clear visibility from existing tracks or roads (by incorporating a dog-leg soon after entry) and by construction to a standard no greater than that required by the exploration programme.
- Windrows and erosion traps are to be formed only when absolutely necessary.
- Earth moving machinery are to be under the supervision of experienced exploration field personnel at all times.

Any cleared vegetation should be stockpiled for respreading at a later date (preferably within six months to maintain seed viability and microbial activity) to minimise erosion and promote rehabilitation. Cleared vegetation should not be burnt.

Vehicle hygiene must also be considered to avoid the spreading of noxious vegetation and soil borne diseases.

3.3 Drilling and Costean Development

Drilling is usually the most intrusive aspect of exploration. The three basic techniques (rotary air blast (RAB), reverse circulation (RC) and diamond drilling) have similar environmental effects, differing mainly in access requirements and extent of ground compaction. Maneuverability and productivity of drilling rigs are continually improving thus reducing site impacts. Increased efficiency means less time on site. Soil compaction is also reduced through drilling in dry seasons.

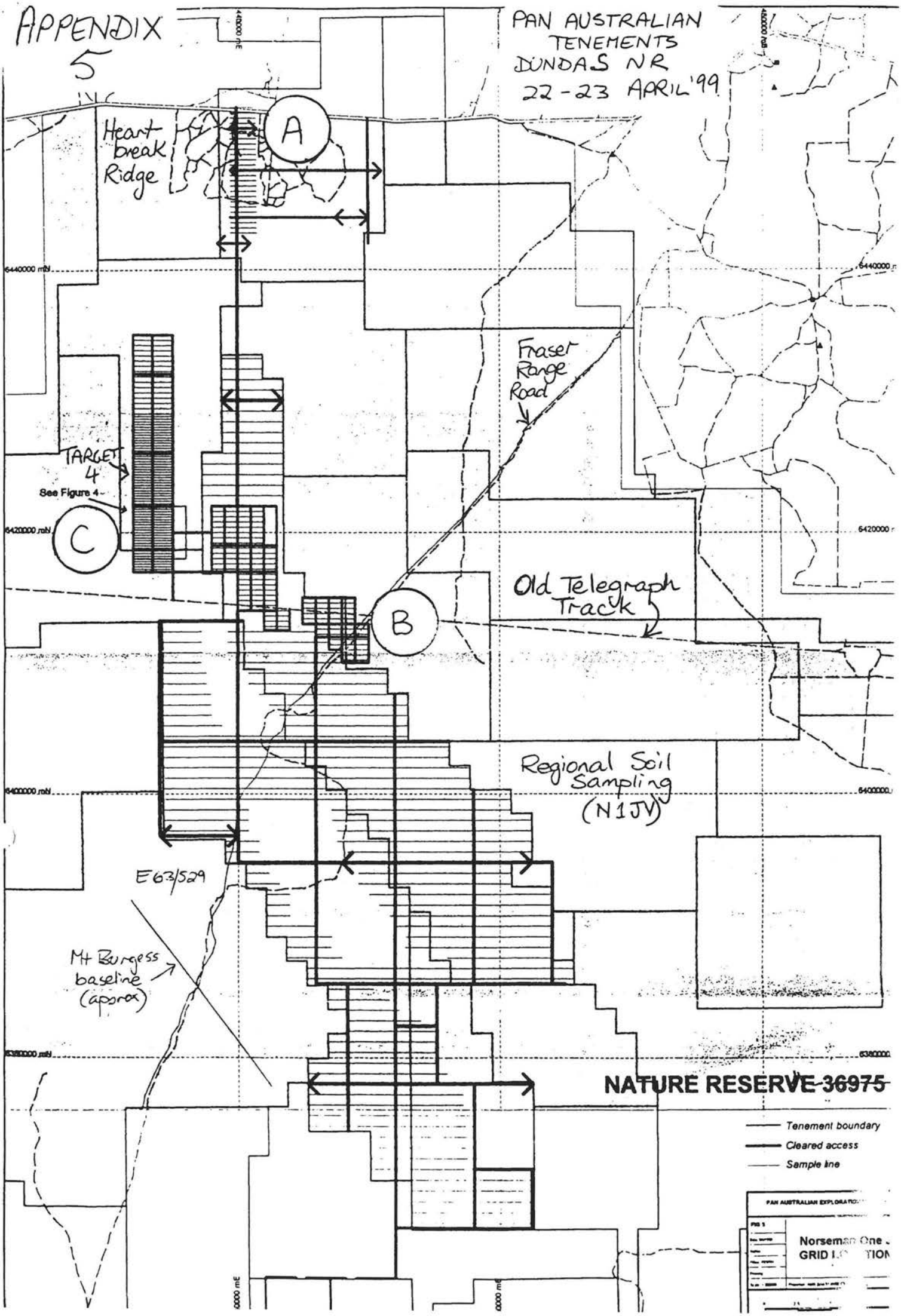
Exploration drilling can cause significant ground and water pollution if not properly managed. Major concerns arise when substantial amounts of water are encountered. Particular care needs to be taken to contain any saline water. If released, saline water will kill vegetation and render soil sterile for many years.

Diamond drilling, in particular, requires sumps to contain and to act as settling chambers for the drilling fluids and cuttings produced in the process. These sumps are to be placed downslope of the drill rig to ensure all site run-off drains into the sump. After use, the sumps and drill fluids are left to dry out and then buried. Increasingly, bio-degradable drilling additives are to be used.

Hydrocarbon management is also an integral part of sound exploration environmental management. Any significant spill of drilling fluids, fuels, oils, or other potentially harmful chemicals should be immediately reported to the Environmental Manager.

Costeaning (trenching) is another potentially intrusive exploration activity used to evaluate a potential deposit. Impact is minimised by:

- costeaning across, rather than down the slope,
- sloping the ends of the trench to allow animals to escape if they fall into them and
- by promptly refilling and revegetating after sampling.


APPENDIX 5
PAN AUSTRALIAN TENEMENTS DUNDAS NR 22-23 APRIL '99
Heart break Ridge
A
B
C
Fraser Range Road
TARGET 4
See Figure 4
Old Telegraph Track
Regional Soil Sampling (N1JV)
E63/529
Mt Burgess baseline (approx)
NATURE RESERVE 36975
Tenement boundary
Cleared access
Sample line
6440000 mN
6420000 mN
6400000 mN
6380000 mN

INSPECTION AUDIT FOR EXPLORATION PROGRAM

Table 1.

PROSPECT NAME	PROGRAM NUMBER	LOCATION (GPS IF AVAILABLE)
NORSEMAN ONE J.V. (SITE "B" ON LOCATION MAP)	**1 (REGIONAL SOIL SAMPLING)**	

Table 2. List tenements which are affected by this particular program

TENEMENT N°	TENEMENT HOLDER (note: tenement holder may not be operator)	STATUS OF TENEMENT (eg, live, surrendered)
E 63/ 407	**ORION RESOURCES NL**	**LIVE**

Table 3.

OPERATOR (company carrying out this particular program)	**PAN AUSTRALIAN EXPLORATION PL**
ADDRESS	**C/- 33 WATSONIA RD, GOOSEBERRY HILL, WA, 6076**
CONTACT PERSON	**PETER ROBINSON (SENIOR GEOLOGIST)**
PHONE NUMBER/FAX/EMAIL	**PHONE AND FAX: 945 47309**
PERSON RESPONSIBLE FOR FIELD WORK	**PETER ROBINSON**
CONTRACTOR	

Table 4.

PROGRAM NUMBER	**TYPE OF PROGRAM (ie low impact OR environmental disturbance)**	**APPLICATION DATE**	**CALM APPROVAL DATE**	**START DATE**	**FINISH DATE**	**CALM INSPECTION DATE**	**REASON FOR INSPECTION** (eg routine during or after exploration program, retirement of bond).....
1	**Environmental Disturbance**	**20/5/97**	**16/6/97**	**JULY 97**	**DEC 97**	**23/4/99**	**routine after exploration program**

Table 5.

SPECIAL CONDITIONS ON THIS TENEMENT? ALSO LIST RARE FLORA/FAUNA	**NOTE: CALM INSPECTED FEB 21/8/97** **PRIORITY 1, *Eucalyptus creta,* close to southern boundary of Dundas.**
SPECIAL CONDITIONS FOR THIS PROGRAM?	**OPERATIONS MUST CEASE IN EVENT OF SOIL RUTTING IN WET CONDITIONS**
TYPE OF DRILLING	**BOB CAT MOUNTED AUGER, SHALLOW**
INTENSITY	**400M X 50M ON T1, 800M X 80 M ON REMAINDER**
CAMP SITE?	**Yes -Heartbreak Ridge, Optus line 8 km west Fraser Range Rd, south of reserve Fraser Range Road**
ACCESS ROADS?	**YES (GENERALLY 6 KM X 9 KM GRID)**
KMS ACCESS ROADS?	**322 KMS**

Table 6.

ACTIVITY	**COMMITMENT/CONDITION**	**SCORE 0 to 4** (0 = UNACCEPTABLE, 2 = ACCEPTABLE, 4 = EXCELLENT)	**AMELIORATION WORK REQUIRED**	**COMMENTS (INCLUDE EASE OF FIXING PROBLEMS)**
COMPANY LIAISON	Advised CALM 7 days prior to commencement?			
	Advised CALM program completed			
	Provided CALM with results flora/fauna surveys	3		
	Other			

INSPECTION AUDIT FOR EXPLORATION PROGRAM

ACTIVITY	COMMITMENT/CONDITION	SCORE 0 to 4 (0 = UNACCEPTABLE, 2 = ACCEPTABLE, 4 = EXCELLENT)	AMELIORATION WORK REQUIRED	COMMENTS
LOW IMPACT EXPLORATION	Airborne surveys			
	Light vehicle reconnaissance on tracks			
	Light vehicle reconnaissance off tracks			
	Geophysical (eg. magnetometer)			
	Geochemical (eg. sampling)			
	Scout drilling on tracks			
	Scout drilling off tracks			
	Other			
ACCESS	Blade above soil	2		
FRONT END LOADER	Line width (generally one vehicle width, unless specified)	3		
	Windrows not present	3		
	Heaps of soil/vegetation not present	2		A few heaps
	Line doglegged where intersecting public tracks	2		
	Entrance points closed and rehabilitated (usually with vegetation debris)	1	More blocking with debris needed.	
	Botanist (prior to program = 3, or supervising line clearing = 2, both = 4)	3		
	Other			
OPERATIONS	Operations occurred in dry soil conditions only			
	Operations stopped in wet conditions if soil rutting	2		
	Compacted or rutted areas treated by ripping	1	Some tracks and pads need ripping	In places, eucalypts are colonizing track.
	Drill holes plugged.	1	At least one needs refilling	Holes appear to have been filled, some need re-doing
	Sample bags removed	0	Sample bag "farm" to be removed	
	No rubbish	3		
	Other			
CALM MANAGEMENT	How much required? Excessive/ average/minimal			
COMPANY CO-OPERATION	Was extra rehabilitation work done, help with feral animal control given etc? (Score 3 or 4, leave blank if no extra work done)			
CAMP SITE	Minimal clearing	2		
	Acceptable waste disposal	2		
	Tidy (if ongoing)	2		
	Rehabilitated (if close-out)			
	Other			
BOND	Current bond on tenement	$		
	Suggested bond following inspection	$		

INSPECTION AUDIT FOR EXPLORATION PROGRAM

Table 1.

PROSPECT NAME	PROGRAM NUMBER	LOCATION (GPS IF AVAILABLE)
YILGARN EXTENSION (SITE "C" ON LOCATION MAP)	**1 (T4 TARGET DRILLING)**	

Table 2. List tenements which are affected by this particular program

TENEMENT N^{O}	TENEMENT HOLDER (note: tenement holder may not be operator)	STATUS OF TENEMENT (eg, live, surrendered)
E 63/ 433	**PAN AUSTRALIA EXPLORATION PL (sites inspected were in this tenement)**	**LIVE**

Table 3.

OPERATOR (company carrying out this particular program)	**PAN AUSTRALIAN EXPLORATION PL**
ADDRESS	**C/- 33 WATSONIA RD, GOOSEBERRY HILL, WA, 6076**
CONTACT PERSON	**PETER ROBINSON (SENIOR GEOLOGIST)**
PHONE NUMBER/FAX/EMAIL	**PHONE AND FAX: 945 47309**
PERSON RESPONSIBLE FOR FIELD WORK	**PETER ROBINSON**
CONTRACTOR	

Table 4.

PROGRAM NUMBER	**TYPE OF PROGRAM (ie low impact OR environmental disturbance)**	**APPLICATION DATE**	**CALM APPROVAL DATE**	**START DATE**	**FINISH DATE**	**CALM INSPECTION DATE**	**REASON FOR INSPECTION** (eg routine during or after exploration program, retirement of bond).....
1	**Environmental Disturbance**	**29/11/96**	**?**	**Feb 97**	**JULY 97**	**23/4/99**	**routine after exploration program**

Table 5.

SPECIAL CONDITIONS ON THIS TENEMENT? ALSO LIST RARE FLORA/FAUNA	**NOTE: CALM INSPECTED PREVIOUSLY (23/1/97 AND 21/8/97)**
SPECIAL CONDITIONS FOR THIS PROGRAM?	**LIGHT GRADING OF TELEGRAPH TRACK APPROPRIATE. MAY "GRAVEL" SOME SECTIONS.**
TYPE OF DRILLING	**RAB, RC**
INTENSITY	**55 RAB, 109 RC**
CAMP SITE?	**Yes - Optus line 8 km west Fraser Range Rd, then temporarily closer to RC drilling (camp for up to 13 people)**
ACCESS ROADS?	
KMS ACCESS ROADS?	

Table 6.

ACTIVITY	**COMMITMENT/CONDITION**	**SCORE 0 to 4 (0:UNACCEPTABLE, 2:ACCEPTABLE, 4:EXCELLENT)**	**AMELIORATION WORK REQUIRED**	**COMMENTS**
COMPANY LIAISON	Advised CALM 7 days prior to commencement?			
	Advised CALM program completed			
-	Provided CALM with results flora/fauna surveys	3		
	Other	3		**Exploration reports supplied.**

COUNTS

SITE C

INSPECTION AUDIT FOR EXPLORATION PROGRAM

ACTIVITY	COMMITMENT/CONDITION	SCORE 0 to 4 (0:UNACCEPTABLE, 2:ACCEPTABLE, 4:EXCELLENT)	AMELIORATION WORK REQUIRED	COMMENTS
LOW IMPACT EXPLORATION	Airborne surveys			
	Light vehicle reconnaissance on tracks			
	Light vehicle reconnaissance off tracks			
	Geophysical (eg. magnetometer)			
	Geochemical (eg. sampling)			
	Scout drilling on tracks			
	Scout drilling off tracks			
	Other			
ACCESS	Blade above soil			
	Line width (generally one vehicle width, unless specified)	3		
	Windrows not present	1		
	Heaps of soil/vegetation not present	1		
	Line doglegged where intersecting public tracks	2		
	Entrance points closed and rehabilitated (usually with vegetation debris)	1	**Block with vegetation**	
	Botanist (prior to program = 3, or supervising line clearing = 2, both = 4)	3		
	Other			
OPERATIONS	Operations occurred in dry soil conditions only			
	Operations stopped in wet conditions if soil rutting	2		
	Compacted or rutted areas treated by ripping	0	**Rip track**	**PR has quotes from contractor**
	Drill holes plugged.	2	**Some need redoing**	**Cones were too stubby, some water erosion**
	Sample bags removed	0	**Remove**	
	No rubbish	1	**Remove**	**Some cardboard, plug**
	Other	1	**Sumps to be filled**	**Probably intersected saline watertable.**
CALM MANAGEMENT	How much required? Excessive/ average/minimal			
COMPANY CO-OPERATION	Was extra rehabilitation work done, help with feral animal control given etc? (Score 3 or 4, leave blank if no extra work done)			
CAMP SITE	Minimal clearing	2		
	Acceptable waste disposal			
	Tidy (if ongoing)	2		
	Rehabilitated (if close-out)			
	Other			
BOND	Current bond on tenement	$		
	Suggested bond following inspection	$		

1 INTRODUCTION

This report covers the period from 1 January to 30th June 1999

A site inspection was conducted between 21st and 23 of April by representatives of CALM, DME, and the NPNCA. Only the northern part of the area was inspected as the Fraser Range track was impassable south of Clear Soak Well due to boggy conditions. The Group was accompanied by Peter Robinson of Pan Australian Exploration on 23rd when most of the inspection was conducted.

Discussions were held on site as to various aspects of the impact of the earlier programs and what rehabilitation will be required.

The visit was followed by correspondence from CALM and the DME which outlined the requirements for rehabilitation.

The next report will be in six months to 31st December 1999.

2 TENEMENTS

A tenement schedule showing the exploration licences that are wholly or partly within the Dundas Nature Reserve is given in Table 1

There are currently 15 approved licences. The location of these tenements is shown on Figures 1 and 2.

3 NEXT PROGRAM

Whilst it is hoped that funding will become available via a farm out arrangement for exploration to continue, the program and its timing are not yet defined.

If no further funding for exploration is forthcoming then the whole exploration area will be subject to reparation.

4 REHABILITATION

The following lists the items of impact that will require reparation.

1 Tracks that were heavily compacted and rutted by constant vehicle and drill truck travel will require deep ripping and seeding with native local flora.

2 Tracks with excessive topsoil removal will need the 'push off' piles pulled back and all windrows spread back on the track.

3 All tracks that reach public access need to be closed by fallen timber.

4 The 4 camp sites need ripping and any fuel oil contamination removed and disposed of. A drum and some drill hole plugs still at a campsite need to be removed.

5 Reverse circulation drill cuttings in PVC bags, which have now deteriorated, need to be buried on site. Any resulting mound would be kept low profile.

6 An audit of all drill collars is required to ensure all holes have remained plugged. Any holes not suitably plugged need to be excavated and re-plugged.

7 The areas of intense RAB and RC drilling need to be deep ripped and seeded.

The following Tables 2a and 2b summarise the estimated amounts of reparation that will need to be done within the wholly owned YEP Project and the NM1 JV Project. These amounts may vary considerably depending on the amount of current active re-growth on tracks and the amount of drill holes that may need re-plugging.

The work will be done in consultation with Esperance CALM and Kalgoorlie DME officers. Dry conditions will be essential for the procedures to be effective.

It is planned to use a bobcat for the spreading of push off piles and windrows. It will also be used on tracks with very little vehicle impact, where re-vegetation has begun and only local compacted patches without re-growth need ripping. This is to avoid any heavy wide tyred vehicle causing destruction of the established re-growth.

A front end loader may be required for deeper ripping of the heavily compacted and rutted tracks and drill lines and camp sites. However a ripper is being designed to suit a bobcat with a suitable blade set up for deep ripping. This will need to be trialed prior to it's commissioning.

Drill hole collars that have not remained plugged adequately will be excavated around the collar. The PVC collars will be checked and re-cut below ground surface where necessary. Appropriate conical cement plugs will be forced down the collar and back-filled, leaving a mound at the collar for rain run off.

The location of grids and campsites are shown on Figure 2. Figure 3 shows the location of the reconnaissance drilling and Figure 4 shows the location of the target RAB and RC drilling on theT4 grid.

5 ESTIMATED BUDGET

The Tables 3a and 3b estimate the total costs of the reparation work for each project.

This estimate may vary considerably depending as explained in Section 4 above.

	REHABILITATION COSTS	YEP	**BULDANIA**					
IMPACT TYPE	REHABILITATION REQUIRED		T1	T2	T4	TOTAL	MACHINE HOURS	MACHINE COSTS $
								75
HEAVILY RUTTED AND COMPACTED TRACKS	CLOSE ENTRANCE RIPPING, SEEDING, REMOVE WINDROWS AND PUSH OFF PILES	KMS	12	0	18	30	30	2250
DRILL LINES	RIPPING, SEEDING, REMOVE WINDROWS AND PUSH OFF PILES	KMS				20	25	1875
LIGHTLY COMPACTED TRACKS	REMOVE WINDROWS AND PUSH OFF PILES LOCAL LIGHT RIPPING	KMS	18	10	38	66	30	2250
CAMP SITES	RIPPING, SEEDING, REMOVE CONTAMINATED SOIL AND OTHER ITEMS	HECTARES	0.5		1.5	2	10	750
RC DRILL SAMPLES	OPTION A - REMOVE FROM SITE	SAMPLES			2500	2500		
	OPTION B - BURY AT SITE						50	3750
	TOTAL						**145**	**10875**
							MAN HRS	
DRILL HOLES COLLARS	AUDIT BY CHECKING EACH COLLAR FOR BREACHING AND REPLUG WHERE NEEDED	HOLES	0	0	165	165	40	

Table 2a Rehabiliation Required Dundas Nature Reserve YEP

	REHABILITATION COSTS	**NORSEMAN 1 JV**						
IMPACT TYPE	REHABILITATION REQUIRED		TN1	TN2	REGIONAL	TOTAL	MACHINE HOURS	MACHINE COST$
								75
HEAVILY RUTTED AND COMPACTED TRACKS	CLOSE ENTRANCE RIPPING, SEEDING, REMOVE WINDROWS AND PUSH OFF PILES	KMS	15	7	100	122	120	9000
DRILL LINES	RIPPING, SEEDING, REMOVE WINDROWS AND PUSH OFF PILES	KMS	18	13		31	20	1500
LIGHTLY COMPACTED TRACKS	REMOVE WINROWS AND PUSH OFF PILES LOCAL LIGHT RIPPING	KMS	15	8	150	173	50	3750
CAMP SITES	RIPPING, SEEDING, REMOVE CONTAMINATED SOIL AND OTHER ITEMS	HECTARES	0.5	0.5	1	2	10	750
	TOTAL						**200**	**15000**
							MAN HRS	
DRILL HOLES COLLARS	AUDIT BY CHECKING EACH COLLAR FOR BREACHING AND REPLUG WHERE NEEDED	HOLES	50	38		88	20	

Table 2b Rehabilitation Required Dundas Nature Reserve NM1 JV