RUM JUNGLE
REHABILITATION PROJECT

IMPLEMENTATION REPORT

THE NORTHERN TERRITORY OF AUSTRALIA

## DEPARTMENT OF TRANSPORT AND WORKS



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REHABILITATION PROJECT

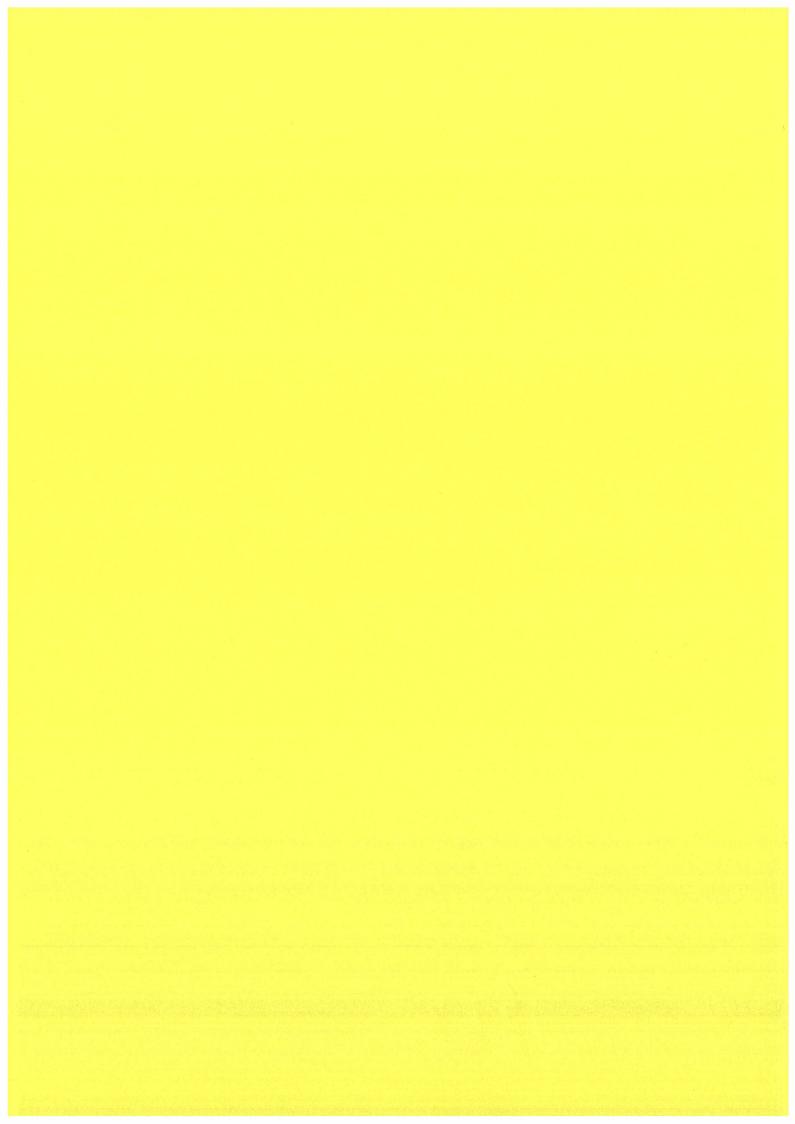
IMPLEMENTATION REPORT

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VOLUME 3 APPENDICES TO REPORT OCTOBER 1981

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CONFIDENTIAL DOCUMENT B



RUM JUNGLE REHABILITATION

PRELIMINARY CONSTRUCTION STRATEGY

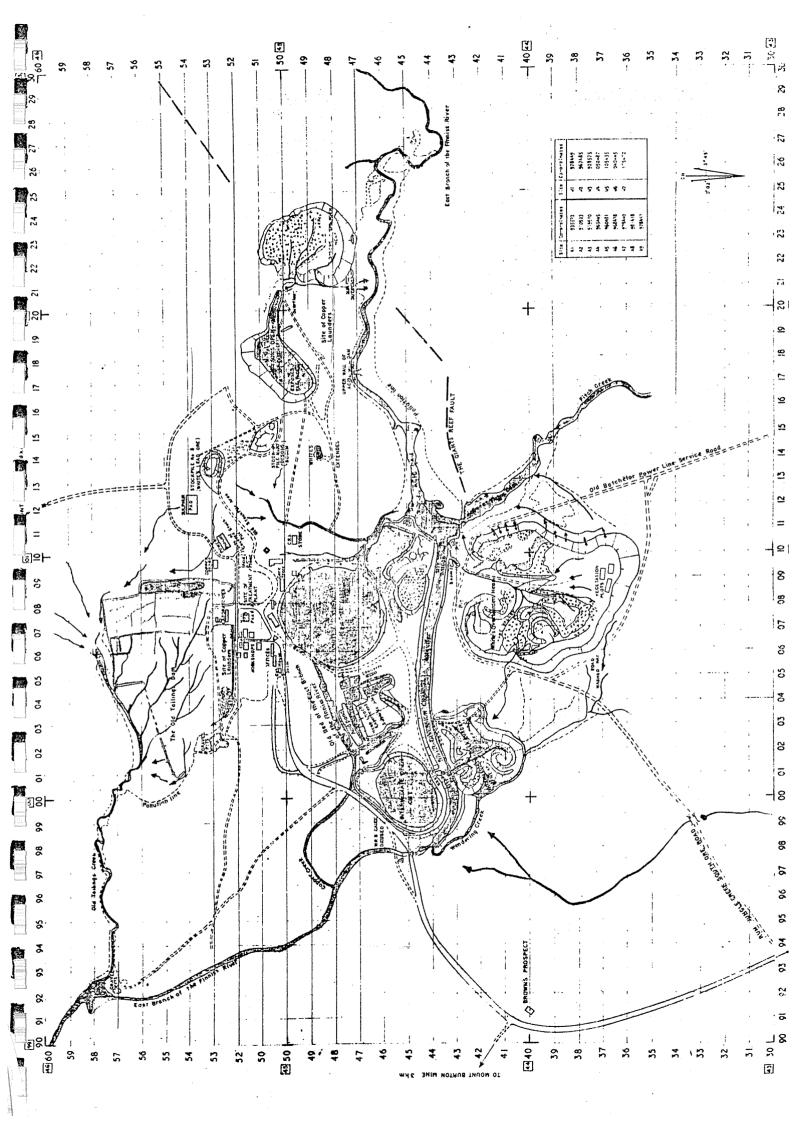
Ву

Department of Housing and Construction S.A./N.T. Region

August 1980

RUM JUNGLE
REHABILITATION

PRELIMINARY
CONSTRUCTION
STRATEGY



#### RUM JUNGLE REHABILITATION

#### CONSTRUCTION STRATEGY

This construction strategy is based upon :-

- 1. Establishment of Water Treatment Facility to treat all acid wastes as decanted forward.
- 2. Cover all Radioactive wastes with sufficient material to reduce levels of Radiation.
- 3. Establishment of stable environmental conditions.
- 4. Long term physical security.
- 5. Safe construction techniques.

#### PREAMBLE

- 1. The strategy allowed for is that designated Strategy 'D' in the report of the Working Group Rehabilitation of Rum Jungle dated April, 1978.
- 2. Time scales set out are conservative and may be subject to some compression when the results of investigations are known.

#### RUM JUNGLE REHABILITATION

#### BASIS OF CONSTRUCTION STRATEGY

#### 1. TREATMENT

#### Intent

To establish a Treatment Plant at the Intermediate Open Cut to :-

- 1. Treat existing ponded liquors.
- 2. Progressively treat liquors decanted from the Acid Ponds and White's Open Cut and Acid Dam.
- 3. Spasmodically treat liquors carrying residual acidity.

#### 2. EARTH WORKS

#### Intent

To re-shape the topography using in-situ and imported material to establish a safe and aesthetically acceptable environment by :-

- 1. Carting selected dumps to White's Open Cut to use as fill.
- 2. Covering areas containing Radioactive wastes.
- Stabilising overburden heaps to inhibit ongoing acidic re-action.
- 4. Providing vegetation to establish acceptable environmental conditions.
- 5. Re-establishing the route of the Finnis River.

#### 3. SECURITY

#### Intent

To ensure no spread of deleterious material during construction operations and maintenance of long term physical security by :-

- 1. Use of appropriate construction techniques.
- 2. Provision of fencing suitable for preventing ingress by local fauna.

#### RUM JUNGLE REHABILITATION

#### WORK PLAN STRATEGY

#### 1. TREATMENT

- a. Establish treatment and acid neutralisation plant at Intermediate Open Cut.
- b. Commence neutralising liquid in ditto.
- c. Connect Intermediate Open Cut to Finnis River.
- d. Divert portion of old bed to East Branch of the Finnis River to Intermediate Open Cut.
- e. Connect Acid Pond to East Branch.
- f. Connect White's Open Cut to East Branch.
- g. Cart Heap Leach and dump in White's Open Cut.
- h. Cart Dyson's Overburden and dump in White's Open Cut.
- i. Connect Acid and Sweet Water Dams to White's Open Cut.

#### 2. EARTH WORKS

- a. Trim Old Tailings Dam.
- b. Cover Old Tailings Dam with first layer of soil.
- c. Trim and drain Dyson's Open Cut.
- d. Cover Dyson's Open Cut.
- e. Shape and fill Intermediate Overburden.
- f. Shape and fill White's Overburden.
- g. Place second layer (rock) on Old Tailings Dam.
- h. Place third layer on Old Tailings Dam.
- i. Place fill to Heap Leach area.
- Re-shape all river courses.
- k. Cut seepage interceptor drains to overburden heaps and connect via River Division Channel and then after treatment to Intermediate Open Cut.

• TREATMENT

#### WORK PLAN

#### PRELIMINARY SPECIFICATION OF STRATEGY ITEMS

#### 1. WATER TREATMENT

1

A. Establish Treatment Plant at Intermediate Open Cut.

The intention is to use the Intermediate Open Cut as both a treatment and settling pond prior to discharge of treated water to the Finnis River by provision of a Treatment Plant incorporating dosing and mixing.

The Plant will be established initially to neutralise the contents of the Intermediate Open Cut with provision for future re-location in the Intermediate Open Cut to process incoming wastes as decanted from the Acid Ponds and White's Open Cut and the Acid Dam.

The Plant must be suitable for ongoing use for treatment of such acidic wastes as may be initially generated from the exposed flanks of re-active overburden heaps (Intermediate and White's).

Final effluent discharge should be low in suspended solids 30 mg/l with a ph in the range 6.5 to 8.0.

Note: Recently conducted trials have shown it is possible to destratify a reservoir by the infusion of compressed air. This process is relatively inexpensive. It is proposed that the water in the open cuts be turned over while CaO/Ca(OH) is added. Precipitants would be deposited at the bottom of the Open Cut.

This process may be expedited by the provision of plastic curtains subdividing the open cut and forming a channel along which the treatment could progress by pontoon. The final position at the pontoon would be at the inflow point of channels containing other liquors to be treated.

#### B. Neutralising Liquor in Intermediate Open Cut

Treatment of liquor is seen as a process involving the use of infused compressed air to the lower layers of the pond to create circulation, and the addition of neutralising chemicals to the liquor.

This process to continue until the required ph achieved, the pond will then be left to settle.

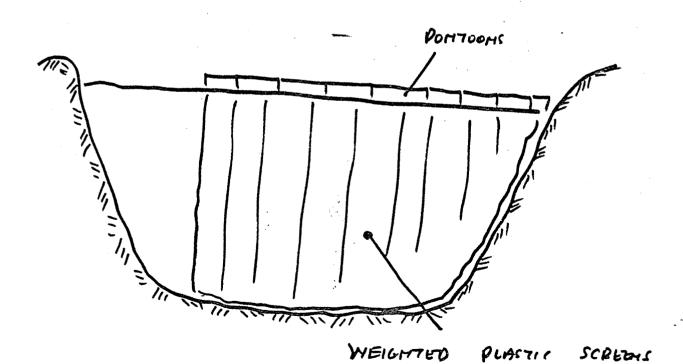
Sub-divide pond by vertical bouyed and weighted plastic screens creating a channel from a point at which the outlet is to be formed to a point at which the inlet from the East Branch will be formed. See sketch.

- 1. Physical soundings of the pond to establish the correct configuration for the screens.
- 2. Analyses of the chemical quality of the ponded liquor to determine application and mixing rates for the neutralising agent and induced air.
- Jesign of suitable plant pontoon and transfer arrangements along the channel.
- 4. Assessment of long term stability of the liquor in the Open Cut when re-contacted to the Finnis River System.

# SKETCH SHUWING TREATMENT PLANT IN INTERMEDIATE

PATH OF THEMT DIMMT

DURING WARPING TO DOSITION A



PROFILE

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#### C. Connect Intermediate Open Cut to the Finnis River

During settlement period the connection of Intermediate Open Cut to the Finnis River will be prepared and when settlement is satisfactory the final connection will be made.

- 1. Size of opening to Finnis River to pass controlled quantities of liquor down stream.
- 2. Position of sampling point down stream to monitor effluent quality.

D. Divert portion of the East Branch of the Finnis River to connect with the Intermediate Open Cut

During settlement period for Intermediate Open Cut prepare the diversion of the old bed of the Finnis River for transfer of Acid Pond liquor for treatment in Intermediate Open Cut.

#### Investigations Required

1. Assessment of existing river bed as to it's ability to pass the quantity of liquor necessary to feed the treatment plant.

#### E. Connect Acid Pond to East Branch

Connect Acid Pond to East Branch of the Finnis River and decant liquor to Intermediate Open Cut for treatment. Make cut at size specified to meet flow requirements for effective treatment in Intermediate Open Cut.

- 1. Assessment of the quantity of liquor in the Acid Pond.
- 2. Assessment of quality of liquor in the Acid Pond.
- 3. Modifications to the Treatment Plant in Intermediate Open Cut to treat liquor from the Acid Pond.
- 4. The rate of transfer of liquor to Intermediate Open Cut.
- 5. The neutralisation of the open area when empty.

#### F. Connect White's Open Cut to East Branch of the Finnis River

When the Acid Pond liquor has been decanted and passed to Intermediate Open Cut, connect White's Open Cut to the East Branch.

The connection should be sized to pass a specified quantity of liquor to Intermediate Open Cut for treatment. The liquor will be decanted initially by displacement during fill operation.

The fill to be employed will be from the Heap Leach followed by part of Dyson's Overburden.

Miscellaneous fill won from other cleaning up operations may be added as the occasion warrants.

#### Investigations Required

- 1. Sounding to obtain profile of Open Cut.
- 2. Samples of material at bottom of Open Cut with assessment of physical properities in relation to it's ability to take additional fill.
- 3. Assessment of materials available for fill.
- 4. Recommendation on method of fill to obtain optimum stabilised profile of Open Cut sides and bottom.
- 5. Analyses of chemical quality of liquor.
- 6. Determination of portion of treatment plant in Intermediate Open Cut to treat liquor.
- 7. Assessment of long term chemical stability of liquor in pond.

#### G. Cart Heap Leach and dump in White's Open Cut

Excavate Heap Leach at pre-determined rate and in the manner specified dump in White's Open Cut.

Leave area of cut ready for scarifying, remove all banks to Acid Ponds and level side of ponds ready for scarifying.

- Make analyses of material in Heap Leach and assessment of it's effect on the liquor in White's Open Cut.
- 2. Assessment of chemical quality of subject, grade to Heap Leach and surrounding area to establish lime dosage rates.

#### H. Cart Dyson's Overburden and dump in White's Open Cut

Excavate Dyson's Overburden and add pre-determined rates and in the manner specified dump in White's Open Cut. Leave site ready for scarifying and planting.

- 1. Assessment of chemical quality of material and it's effect on the liquor in White's Open Cut.
- 2. Determination of any treatment that may be required for chemical stabilisation of the Overburden sub-base.

#### I. Connect Acid and Sweet Water Dams to White's Open Cut

Breach Acid Dam and allow a pre-determined flow of liquor to decant into White's Open Cut and thence to Intermediate Open Cut.

At a pre-determined time breach Sweet Water Dam and allow maximum quantity of water to flow through White's Open Cut and East Branch to flush the system.

- 1. Assess chemical quality of Acid Dam and determine treatment necessary to wastes when passing into Intermediate Open Cut.
- 2. Determine residual chemical quality of river bed and required lime dosing rates (if any).
- 3. Determine timing and release rate of "Sweet Water" to flush system.

2. EARTH WORKS

#### 2. EARTH WORKS

#### A. Trim Old Tailings Dam

To pre-determined limits trim surrounding areas, banks, water courses and scours to Old Tailings Dam to even, stable, slopes and contours, place any surplus material on top of main tailings dam area.

To pre-determined limits collect material which is previously scoured from the Old Tailings Dam area and deposit on top of the existing tailings. Leave all surrounding shapes and contours in a natural stable condition.

- A survey of Radioactive levels to determine the extent of the scoured material and the extent of which it is safe to collect "scours" and return to main body.
- 2. Recommendations and methods and equipment necessary to accomplish this to acceptable standards of safety.

#### B. Cover Old Tailings Dam

Cart selected material from spoil heap, spread and compact the first level of cover as specified to a depth of X m.

Material will be dumped ahead of earth moving equipment to minimise exposure of operators.

The layer will act as a mechanical seal immediately above Radioactive material and will require to be shaped and compacted for an indefinite stability period.

- 1. Survey of Old Tailings Dam area to establish thickness of tailings.
- 2. Radiation survey of total tailings area.
- Depth of fill required to provide Radioactive blanket.
- 4. Assessment of quantities and quality of fill required.
- 5. Recommendations of necessary compaction rates.
- 6. Topographical and soil survey to establish borrow pits.
- 7. Strategy for stabilising borrow pits on completion of the operation.

#### C. Trim and Drain Dyson's Open Cut

Breach banks and drain liquor into the Acid Dam, pump out residue.

Trim banks to even/stable slopes and contours.

To pre-determined limits collect Radioactive materials in banks and surrounds and dump on main tailings area.

Trim all banks and other earth works to even stable slopes.

- 1. A survey to establish the extent (if any) of any movement of Radioactive materials away from the main area by scouring.
- Assessment of quantities involved and methods to be used to restore such material to the main body.
- 3. Soils investigation in the area of the banks to establish desired profiles for long term stability of banks.

#### D. Cover Dyson's Open Cut

Commence filling from the lowest point with X m of material from Dyson's Overburden, leave area smooth and level ready for scarifying prior to re-vegetating.

Note: Tailings have filled Dyson's Open Cut to the lowest point of it's perimeter and the level of the tailings material is several metres below the rim.

Cover area with X m of fill from Dyson's Overburden Heap and compact.

Provide layer of soil and lightly compact scarify to a depth of 150 mm, provide a haze of rocks and vegetate.

- 1. Quantification and qualification survey of Dyson's Overburden.
- 2. Assessment of compaction rates for overburden as filled.
- 3. Assessment of proportion of fill available for Dyson's Open Cut and White's Open Cut.

Note: The objective of the next two items is to re-create a natural hill by providing a re-vegetated gibber type plateau covered with compacted soil to restrict downward flow of water whilst the rock-faced banks are left to "burn themselves out"/leached acids will be collected and treated.

#### E. Shape and Fill Intermediate Overburden

Trim banks of Overburden to even stable slopes.

Trim and shape central area to general saucer shape, making allowance for stormwater control via the existing central track.

Cart selected fill to the central area and grade to saucer shape, compact as specified.

Scarify top 300 mm of compacted material ready for vegetating, place indiscriminate haze of rocks over the area to reconstruct a natural occurring gibber type environment.

#### F. Shape White's Overburden

As for Intermediate Overburden.

- 1. Topographical survey of both heaps.
- 2. Assessment of chemical properties and rate of acidification.
- 3. Effect on acidification of provision of soil cover.
- 4. Depth of thickness required to ensure adequate sealing effect.
- 5. Compaction rate of such fill.
- 6. Measures necessary to treat banks to slopes to reduce rate of "burn".
- 7. Determination of drains to intercept acidic leaching waters.
- 8. Determination of suitable stable areas.

G. Place Second Layer (Rock) on Old Tailings Dam

Cart selected rock fill as second (middle) layer of fill to Old Tailings Dam.

Depth of rock to be approximately X m and placed on previously compacted clay layer as poor breaking membrane.

- 1. Site soils investigation to obtain source or rock.
- 2. Appropriate determination of rate of application and compaction.
- 3. Recommendation of grading of rock and thickness of rock layer.

#### H. Place Third Layer of Fill on Old Tailings Dam

Place and lightly compact selected clay layer as covered to rock layer on Old Tailings Dam.

Depth of layer approximately X m.

Scarify surface ready for vegetation, place haze of rocks over surface to reconstruct natural occurring gibber plain environment.

- 1. Site soils investigations to establish site of borrow pit.
- 2. Recommendation on compaction rates and thickness of layer suitable for long term stabilisation.
- 3. Recommended contours and profile suitable to long term (indefinite) stability.

#### I. Place Fill to Heap Leach Area

Scarify total area to a depth of 150 m and spread lime at a pre-determined rate and thoroughly mix lime.

Place and lightly compact 300 mm of selected fill and scarify to a depth of 15 mm, place a haze of rocks to establish gibber plains conditions.

Plant vegetable cover.

- 1. Determination of suitable borrow pit.
- 2. Recommend suitable compaction rates.
- 3. Recommend suitable vetegation.
- 4. Propose structure to render borrow pit environmentally acceptable.

#### J. Re-shape River Courses

Trace out previous courses of all branches of the Finniss River in the area and re-shape as close as possible to the original course.

Modify courses to pass flow through both open cuts and East Branch.

- 1. Examination of past records and local features to recommend preferred profiles, grades and alignment of former water courses.
- 2. Recommendation of measures to re-create environmentally acceptable conditions within the water course.
- 3. Recommend plantings and works within the water courses to establish long term stability.

K. Cut Seepage Drains to Edge of Overburden Heaps and connect to Old River Diversion Channel

Cut drains around both Intermediate and White's Overburden Heaps to intercept acidic leach water. Pass water to river diversion channel for treatment.

Note: The treatment plant will be re-positioned in the river diversion channel to suit oncoming spasmodic operations for treatment of these wastes as necessary prior to passing to the Intermediate Open Cut.

- 1. Quantity and quality of leached wastes to be anticipated.
- 2. Sized, type and configuration of interceptor drains.
- 3. Type of diversion and storage arrangements in the river diversion channel.
- 4. Position and operation of the re-positioned treatment plant from the Intermediate Open Cut.

3. SECURITY

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#### L. Security

1. Use of appropriate construction techniques

The construction techniques to be employed on the works will need to be designed to accept all the limitations real or apparent that will ensure maximum safety both to operating personnel and the surrounding environment.

- 1. Maximum Radiation levels to which operators may be exposed.
- 2. Effect of work to Radioactive material in respect of transient climatic conditions i.e. dust or contaminated water.
- Recommendation of safety measures to ensure that safe Radiation levels are not exceeded.
  - Note: To meet this need it is allowed that Radioactive wastes will, in general, be covered and not moved.
- 4. Design of works to allow for maximum long term stability in respect of both physical and chemical degradation.

### 2. Provision of Fencing suitable for preventing ingress by local fauna

The fence is to provide the vegetation with adequate protection to allow it's successful establishment. The primeter of the whole site is to be fenced - approximately 10 km.

The fence must be strong enough to keep out the largest animals and yet also exclude small animals including rodents which could be expected to burrow beneath the fence. Eradication of existing fauna will be necessary until remedial measures are well established.

- 1. Establishment of the total area regarded as being within the scope of these works.
- 2. Zoological survey of all fauna which normally inhabit the area.
- Design of a suitable fence to exclude all fauna types to be expected, including below ground dwellers.
- 4. Designs of fences at river crossings to exclude fauna as per 2 above.

## DESIGN STRATEGY

Design Strategy is to provide all necessary design input for execution of work in accordance with proposals outlined in the Construction Strategy.

# DESIGN STRATEGY IS IN TWO (2) PARTS

- (1) Investigations necessary to establish Design
- (2) Design Documentation

and will produce documents comprising working sketch details and data arising out of the investigations and report program, together with such design documents as may be required for total co-ordination.

# 1. <u>INVESTIGATIONS</u> - Liquid Wastes

Note: In the following proposals it is accepted that alternatives may be proposed or ensue as a result of experience and data gained as investigations proceed.

## Intent

The intent is to assess the quality of all liquid wastes in ponds and determine effective methods of treatment and disposal.

Current proposals allow for the passing of wastes into the Intermediate Open Cut for treatment and then dispose via the Finnis River.

# Treatment of Liquid Wastes

- 1.1 Establish data on the chemical and physical properties of liquids in :-
  - (A) Intermediate Open Cut
  - (B) Acid Ponds at Heap Leach
  - (C) White's Open Cut
  - (D) Acid Dam
  - (E) Sweetwater Dam
  - (F) River Diversion
- 1.2 Establish data as long term properties of liquids in respect of ongoing acidicification of :-
  - (A) Intermediate Open Cut
  - (B) White's Open Cut
- 1.3 Formulate proposals for the establishment of a treatment plant in the Intermediate Open Cut which will be suitable for successive modification to treat acidic liquors in all ponds as they are successively passed through to the Intermediate Open Cut.

The plant should be of the air infusion/chemical dosing type, preferably liquid fuel powered.

- 1.4 Formulate proposals for the ongoing operation of the plant to treat liquid wastes in the Intermediate Open Cut as rehabilitation works proceed. These should include :-
  - (A) Rate of initial 'warping' of treatment plant across the Intermediate Open Cut during treatment of liquor in place.
  - (B) Spacing and profiles of plastic curtain subdividers in the Intermediate Open Cut.
  - (C) Positioning and modification of treatment plant to process successive inflow of wastes from Acid Ponds, White's Open Cut and Acid Dam definition of inflow rates.

# 2. INVESTIGATIONS - Earthworks

Note: In the following proposals it is accepted that alternatives may be proposed and ensue as a result of experience and data gained as investigations proceed.

#### Intent

The intent is to accurately survey all spoil and waste heaps and assess them in respect of soil type and chemical quality against their use as fill material or suitability for long term stabilisation, and to establish areas for spoil pits to provide suitable cover.

## 2.1 General

- 2.1.1 Carry out topographical survey of whole area of the 'mine' and establish.
  - (a) Boundary marks/line delineating the edge of the work area.
  - (b) Establish grid at say ½ km intervals mark and number as plot.
- 2.1.2 Carry out site soils investigation with dippings at say ½ km (or grid as per 1.1(a) to a depth of say 3m establishing:
  - (a) Soil types
    - (b) Water table, if any, with water quality assessments.

# 2.2 Radiation Surveys & Treatment

- . Old Tailings Dam
- . Dyson's Open Cut
- 2.2.1 Carry out surveys of both the above areas to establish the extent and strength of Radiation.

The survey should extend to cover all areas into which Radiative material may have been scoured.

The areas should be dipped to determine the depth of Radioactive material and plots produced showing contours of both depth and Radiation counts.

2.2.2 Based upon the results of the surveys above make assessments of configuration of material to cover the heaps to effectively reduce Radiation counts at the final surface to acceptable levels.

The configuration proposed to the cover is to allow for compaction rates and material type to produce consistency, form and shape designed for an indeflinite life.

It is to prevent ingress of surface and stormwaters to reduce loading to a minimum level, and be suitable for final treatment to make an environmental pleasing feature.

2.2.3 Proposals should allow for collection of scoured Radioative material and return to the main area.

Equipment specification for this operation must be given.

- 2.2.4 Final treatment to the above area will by placing cover material of soil and rock in three layers over the whole area - the material to be placed in front of the operation.
- 2.2.5 Radiation surveys must allow for diurnal variation in emissions and make recommendations for hours of work.
- 2.2.6 Work proposals must allow for climatic factors, and recommendations in this respect are necessary.

#### 2.3 Open Cuts

- 2.3.1 Carry out soundings of both Intermediate and White's Open Cuts, and obtain samples to establish data on nature and strength of material forming base of costs.
- 2.3.2 Assess chemical quality of material with reference to ongoing reactive processes in relation with Item 1 Treatment.
- 2.3.3 Recommend procedures for placing fill in White's Open Cut to decant liquor for treatment.
- 2.3.4 Identify fill to be used for 2.2.3.

- (D) Establishment of standards to be achieved in terms of settled solids and ph.
- (E) Periodic testing to ensure standards are met.
- (F) Operation during successive wet and dry seasons.

#### Documents

Produce all working sketches, charts and diagrams with accompanying data to accurately portray all proposals.

## Report

Produce a fully illustrated and detailed report covering the total extent of the proposals.

# 2.4 Heap Leach Area and Acid Ponds

- 2.4.1 Carry out survey of Heap Leach pile and soundings at Acid Pond area to determine the quantities of material to be made available for fill to White's Open Cut. This should be the surplus material after the area has been restored to natural contours (allow for 2.3.3 below).
- 2.4.2 Carry out chemical analysis of area of both Heap and Ponds to determine the dosing rate needed for neutralisation.
- 2.4.3 Establish quantities and quality of soil cover required to cover and vegetate the total area of both the Heap and the Ponds.

# 2.5 Overburden Heaps - Intermediate & White's

- 2.5.1 Carry out survey of both Intermediate and White's Overburden Heaps to establish topography, material properties and chemical characteristics.
- 2.5.2 Recommend depth and type of soil necessary to seal the upper surface of the heaps and establish vegetation.
- 2.5.3 Recommend measures to reduce the ongoing acidification of the exposed banks together with assessments of long term effects of such measures in reducing the rate of acidic degradation.
- 2.5.4 Assess rate of acidic reaction to be expected following soil measure and the quantities and strength of any acidic liquors that may be leached out in future.

# 2.6 Dyson's Open Cut

2.6.1 Following on 2.2, carry out topographical survey as all banks in the vicinity of the open cut and establish quantities of material necessary/available to add to imported fill for provision of suitable cover.

#### 2.7 Dyson's Overburden

- 2.7.1 Carry out topographical and qualitative survey of the overburden heap.
- 2.7.2 Determine the distribution of the above as fill to:-
  - (a) Dyson's Open Cut
  - (b) White's Open Cut

#### 2.8 Acid & Sweetwater Dams

- 2.8.1 Carry out topographical surveys of both dams to establish the extent of any works necessary to restore the water ways to a natural alignment.
- 2.8.2 Establish necessary data to restore the connection of both dams to the original/modified Finnis River diversion through White's Open Cut.

## 2.9 Spoil Heaps/Pits

- 2.9.1 Carry out surveys to establish the site of suitable spoil pits for both soil and rock.
- 2.9.2 Prepare proposals for removal of spoil to areas for use.
- 2.9.3 Prepare proposals for final treatment of spoil pits to an environmentally acceptable standard.

#### Documents

Produce all working sketches, charts and diagrams with accompanying data to accurately portray all proposals.

#### Reports

Produce a fully illustrated and detailed report covering the total extent of the proposals.

DESIGN DOCUMENTATION

#### DOCUMENTATION

Documentation will take the following form :-

## 1. Site Plans & Specification Clauses

- (a) Site plan showing extent of wastes and all elements involved.
- (b) Site plan showing line of fence.
  Fencing Details.

#### 2. Treatment Details & Specification Clauses

- (a) Plans show outlines and profiles of Intermediate Open.
- (b) Form of Treatment Plant.
- (c) Configuration of screens.
- (d) Details 2 3 sheets.
- (e) Specified description of treatment process to be followed.
- (f) Details and specifications of repeated modifications to Treatment Plant.

#### 3. Overburden Heaps

- (a) Details of final shaping of White's and Intermediate Overburden showing compacted soil cover, stormwater drainage proposals and position and size of interceptor drains.
- (b) Details of final removal /treatment to Dyson's Overburden.

## 4. Old Tailings Dam

- (a) Plan showing Radiation count contours and areas to be cleaned and restacked on the main body.
- (b) Plan showing finished profiles of Tailings Dam including:-
  - . Section through compacted fill
  - . Final grades and slopes of banks
  - . Plan of vegetation cover

(c) Specified operational techniques.

# 5. Dyson's Open Cut

As for (4).

# 6. Heap Leach Area

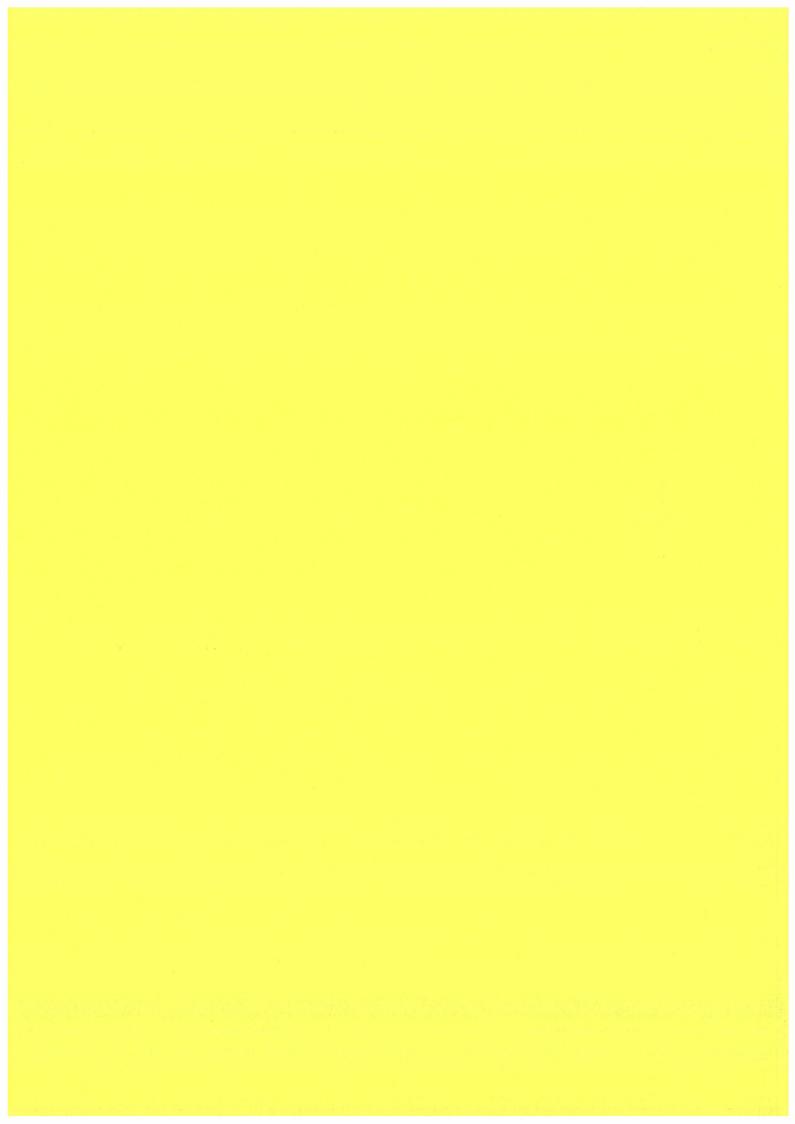
- (a) Site plan for total area of Heap Leach pile and Acid Ponds showing areas to be worked and limed.
- (b) Section through site outlining profiles of fill, finished levels and vegetation.

# 7. Dyson's Overburden

- (a) Plans and sections of Dyson's Overburden showing existing profiles and soil types.
- (b) Plan and section of ditto showing final profiles and vegetation.
- (c) Specified soil removal and dumping procedures.

# 8. Acid and Sweetwater Dams

- (a) Plans and sections showing existing and final grades and cross sections.
- (b) Plans and sections of water course of Old Finnis River connecting to White's Open Cut.
- (c) Specified work procedures.



# APPENDIX 4

Mining leases and exploration licences located within the area of  ${\sf Rum}$  Jungle Mine that may be affected by rehabilitation works.

Mining Leases No.	<u>Holder</u>	Expiry Date
ML 123B	CRA Ltd	31 Dec. 1977
ML 124B	н	II .
ML 125B	н	81
ML 126B	11	fi
ML 127B	H.	н
ML 128B	п	Ħ
ML 133B	н .	н
ML 134B	n	II
ML 135B	II .	31 Dec. 1998
ML 161B	11	H
ML 162B	н	H
ML 163B	ıı .	81
ML 306B	II.	31 Dec. 1984
ML 307B	п	Ħ
ML 308B	н	H
ML 309B	н	· n
ML 310B	н	Ħ
ML 1067B	R.W. & W.J. Bennett	31 Dec. 1999
ML 1068B	H .	н н

# Exploration Licence

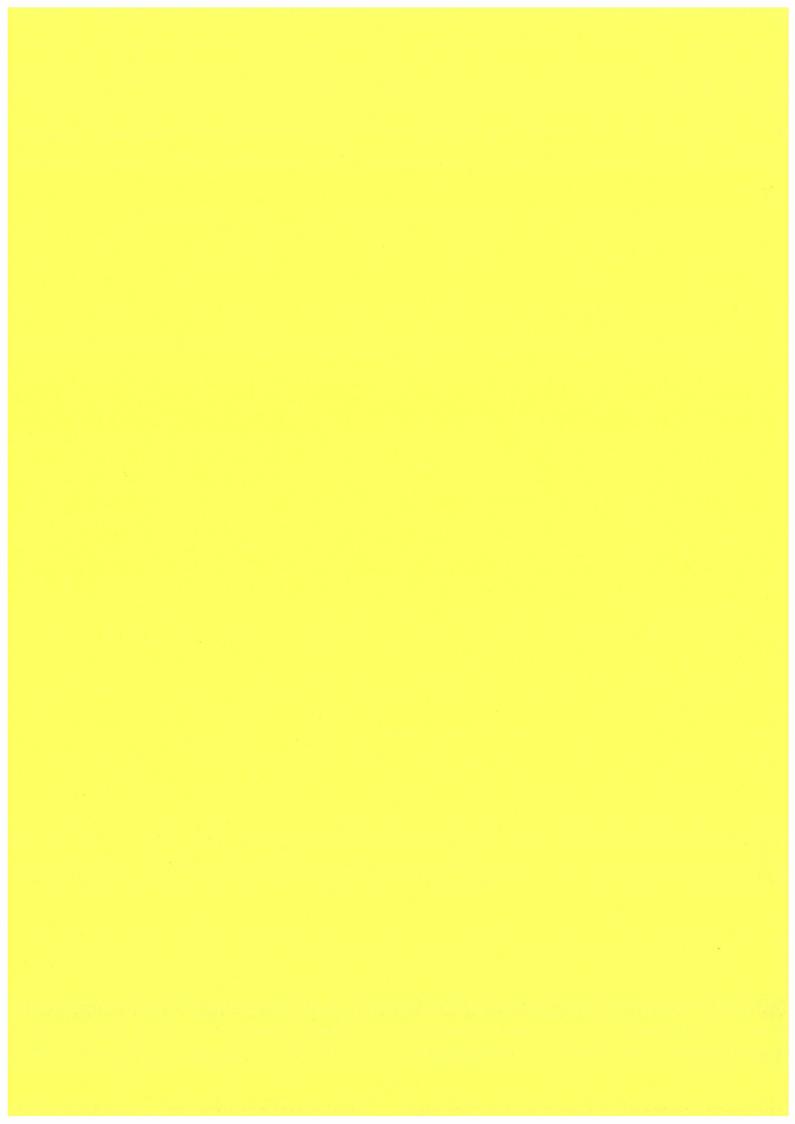
EL 1563

A.O.G. Minerals Pty Ltd

30 Aug. 1982

(renewable

every year)



# 9.1 Rehabilitation of the Mine Pit

As a result of mining operations, there will be stockpiles of various grades of ore together with which falls below ore grade and stockpiles of waste materials.

Once all mining operations have been completed, it is intended to replace the mineralised material the waste rock back in the mine pit as part of the rehabilitation of the mine pit. To do this, mineralised material will be dumped at the bottom of the mine pit in order that it is located as remote as possible from the levels active water of variation. The waste rock materials will then be dumped on top of the mineralised material, the quantity being sufficient to fill the mine pit back to the original ground surface level. At this stage, there will be no further water pond in the mine pit and the mine pit will be removed from the water management system.

Rehabilitation of the mine pit will then be undertaken consisting of the revegetation and regrading of the surface to stable lines and grades. The pipeline corridor/haul road across Koongarra Creek will also be dismantled at this point so that there is no further connection between the mine pit and the processing plant. As these rehabilitation procedures will take place early in the life of the mine (see Figure 2) there will be several years in which it will be possible to ensure that the rehabilitation procedures adopted are appropriate for the site and will provide a stable site in the long term with minimal effect on the environment.

# 9.2 <u>Progressive Rehabilitation of the Tailings Pits</u>

Tailings Pits Nos. 1 and 2 have been designed as subgrade disposal pits, having a three year life of operation at a milling rate of 1000 t/d or six years at 500 t/d. The first of these pits to be rehabilitated will be Tailings Pit No. 1. The rehabilitation of the tailings pit will comprise the disconnection of the pit from the water management system and a period of drying out of the surface of the tailings. Once the surface is strong enough to support the establishment of a clay cap, this will be placed in a layer approximately 1 to 2 m thick, the clay being derived from extremely weathered soil used in essential site filling. The details of the cap for the tailings pits are shown on Figure 19.

The clay layer will be lightly compacted at a moisture content to ensure its ability to deflect without cracking as a result of differential settlement in the underlying tailings. The purpose of this layer is to provide an impermeable barrier over the surface of tailings inhibiting inflow of fresh water into the tailings and thus an increase in the total seepage. The will be contoured slightly to ensure the ponding of water does not occur over the central part but rather shed towards the surrounding embankment. Once the clay layer is in place, a protective layer of lateritic gravels about 0.5 m thick will be placed. This layer is to provide a transitional layer in order to support a rock fill-poorly graded gravel vapour barrier on top of it. This gravel will consist of waste Kombolgie sandstone or other suitable coarse material.

The upper 1 m of the rehabilitated tailings surface will comprise 0.5 m of lateritic gravels immediately overlying the Kombolgie sandstone waste followed by 0.5 m of sand, surficial soil and topsoil to serve as a seed bed for revegetation.

The outer walls of the tailings embankments will be stabilised by the placement of earthfill at a slope of 6 horizontal to 1 vertical followed by a protective layer 1 m thick of Kombolgie sandstone partially filled with topsoil and surficial soil to act as a seed bed for stabilising revegetation. Drainage will be directed from the surface of the tailings pit to surrounding stable drainage lines.

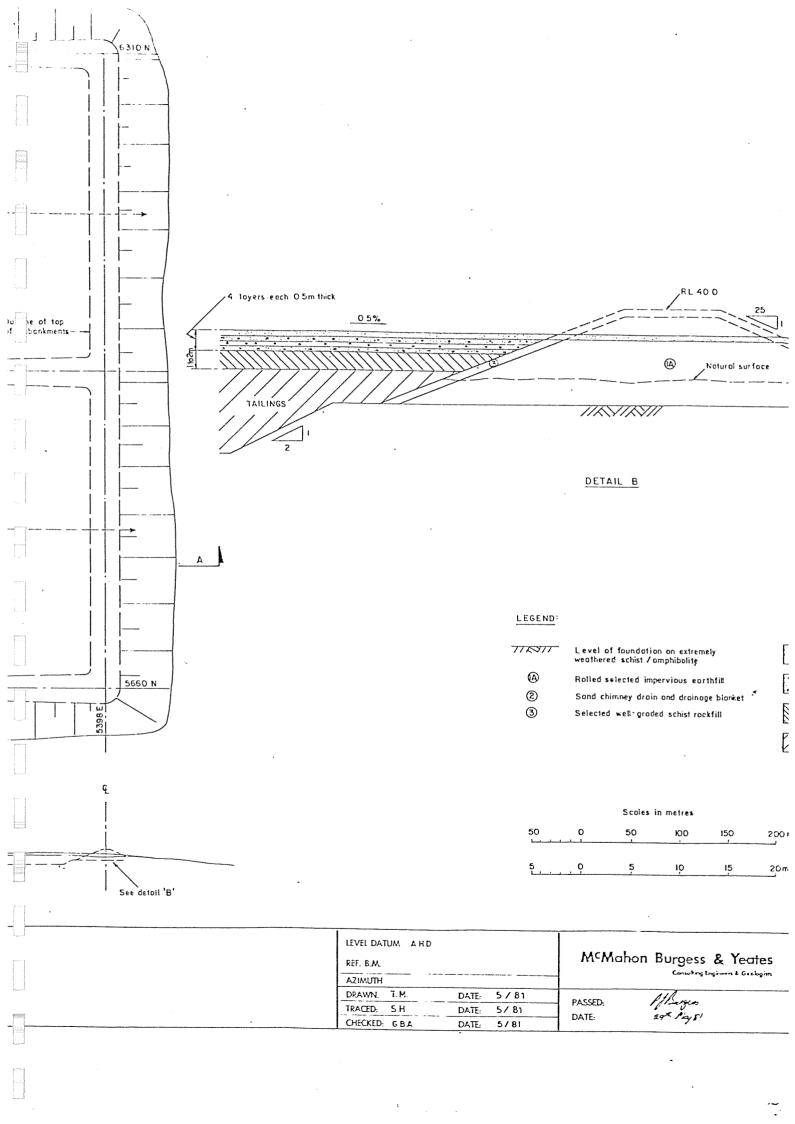
As these revegetation procedures will be carried out during the life of the milling operations, there will be sufficient time to adequately test the rehabilitation procedures and to ensure that stream erosion is not occurring which will jeopardise the integrity of the tailings impoundment in the long term.

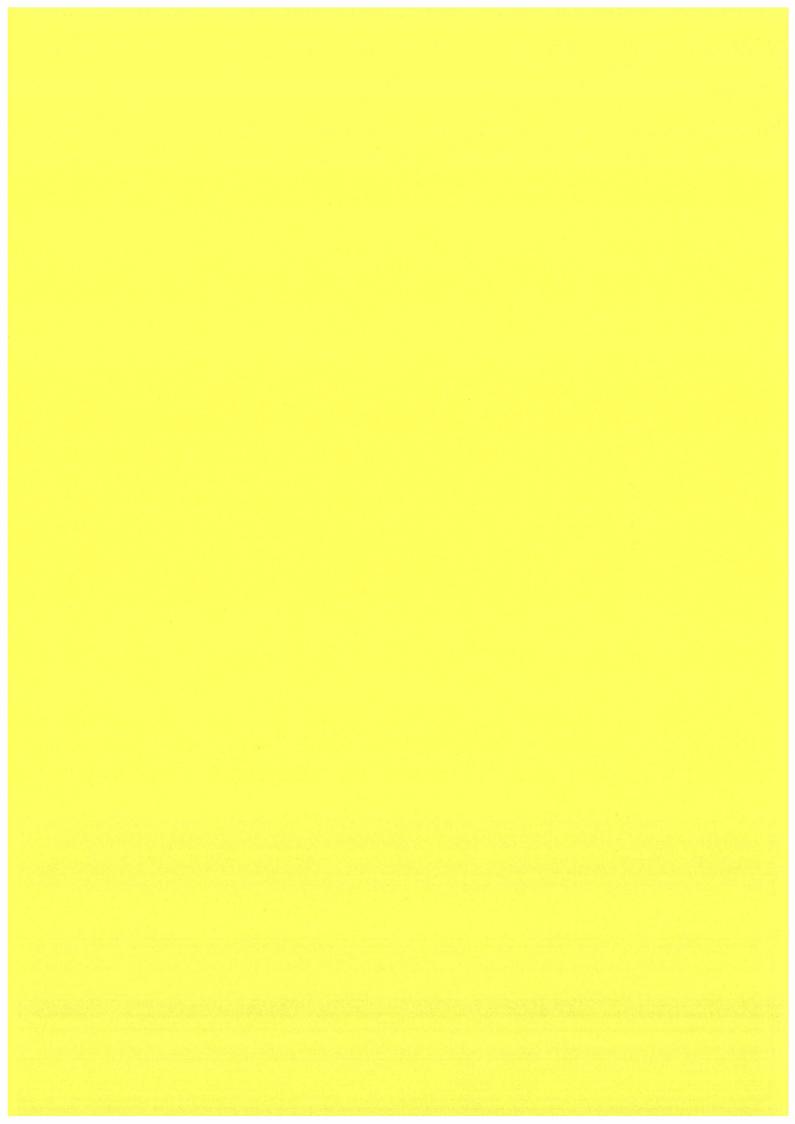
#### 9.3 Rehabilitation of the System

The final rehabilitation of the system will comprise the disposal of all waters in Evaporation Ponds A and B and the Retention Pond by evaporation and the re-establishment of stable ground contours.

The time taken for final dissipation of all waters by evaporation will depend on the climate which has prevailed up to the time of cessation of milling. The rehabilitation will comprise the backfilling of low points in Evaporation Pond A and Tailings Pit No. 2 with any contaminated soils removed from the mill area (as determined by a radiometric survey) once this has been

carried out, final rehabilitation will comprise progressive bunding off and rehabilitation of areas within the evaporation ponds till such time as all waters are lost from the system. Revegetation of the area will then be undertaken and monitoring carried out to ensure that areas of erosion are recognised and protected so that progressive degradation does not occur and jeopardise the environment.





## Copy of the letter from the Prime Minister

13 AUG 1980

My dear Chief Minister,

In his statement to Parliament on 25 August 1977 concerning further uranium development in Australia, the then Minister for National Resources, the Rt Hon. J.D. Anthony, M.P., advised that as a first step, \$300,000 has been provided in the 1977-78 Budget Estimates of the Department of the Northern Territory for clearance and rehabilitation of the former Rum Jungle mining area. It was also noted that the Department of the Northern Territory would co-ordinate a study of a comprehensive program of rehabilitation of the area.

The Commonwealth has considered the Report prepared by the Department of the Northern Territory in April 1978 and has decided to provide \$0.5 million in the 1980/81 Budget for commencement of a rehabilitation program at Rum Jungle. In its decision the Government noted that the program was estimated to cost a total of \$12.14 million (February 1980 prices) over four years. Approval has been given for the Department of Housing and Construction to commence site investigations and the proposal will be admitted to Design List C to enable design development for the proposal to be submitted to the Parliamentary Public Works Committee.

I would appreciate receiving your concurrence in the above course of action. The Commonwealth's decision to commence a rehabilitation program and the funding available in 1980/81 will be announced in the Budget and I understand that the program would generate significant local employment opportunities.

In relation to the site investigations noted above and design development for submission to the Parliamentary Public Works Committee, officials of the Department of National Development and Energy will contact officials of your Department shortly, to arrange for any necessary consultations on these matters.

As regards continuity of the program, you will be aware that the Finniss River Vacant Crown Land Claim lodged

by the Northern Land Council includes the Rum Jungle mine site. In the event that title to the land passes to a Land Trust following examination of the claim it would be necessary of course for the Commonwealth to seek the agreement of the Northern Land Council to commence or complete the program as the case may be.

Yours sincerely,

Malcolm Fraser)

The Hon. Paul Everingham, M.L.A., Chief Minister of the Northern Territory, P.O. Box 3146, DARWIN N.T. 5794