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WORKING ARRANGEMENTS 1994-1996

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THIS DOCUMENT CONTAINS THE WORKING ARRANGEMENTS AND DETAILED PRESCRIPTIONS JOINTLY AGREED BETWEEN ALCOA AND THE DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT IN RESPECT OF ALCOA'S OPERATIONS IN STATE FOREST.

EFFECTIVE FOR OPERATIONS YEARS 1994-1996

S.R. SHEA
Executive Director
Department of Conservation

J.M. SIBLY
Executive Director
Alcoa of Australia Limited

WORKING ARRANGEMENTS FOR PRESCRIPTIONS

PART 1

1. Introduction

These arrangements set the framework for control of Alcoa's field operations in State Forest at Jarrahdale, Huntly, Del Park and Willowdale. A brief description of mining and a definition of Alcoa and CALM responsibilities in State Forest is included. These two parts are likely to remain unchanged unless new mining methods develop or Alcoa enters new agreements with the State. Detailed prescriptions form an appendix to these working arrangements. The Prescriptions should be updated when new research information has been produced and verified.

A co-ordinated approached between Alcoa and CALM is required for effective and efficient control of mining operations. This is important so that better use is made of information in both organisations. Prescriptions represent mutually agreed, practical, and technically sound specifications for executing field operations. Representatives from Alcoa and CALM have been nominated with responsibility for developing (where necessary) and updating prescriptions.

2. Field Operations in Bauxite Mining

Bauxite mining follows a sequence of exploration, mining and rehabilitation. This includes a number of discrete operations:

- Exploration drilling at a grid spacing of 120 metres
- Ore development drilling at spacings of 60 metres and 15 metres
- Removal of marketable timber
- Stacking and burning forest residues
- Removal an direct return or stockpiling of topsoil and stockpiling of overburden
- Secondary overburden removal (under trial in 1994/5)
- Ripping/drilling and blasting caprock
- Extracting bauxite ore by loading and transport to a crusher
- Crushing and transport to refinery
- Rehabilitation of mined pits
- On-going management of rehabilitated areas.

Jarrah forest surrounding bauxite mining operations is treated to improve resistance to dieback disease or rehabilitated if it is heavily degraded. These operations are carried out under the Dieback Forest Rehabilitation programme (DFR).

Within the list of mining operations above, prescriptions are required in every case where forest values are likely to be affected, particularly by the spread of dieback disease.

Prescriptions exist for:

- Forest access control
- Exploration and Ore Development Drilling
- Soil handling
- Drilling and Blasting
- Extraction of bauxite
- Logging and Clearing and Burning of Forest Residue *
- Rehabilitation
- Dieback Forest Rehabilitation and a
- Interagency agreement for fire control

3. Organisational Responsibilities

3.1 Department of Conservation and Land Management

Under the provisions of the CALM Act 1985, the Department of Conservation and Land Management is charged with the responsibility for management of State Forest included in the Alcoa lease area.

In fulfilling this responsibility CALM aims to ensure that forest resources are managed for maximum long term social and economic benefit. To this end, CALM has adopted a multiple use management system seeking to minimise conflict between land uses whilst having regard to overall balanced development, including economic considerations. Mining is recognised as being a conditional land-use in areas of State Forest with a priority use of Water Production, Recreation, Catchment Protection, or Forest Production. Mining is not considered compatible in areas where Nature Conservation is the priority land use.

Mining is a transient land use and CALM is charged with ensuring it takes place with minimum long term deleterious effects on the forest environment and that rehabilitation is consistent with the land use needs.

3.2 Alcoa

Alcoa's responsibilities in State Forest are defined in Alumina Refinery Agreement Acts (Kwinana, Pinjarra, Wagerup) and under the Wagerup ERMP.

3.2.1 Alcoa's Rights and Obligations under Agreement Acts. (Forest requirements only)

- Alcoa may remove overburden and forest produce for its own operations.
- Alcoa will give the Executive Director 6 months notice of such intentions.
- Executive Director will remove millable timber from areas to be mined.
- Alcoa will dispose of overburden and forest waste so as not to damage adjacent forest.

- Alcoa will leave areas clean and tidy after mining, but not necessarily on original contour.
- Alcoa will pay compensation for areas of State Forest cleared for mining.
- The District Manager may prohibit use of CALM roads and give Alcoa directions on roads that can be used. This does not apply to roads built by organisations other than CALM.
- Damage to CALM roads from Alcoa's operations will be repaired at the company's expense.
- Alcoa will restore and reafforest mined areas.
- Alcoa will comply with the bush fires Act and take precautions to prevent the spread of fire in its lease area and in adjacent areas, as directed by the District Manager.

3.2.2 Alcoa's Undertakings Under Wagerup ERMP.
Although developed as part of the Wagerup ERMP these undertakings are being applied to other mine sites, i.e., Jarrahdale, Del Park and Huntly.

- Alcoa submits a mining and management programme which specifies areas and methods for mining and rehabilitation. Five year mining plans are submitted for Jarrahdale, Huntly and Del Park and ten year mining plans for Willowdale.

  These are revised annually and form the basis for clearing applications for areas to be mined. Two year clearing plans are submitted annually and checked by District Managers and the Mining Operations Group before approval is recommended to the Executive Director.

- Exploration drilling is subject to stringent dieback hygiene specified by CALM.

- Rehabilitation proposals are developed to best suit the designated land use. The Mine Site Environmental Scientist is responsible for the preparation of conceptual rehabilitation plans. Rehabilitation includes the following stages:

  - Reshaping mined areas to control drainage,
  - Return of topsoil,
  - Contour of ripping,
  - Establishing ground vegetation and trees with the aid of fertiliser,
  - Controlling drainage and water discharge from pits,
  - Providing access for future forest management.

- Alcoa has undertaken to rehabilitate dieback infected forest adjacent to its mining areas.

Prescriptions have been developed and the CALM works programme is funded by Alcoa through the Dieback Forest Rehabilitation Programme (DFR).

- Alcoa will dismantle its facilities on termination of mining and will carry out rehabilitation measures.

3.3 Water Authority

The Water Authority has particular responsibility for the protection and production of water supplies. Alcoa and CALM consult Authority staff as required. The Authority is represented on the MMP and MOG groups and contributes to the planning and implementation processes as shown on the attached diagram.

PART 2

Part 2 comprises detailed working prescriptions which specify objectives, strategy, technical specifications and works programme requirements in terms of timing, resources and funding. Responsibilities for the co-ordination and review of the existing prescriptions is between CALM's Co-ordinator and Alcoa Team Leader Mine Planning and Operations Group (MEPOG). The above representatives will have primary responsibility for the annual review of prescriptions. Existing prescriptions are reviewed annually and necessary amendments made.

DIEBACK CONTROL PRINCIPLES

CONTENTS

1. INTRODUCTION

The dieback control principles that are applied by Alcoa of Australia Ltd mining operations. With agreement for CALM. have been developed to meet the overall objective of effectively minimising the spread and intensification of dieback disease caused by *Phytophthora cinnamomi* whilst maintaining an efficient mining operation.

These principles have been developed based on a knowledge of disease location, degree of infection present and access control applied to the forest.

Mines fundamentally can either be managed as a Dieback-Free Mining System (Secured Site) eg. Huntly or as non-secured sites Jarrahdale and Willowdale. Irrespective of the security of the sites every attempt will be made using the principles outlined in this manual to meet the overall objective.

2. OVERVIEW

The prescriptions in this document have been developed for all Alcoa Mines operations and may vary depending on whether a secure (Dieback-Free system) or non-secure envelope approach to mining has been selected. This decision will be based on a number of criteria but principally on the area and distribution of dieback within the mine envelope.

As with other forest operations dieback control in bauxite mining operations will be in accordance with CALM policy. In general, this policy and associated operational procedures were developed essentially for forest operations other than mining.

It is important to note that mining differs markedly from these other operations in three important ways:

1. Soil and ore movement are fundamental requirements of mining, whereas dieback control in other forest operations is largely dependent on preventing soil movement.

2. Bauxite mining can be separated into two distinct phases:
   (a) Surface operations in contact with the soil
   (b) Subsurface operations at or below caprock level.

3. Mining is limited in extent at any one time and has the capacity for substantial earthworks to contain drainage and soil movement. Hence dieback containment is a feasible alternative to the strategies which rely on the prevention of soil movement to control dieback.

These differences have real implications for practical implementation of dieback hygiene/control. As a result the measures which are used are based on the same principles expressed in the CALM policy but utilise significantly different procedures, provided the intent of CALM Policy is adhered to (Policy statement No.3).

The aim will be to conduct operations under the conditions specified in the prescriptions. Recognising the developmental nature of the prescriptions, there will be a mechanism to resolve unforeseen problems as follows:

- Problem areas will be dealt with on a case by case basis. Initial proposals for handling these sites will be put up by Alcoa in consultation with CALM for agreement by the two parties. If agreement cannot be reached the matter will be referred to the Mining Management and Planning Liaison Group for consideration.

3. OBJECTIVES

The primary objectives for dieback control in the mining envelopes using the principles and procedures in this manual are as follows.

1. Effectively minimise dieback spread as a result of conducting mining operations

2. Prevent the introduction of *P. cinnamomi* to dieback-free soils during mining

3. Protect adjacent forest from dieback introduction and/or intensification

4. Achieve the above whilst maintaining an efficient mining operation.

4. GLOSSARY OF IMPORTANT TERMS

Secured Mining Envelope (Dieback-Free System)

A Secured mining envelope is defined as a mine for which there is:

a) Accurate knowledge of disease location

b) Well defined access and control of movement of vehicles both into and within the area e.g. agreed Access Plan

c) A haul road network which is constructed and maintained Dieback-Free

d) A high level of hygiene existing. All vehicles must have access to well maintained and effective cleandown facilities

e) Well developed drainage controls to prevent spread and intensification of the disease. Where necessary this includes the use of blasted or ripped drainage slots, developed before clearing and/or stripping operations

This system is currently in operation at the Huntly mine and allows for fewer seasonal constraints on operations except for the significant change of developing dieback areas under summer conditions. Operators are asked to work to the following simple principles.

i) Always clean machines thoroughly before entering mine
ii) Always obey forest signs and cleandown requirements
iii) Always know the dieback status and the signs in the area they are operating in
iv) Never allow any equipment to move from dieback to dieback-free without cleandown
v) Always report any violations (accidental or otherwise) of dieback control procedures to the foreman
vi) Always ask the foreman, if in doubt.

Non-Secured Site

A Non-Secured site is defined as a mine for which there is one or more of the following situations:

a) A high percentage of dieback infection pre-existing in the area
b) A greater reliance on seasonal constraints for hygiene management
c) Less use of quarantine measures.
d) Stringent requirements for field cleandown.

Drainage Slot

A drainage slot is an area adjacent to forest below an area to be mined which has been created by blasting or ripping of an area of caprock. It is as wide and as long as required to prevent water running over the surface of exposed caprock into the adjacent downslope dieback-free forest.

The drainage slot allows water to drain below the caprock level and therefore prevent the spread or intensification of dieback disease in downslope forest.

5. THE RATIONALE FOR CHANGE

Until 1989 pre-mining operations, up to and including soil stripping, were conducted under a hygiene prescription similar to that used for logging. Accordingly, where these occur in dieback free forest, they were restricted to that part of the year when the near-surface soils were dry.

These restrictions were consistent with the state of knowledge of *Phytophthora cinnamomi* and its biology at the time. In essence the restriction to dry soil conditions was to :

i) minimise soil movement from infected to uninfected areas
ii) minimise the survival of *P. cinnamomi* in the event of inoculum being transported into uninfected areas.

Prior to the late 1980's, mining operations were being conducted in forest areas close to the Darling Scarp which were comparatively heavily infected by dieback. The proportion of dieback and dieback-free areas being mined were similar and dry soil restrictions were operationally feasible. Subsequently however mining has moved into areas with a majority of dieback-free forest and it has become very difficult to operate in these areas only under dry soil conditions, due to the capacity of the operation to develop the appropriate area in an economic manner.

However knowledge of disease biology was also changing at this time. Research and modelling conducted by Alcoa and by independent consultants Rockwater Pty. Ltd. concluded that in fact the topsoil in cleared jarrah forest areas in typical mid and upper slope situations remained sufficiently moist throughout summer for *Phytophthora cinnamomi* to survive. This information, and the fact that mining by its very nature mixes soil, required the restriction of operations to dry soil to be re-examined.

Against this background an alternative hygiene regime has been developed which recognises these changes.

The essence of dieback disease hygiene is analogous to the approach to treatment of human/animal diseases. Preventing contraction of disease is regarded as preferable and many techniques are available to do this. However if disease is contracted then treatment reverts to attempting to cure or contain damage caused by the disease. Dieback hygiene too contains both the prevention and containment elements. These have been incorporated in the hygiene package(s) now used in bauxite mining operations. Parallels between mining and logging hygiene strategies are shown in Table 1.

Clearly, whilst the procedures involved may be different, the underlying principles are maintained to achieve the primary objectives of dieback control.

Table 1: A COMPARISON OF HYGIENE PRINCIPLES APPLIED TO LOGGING AND MINING IN A 'SECURED SITE'.

HYGIENE PRINCIPLE	CONVENTIONAL HYGIENE Refer Timber Harvesting in WA Manual March 1993 section 5.1.	'SECURED SITE' HYGIENE DIEBACK-FREE MINING SYSTEM
1. PREVENTION		
1.1 Prevent Introduction of disease	i) Vehicle Cleandown ii) Split-Phase iii) No Soil Movement	i) Vehicle Cleandown ii) Stringent Access Control (into and within Site)
1.2 Prevent Spread of Disease	i) No Soil Movement ii) Disease Mapping iii) Self-Draining Mini catchment iv) Split-Phase v) Vehicle Cleandown iv) Vehicle Cleandown	i) Disease Mapping ii) Effective Drainage Control iii) Dieback-Free Haul Road System
1.3 Minimise *P. cinnamomi* Survival	i) Dry Soil ii) Water Treatment ii) Water Treatment iii) Monitoring iv) Selective use of dry soil conditions.	i) Chemical & Heat Treatment
2. CONTAINMENT		
2.1 Minimise Area at Risk	i) Low Profile Roading ii) Mini-Catchments ii) Seasonal Planning iii) Ability to maximise Topsoil	i) Effective Drainage Control Return to disfavour the fungus.
2.2 Minimise Impact in Infected Areas	i) Select Silviculture ii) Impact/Hazard Mapping iii) Seasonal restrictions	i) Impact/Hazard Mapping ii) Effective drainage control incl. Deep Slots

6. A FOREST PRIORITY SYSTEM FOR BAUXITE MINING OPERATIONS

The Forest Priority system was developed in 1988 to enable mining operations to operate efficiently while effectively controlling dieback disease. It is documented in the CALM/Alcoa "Manual of the Forest Priority System and Developmental Prescriptions for Dieback Control in Good Quality Forest During Bauxite Mining 1 February 1989".

The system has been evaluated at the Huntly mine and to a lesser extent at Jarrahdale and Willowdale where the system has been referred to as the "category" system. The term "category" will no longer exist and all areas will be referred to as forest priority areas.

The system has been applied to all Alcoa's mechanised surface operations, from grade control drilling onwards (60 x 60m and infill drilling). Exploration drilling (120 x 120m and 120 x 60m) and survey are subject to the existing CALM hygiene prescription, in line with other more extensive forest operations such as logging.

The Forest Priority system will continue to be applied to all grade control drilling operations at all mines, as the drill operation is a surface operation similar to logging. The Forest Priority system will be applied to all pre-drill and blast operations where dieback hygiene practise occurs at a non-secured site. The system will be reviewed at such time that Alcoa does not have the capacity to achieve the required split of Priority 1, 2 or 3 within its mining areas.

Forest will be allocated to one of three priorities on a case by case basis.

Prioritisation will be based on accurate hygiene maps produced for all mines (see Table 2). The status and significance of downslope forest will also be considered on a case by case basis. The areas and priorities will be proposed by Alcoa for approval by CALM. Where Priority 1 areas are required to become Priority 2 then this will be done as per Table 3.

A cut-off of greater than 0.5 hectare downslope of a pit should be used as a guide to determine if a significant area of vulnerable forest exists downslope.

Table 2
METHOD FOR DETERMINING FOREST PRIORITIES USING HYGIENE MAP INFORMATION

PRIORITY ONE

(i) Areas of Secure Dieback Free within a reliable dieback boundary.

(ii) Most areas of Low Potential Risk.

(iii) Discrete areas of any other hygiene or dieback category that can only be accessed via Secure Dieback Free. (Very few in reality). Discrete areas of uninterpretable due to burning, or too few or lack of indicator species.

PRIORITY TWO

i) Areas of Low Potential Risk within a reliable dieback boundary which have a higher chance of having infection present*
ii) Areas of High Potential Risk
iii) Areas Not Effectively Quarantined
iv) Areas of Suspect
v) Areas of dieback
vi) Areas which are uninterpretable due to forest operations e.g. notching of trees in Dieback-Free areas, or burning.

* Low Potential Risk areas will be evaluated on a case by case basis, for example, distance from a higher risk category, should be taken into account when deciding whether it is placed as Priority 1 or Priority 2.

PRIORITY THREE

Areas of dieback, but may include small areas of other risk categories.

TABLE 3

PROCEDURE FOR RE-CLASSIFYING FOREST PRIORITY ONE AREAS TO FOREST PRIORITY TWO AREAS TO MEET DRILL CAPACITY REQUIREMENTS

1) Establish Forest Priority from Hygiene map information.

2) Site geologist to assess opportunities to flex drill layout to achieve better split between Forest Priorities 1, 2 and 3.

3) MES/MEA checks an historical coverage (as drilled) to determine the Priority under which areas have been drilled. MES to evaluate whether area can be re-prioritised given better dieback information or whether area will have to be drilled as previous years Priority.

4) Areas of Priority 1 which have not been effectively quarantined since interpretation should be considered for re-classifying to Priority 2.

5) Examine opportunities for infill drilling within a Priority 2 area within the same season. i.e. 30 x 30 first pass, with a possible additional 2 to 3 holes infill for each initial hole.

6) **Size of Priority 1 Areas**
Before any areas are downgraded on size the hygiene derived priorities need to be reviewed in total. Where small areas of either Priority 1 or Priority 2 have been identified in the middle of a drill sheet then the Priority 2 area may more logically become Priority 1 or Priority 1 may become Priority 2 to meet the practical requirements of the operations.

Areas of Priority 1 should then be downgraded on size, as a guide a cut off of greater than 0.5 hectare downslope of a area being drilled should be used. Areas for re-classifying should contain 100 holes or more. Areas with less than 100 holes will normally be drilled under the original priority. When sites have to reduce substantial areas of Priority 1 to Priority 2 to meet the operational capacity, then this needs to be raised with management.

7) **Use of vegetation data, slope, topography, soil type, etc.**
Other environmental parameters may be used to decide whether an area can be downgraded to Priority 2. This information is not always available.

7. PRESCRIPTION GUIDELINES

The guidelines below specify the method for determining the necessary dieback control procedures, and the conditions under which various operations can occur.

The procedures relevant to each operation are based on whether the site is a Dieback-Free system (secured mining envelope) or non-secured and are summarised in Table 3.

Assessment

a) Use of Disease Hygiene Evaluation and Prescription

Alcoa will nominate to CALM designated mining envelopes for approval for which prescriptions within these Working Arrangements will have application. For these operations a disease hygiene ~~declaration~~ evaluation form and permit for access will not be required.

For other activities such as drilling associated with the salinity research and access requirements of forest areas other than by Grade Control or survey, a disease evaluation will be required. This evaluation will determine the appropriate prescription for this activity.

The evaluation will only be undertaken again if the activity radically changes in nature. Permits will be issued on the original evaluation provided. Alcoa personnel to keep CALM informed of the access requirements of their operation, the disease status of tracks and operating site to be used, and the vehicles that will be used as the operation changes area. This should preclude the necessity of undertaking a disease hygiene evaluation at the commencement of each drill program or for those activities which are similar from year to year.

b) Alcoa will produce plans annually for areas within a Dieback-Free system. These plans will include planning for Access, dieback distribution, vegetation type, drainage control, soil movement, and rehabilitation plans.

The plans will be completed and available at the time the Clearing schedule is submitted for the area.

Within a non-secured site, Priorities will be tabled as part of the clearing notice for those areas being cleared. Priority coverage will also be available for grade control drilling. Changes to these plans are discussed with CALM at the time of presenting of the clearing schedule.

Mapping

The dieback hygiene mapping categories currently in use by CALM are grouped to create three operating categories: Dieback, Dieback-Free and Uncertain. These categories are derived from standard hygiene mapping categories as shown in Table 4.

The hygiene mapping categories are ranked from lowest (secure Dieback-Free) to highest (dieback) likelihood of *P. cinnamomi* infections being present. It is crucial to remember that mapping can only delineate areas where the vegetation show symptoms of the disease. It is still possible for areas which do not show symptoms of disease to have *P. cinnamomi* infections which cannot be detected yet.

The Mine Environmental Scientist (MES) is responsible for mapping and demarcation being complete before operation commences in area.

TABLE 4: CONTROL PROCEDURES APPLIED TO STAGES OF BAUXITE MINING OPERATIONS IN SECURED AND NONSECURED SITES

STAGE	ORGANISATION	PROFILE LOCATION	CONTROL PRINCIPLES AND STRATEGIES	SECURED SITE PROCEDURES	NON-SECURED SITE PROCEDURES
FIRS	CALM	Surface	As per CALM Timber Harvesting Manual March 1993 Sect. 5.1	Access as per mine Access plan	Access as per mine Access plan
Survey and exploration	Alcoa	Surface	As per CALM Timber Harvesting Manual March	As per agreed Access Plan	Access as per mine Access plan.
Grade control		Surface	1993 Sect. 5.1	Apply Forest Priority to area and agreed Access Plan	Forest Priority set with agreed Access plan
Logging	CALM	Surface	As per CALM Timber Harvesting Manual March	Preferably log at least 10/15 yrs ahead of mining	CALM traditional hygiene procedure
MFP		Surface	1993 Sect. 5.1	MFP maybe allowed in areas under moist soil if prior to clearing according to Forest Priority	CALM traditional hygiene procedure
Clearing	Alcoa	Surface	Containment Modified hygiene	Drainage control to enable operation in MOIST soil	Forest Priority set
Road Development	Alcoa	Surface - Subsurface	Modified Hygiene Containment	Clear dieback areas in dry soil conditions install dieback-free bridges in dry soil condition. Stripping in winter only after appropriate drainage protection installed.	Forest Priority set
Soil stripping	"	Surface _ caprock Modified hygiene	Containment enable operation in	Drainage control to MOIST soil.	Forest Priority set
Drill and blast	"	Sub surface	Containment	Cleandown applied leaving DB areas.	Cleandown at dieback boundary
Ore extraction	"	"	Containment	Dieback areas mined wherever possible when HOT conditions exist.	No constraints
Landscaping		"	Containment	Cleandown etc.	As constraints
Soil Return	"	New surface	Containment Modified hygiene	Dieback soil handled under dry soil conditions.	Cleandown prior to access to dieback-free.
Ripping	"	"	Containment	Cleandown between dieback categories.	
Rehab Mgmt	"	"	Containment	Drainage of perimeter tracks critical.	

TABLE 5: HYGIENE MAPPING AND OPERATIONAL CATEGORIES FOR DIEBACK CONTROL IN MINING

DIEBACK HYGIENE MAPPING CATEGORY	BAUXITE MINING OPERATION CATEGORY
Secure Dieback-Free Low Potential Risk High Potential Risk*	Dieback-Free
Uninterpretable Suspect Not effectively quarantined	Uncertain
High Potential Risk* Dieback	Dieback

* All High Potential Risk areas will be individually assessed. A decision to operate within the area as dieback or dieback-free will be based on the currency of the hygiene map. In some cases a larger operational buffer will be applied.

PRESCRIPTION FOR FOREST ACCESS CONTROL IN STATE FOREST

CONTENTS

1.0 INTRODUCTION

This prescription specifies the agreed procedure for access to State Forest which has been interpreted for the presence of the dieback fungus *Phytophthora cinnamomi* within and outside designated Disease Risk Areas (DRA)

1.1 Scope

The prescription has been designed to control general access to State Forest, prior to, during and after mining operations. It refers specifically to normal forest access tracks. Haul Road locations will be reviewed and agreed under the Five Year Mining Plan and Annual Clearing notice.

1.2 Control of Access

The control of access will enable all forest operations including mining to meet the dieback objectives, specifically during survey, exploration drilling, ore development work, haul road construction, blasting operations and forest environmental monitoring.

Access controls specified in other prescriptions must be adhered to, in addition to the controls specified in this prescription.

2.0 ACCESS SEQUENCE

2.1 Pre-Mining Access

2.1.1 Ten year mine plans are reviewed by Alcoa and CALM to identify all forest tracks using aerial photography and/or field checking where necessary. Where necessary consider declaration of areas as DRA (quarantining).

2.1.2 Some tracks not required by CALM, the Water Authority or Alcoa will be ripped up or blocked.

2.1.3 A Survey and Drilling Access plan covering the 5 year drill plan will be produced by Alcoa and approved by the District CALM office.

2.1.4 Tracks identified on the Survey and Drilling Access plan will be upgraded where necessary to improve dieback control. The need for upgrading will be by agreement between CALM District office and Alcoa. The standard of upgrading will also be decided by agreement, consistent with section 3.4 below.

2.1.5 Each access track based on dieback status will be designated as either all weather access or limited access ('no soil movement conditions only'). Roads which do not come up to all-weather standard may be closed by CALM District office. Roads may be upgraded by Alcoa or CALM to all-weather standard.

2.1.6 Alterations to the Survey and Drilling Access plan will be by agreement between the District CALM office and Alcoa as the need arises.

2.1.7 Tracks which could lead significant public traffic to unsafe areas will be closed by gates. These gates will be marked on the Access plan and adequately sign posted.

Alternative access will be via detours agreed between Alcoa and the District CALM office.

2.1.8 Forest tracks required for operations preceding haul road construction will be identified on a Mining Access plan, this will identify construction of additional tracks if required and closure of existing forest tracks by the haul road development.

2.1.9 Haul road alignments will be indicated on the Five Year Plan and approved on the annual clearing notice.

2.2 Post Mining Access

2.2.1 CALM and the Water Authority will identify long term management requirements to Alcoa five and ten years prior to mining, with particular regard to public access and minesite fire protection. Long term access will be selected with regard for the dieback status of the area and the need for protection of State Forest.

2.2.2 Long term access will be incorporated into the local land use management plan prepared for the region by CALM.

3.0 DIEBACK CONTROL STRATEGIES

3.1 General

The basic strategy governing dieback control during forest access to and from the minesite will be forest hygiene. During clearing development soil stripping and haul road construction the strategies may be hygiene and containment.

3.2 Access Designation

3.2.1 Forest tracks will be designated as 'all-weather access', suitable for use by vehicles all year round, or as 'limited access' tracks, which are suitable for access under dry, no soil movement conditions only. The designation will be based on best dieback information, area placed at risk from an infection or possible infection. Tracks may be upgraded to all-weather access to limit hygiene controls that will be necessary.

3.2.2 Hygiene Practice

Tracks nominated as 'limited access' may be used under no soil movement conditions where by clean vehicles has occurred. Limited access tracks should be regarded as dieback "suspect" because of the possibility of the track having *Phytophthora citricola* present on it that is not readily mapped from vegetation. All vehicles leaving the track to enter Dieback-Free forest must be inspected and if necessary cleaned down.

3.3 Standards

3.3.1 Vehicle cleanliness will be the basis for controlling dieback spread along forest tracks.

This can be achieved by:

Under moist soil conditions:

- Washdown with Dieback-Free water from a high pressure/low volume pump,

Under dry soil conditions:

- Blowdown with compressed air, and
- Brushing down.

3.3.2 Every vehicle accessing forest tracks in Dieback-Free State Forest should be inspected by the operator prior to entry to ensure that soil has not been picked up in transit. Cleandown at a nominated point is required if the vehicle is not clean. (Nominated cleandown points should always be located as low in the landscape as possible with drainage to an approved point).

3.4 Track Upgrading

3.4.1 Forest tracks which require upgrading should be agreed between Alcoa and the District CALM office.

3.4.2 Dieback-Free gravel should be made available to Alcoa for use in dieback-free areas. Dieback gravel can only be used for access tracks in infected areas. Agreement should be reached between the District CALM office and Alcoa on who is responsible for upgrading each track.

3.4.3 Except in Dieback, earthmoving work will only occur when the soil is dry. Suitable soil conditions will be determined by the Minesite Environmental Scientist with agreement from CALM District office.

3.4.4 Upgraded all-weather roads will be constructed to shed water and dry quickly.

3.4.5 Drainage from all-weather tracks is to be consistent with not introducing disease to Dieback-Free forest.

Drainage from all-weather tracks will be such that dieback-free forest will not be unnecessarily placed at risk.

3.4.6 Road upgrading equipment must be clean before entering Dieback-Free or Uncertain forest and when leaving Dieback and Uncertain areas.

3.4.7 Road drainage shall be shed into an approved sump or suitably vegetated area so as to remove silt while avoiding unnecessary ponding.

3.4.8 Grading of tracks should not be done in a way that pushes dirt long distances into forest, or deeper or wider than prescribed.

3.4.9 Soil should not be graded from uncertain or Dieback into Dieback-Free or Uncertain forest.

3.5 Supervision

Track usage by Alcoa staff and cleanliness of Alcoa vehicles will be supervised by Alcoa Minesite Environmental Scientist with periodic checks by CALM personnel. In order to ensure effective dieback control, CALM and Water Authority staff will also be required to comply with the provisions of the Access plan, in liaison with the MES.

3.6 Haul Road Construction (General comments)

3.6.1 Soil moisture conditions for construction of haul roads above Dieback-Free or Uncertain forest will be agreed with the District CALM office based on the extent and dieback vulnerability of downslope forest. *Areas with dieback-free forest below will require haul road construction under dry soil conditions.*

3.6.2 Haul roads and roadside drains above all forest will be constructed from Dieback-Free gravel.

All roadside drains must take water away from Dieback-Free forest.

3.6.3 Haul roads will be compacted to control the movement of dieback fungus into or out of the road base.

All roadside drains adjacent to Dieback-Free and existing low dieback impact forest will be compacted to control the spread of dieback fungus travelling through the drain to the native forest.

3.6.4 Haul roads with adjacent Dieback and Uncertain forest will have suitable containment structures to prevent the spread of dieback disease from the forest onto the haul road.

3.6.5 All roadside drains adjacent to Dieback-Free and existing dieback infection in low hazard forest will be compacted to stop the potential spread of dieback fungus travelling through the drain to the native forest to prevent the introduction or intensification in downslope forest.

PRESCRIPTION FOR OPERATIONS IN THE EXPLORATION AND DEVELOPMENT OF BAUXITE IN ALL STATE FOREST (INCLUDING SURVEY AND DRILLING)

CONTENTS

1. INTRODUCTION

1.1 The Ore Development Process

1.1.1 Geological mapping and aerial photography interpretation to delineate prospective areas.

1.1.2 Broad-spaced exploration drilling of lateritic areas. Drill holes are usually located off local bench marks using chain and compass. Drill grids range from 60m to 240m.

1.1.3 Geological mapping of caprock grade and textures based on a surveyed 60m x 60m grid. This determines targets within potential ore zones for close-spaced control drilling.

1.1.4 Close-spaced drilling to provide proven ore reserves. This delineates lateral and vertical limits of the ore body, and provides information for grade control in the mining process.

2.0 PLANNING FOR DRILLING OPERATIONS

2.1 Five Year Drilling Plan

Each July Alcoa will submit a Five Year Drilling Plan (1:25,000 scale) to the District and Regional offices of the Department of Conservation and Land Management.

This plan shows the broad direction of both exploration and grade control drilling over each of the ensuing five years. This will assist in the coordination of drilling and associated operations with other forest activities, particularly logging and prescribed burning, dieback photography and interpretation. Without such a plan there may be:

* Destruction of dieback symptoms and the creation of false symptoms resulting in greater difficulty in disease interpretation.

* Exposure of the soil (by burning) causing hygiene difficulties under moist soil conditions.

* Disturbance of pegs which have been accurately surveyed.

In addition, this plan permits commencement of CALM hygiene planning well in advance of the operations.

2.2. Annual Drilling Plans

By the first week of July each year Alcoa will submit proposals for the next 12 months' drilling operations to the District CALM office. These should include:

(i) Broadscale plans showing areas and type of drilling at 1:25,000 scale.

(ii) A programme indicating Alcoa's priority for operations.

(iii) A plan with dieback status and Forest Priority overlay for the proposed drilling areas. These will be used to develop a hygiene strategy. Where dieback information is incomplete areas will be drilled under dry soil conditions only.

All exploration drilling in State Forest including DRA will be subject to a dieback hygiene evaluation, for approval by CALM.

Operations in Dieback-Free forest will be scheduled for dry or moist soil, no soil movement conditions.

Operations in Dieback forest will be allowed at any time of the year.

Drilling hygiene requirements will determine how the programme is undertaken. Small shortfalls in capacity for a particular year may be resolved in liaison with the CALM Mining Industry Co-ordinator if this is possible without risking dieback spread.

2.3 Changes to Plans

Forest priority settings will follow the procedure "Method for Determining Forest Priorities Using Hygiene Map Information". Changes from this procedure are possibly by agreement with the CALM District Office (DWP) or Mining Industry Co-ordinator provided adequate notice for dieback demarcation is given.

Drilling hygiene may be audited by CALM. A plan showing the order of march for drills is to be submitted to the District Office at the commencement of the drill programme.

3.0 SCHEDULE OF OPERATIONS

3.1 Dieback Interpretation and Demarcation

This is CALM responsibility financed by Alcoa. Demarcation occurs just in advance of all field operations to ensure that hygiene conditions are consistently applied to those operations. The onus will be on Alcoa to identify operational areas to CALM with reasonable accuracy on 5 year drill plans. The minimum standard for interpretation is that all areas have been ground stripped using ground interpretation method.

3.2 Dieback Location Maps

Maps at 1:25000 scale and hygiene conditions (including access) should be forwarded by Alcoa minesite environmental scientist to the mine geologist for areas of operation in the ensuing season.

3.3 Dieback Hygiene Requirements

Prior to drilling three copies of the Annual drill plan will be sent to CALM. The drill plan will be overlaid with a Priority coverage and a dieback demarcation coverage.

3.4 Notification

Survey crew and drill rig locations are to be available at all times from the minesite security office.

4.0 HYGIENE OPERATIONS

4.1 Objective

To prevent the spread of dieback disease into Dieback-Free forest.

4.2 Dieback Categories

Areas of forest in which field operations are to take place will be categorised as Dieback, Dieback-Free or Uncertain based on the hygiene map.

In the forest these categories will be separated by Dieback Management Lines of yellow, red or white painted blazes on trees and will be demarcated by CALM officers dependant on the disease category. Old management lines will be painted over by CALM. Lines will be checked on an annual basis by CALM officers upon receipt of the 5 year and annual drill plans.

4.2.1 Access

Field Operations will be confined separately to each disease category. Transfer from one disease category to another requires specific hygiene conditions.

4.2.2 Standards

Vehicle and plant cleanliness is the basis for controlling dieback spread in the field operation. Cleandown will be carried out at all hygiene boundaries and will be achieved by:

Under moist soil conditions:

* Washdown from a high pressure/low volume pump.

Under dry soil conditions:

* Blowdown with high pressure compressed air.

* Brushing down.

Prior to departure from base depot all vehicles must be in a clean condition, and must follow an agreed access route to a field cleandown location.

4.3 Operating Conditions

Operations are permitted in Dieback forest under all soil conditions.

Operations are permitted in Uncertain and Dieback-Free forest only under no soil movement conditions. Soil moisture conditions will vary from site to site. Where drills are operating on heavy litter layers, no soil movement conditions may occur after quite considerable rainfall. CALM Officers are to liaise with Alcoa Environmental Scientists and Drill co-ordinator to maximise opportunity to continue operations.

Conventional support vehicles (eg. light vehicles, trucks, trailers) and all other non-drill vehicles are to remain outside the Dieback-Free boundary or on nominated hard surfaced roads when wet soil conditions exist.

4.3.1 Field Hygiene Practice

Uncertain and Dieback-Free Forest

(i) Every vehicle is to be inspected by the operator prior to entry into the area to ensure that no soil has been picked up in transit. A cleandown is required at the dieback boundary or nominated cleandown point, if the vehicle is not clean. (Nominated cleandown points should always be located as low in the land profile as possible.)

(ii) Each vehicle traversing an area must be continually checked by the operators to ensure that soil is not being picked up. If soil conditions deteriorate the operation must transfer to dieback forest via an approved access road.

(iii) After drilling each hole and prior to departure for the next hole, the drill rig must be inspected by the operator for cleanliness. If the rig is not clean of soil, cleandown is required. Control inspections may be carried out by CALM officers.

(iv) Where practicable, routine daily cleandown is to be carried out and operations should endeavour to start at the highest topographical point after a cleandown to prevent potential upslope infection during drilling.

(iv) Prior to leaving Uncertain or Dieback forest, vehicles are to be free of soil.

Dieback Forest

* Cleandown between holes is not necessary.

* Do not cross moist low-lying flats or creeks.

5.0 TRAINING

Vehicle operators must be trained in hygiene principles, techniques of inspection for vehicle cleanliness and vehicle cleandown. All training will be subject to an annual update and current prescription review.

Prior to departure from the base depot all vehicles must be in a clean conditions, and must follow an agreed access route to a field cleandown location.

6.0 RUBBISH

No refuse is to be left behind after any field operation.

7.0 FOREST DISTURBANCE

All field operations must minimise damage and disturbance to forest vegetation.

PRESCRIPTION FOR SOIL HANDLING IN BAUXITE MINES

CONTENTS

1.0 INTRODUCTION

1.1 General

1.1.1 This prescription specifies the agreed procedures for the removal, or stripping, of topsoil and overburden prior to bauxite mining operations and their return afterwards. These operations are collectively termed 'soil handling'.

1.1.2 Areas will normally be designated either Dieback, Uncertain or Dieback-Free and the soil handled separately.

1.1.3 It is desirable to minimise the number of dieback categories wherever possible. It is expected that Uncertain forest will generally occur infrequently. Where large areas do occur, separate planning and handling arrangements will be required. This is because mixing Uncertain soil with Dieback soil would contaminate the Uncertain if it had in fact been free of dieback. Similarly mixing Uncertain soil with Dieback-Free soil could result in contamination if the Uncertain soil was infected. Where small areas (<1ha) only occur they will be rationalised to dieback and replaced low in the landscape.

1.2 Definitions

1.2.1 "Topsoil' is here defined as the uppermost part of the soil profile containing the highest concentrations of organic matter, nutrients and plant propagules.

1.2.2 'Overburden' is the friable material under the topsoil and above the cemented caprock. It is generally sandy with varying amounts of organic matter and gravel. Distinct pockets containing gravel only are extracted separately for haul road construction. Gravel extraction is also covered by this prescription. Overburden generally ranges from 0 to 40cm thick. It is almost invariably stockpiled for some time.

2.0 PLANNING

2.1 Planning Sequence

2.1.1 An Access Plan will be prepared by Alcoa as part of the Dieback Management Plan for approval by CALM District office.

2.1.2 Dieback categories will have been established prior to clearing and these will be maintained during topsoil and overburden handling.

2.1.3 Dieback management requirements will be evaluated for each pit individually and shown on the Dieback Management Plan.

Topsoil and overburden handling operations should normally be scheduled wherever possible to preserve soil condition.

2.1.4 Scheduling should be inline with the Forest Priorities set for other stages of the mining operations. e.g.. clearing and rehabilitation.

2.1.5 Stripping and return will be planned so that each dieback category is treated separately.

2.1.6 A Soil Movement Plan will show the approved locations for stockpiles and for inter-pit transfer and location of dieback and dieback-free soils in rehabilitation. This transfer will be closely monitored by Alcoa staff and CALM as required.

2.1.7 As a rule all Dieback soil will be placed low in the landscape and Dieback-Free soil high in the landscape.

3.0 DIEBACK CONTROL STRATEGIES

3.1 General

3.1.1 The basic strategies governing dieback control during topsoil and overburden stripping will be by containment and hygiene. Control of disease introduction to surrounding forest will be by:-

* dieback mapping and categorisation
* access designation and control
* drainage control
* appropriate equipment cleanliness

Disease intensification will be controlled by:-

* draining roads and stripped areas to designated points identified on a Drainage Plan.

3.1.2 Disease control between different dieback categories will be by hygiene, limiting access drainage control and by permitting direct soil transfers between areas of similar disease status and seasonal restrictions.

3.2 Access Control

3.2.1 Access will be in accordance with the Access Plan prepared by Alcoa and approved by the District CALM office.

Topsoil haulage will only be within the same disease category. Dieback-free soil may be moved across a haul road on formed roads to which minimal water is applied to provided it has been allowed to dry out and access control prevents other vehicles accessing this road from a dieback area during the soil transfer operation.

3.2.2 Dieback control on access tracks will be according to the standard requirements outlined in the Access prescription.

3.2.3 Operations will be confined to a single disease category.

3.3 Soil Conditions and Cleandown

3.3.1 All equipment must be clean on entry to the site. (i.e. before entry to Dieback-Free area). Equipment may enter Uncertain areas without clean down from the secured area, but will need to clean down before entering Uncertain areas from Dieback, or other Uncertain areas.

3.3.2 Operations will be directed towards Dieback areas under dry soil conditions and Dieback-Free areas will have drainage control as determined by the drainage control process agreed by CALM/Alcoa, to allow operations to proceed under moist soil conditions in Dieback-Free.

4.0 SOIL STRIPPING

4.1 Sequence

4.1.1 Topsoil and overburden stripping usually occur on a number of areas, hence different disease categories, over the same period. Stripping follows the sequence below.

4.1.2 Within a secured site, a detailed plans covering drainage, access, soil movement and rehabilitation are developed by Alcoa and approved by the District CALM office.

Forest Priorities are planned and are shown on the Annual Clearing notice. Approved by the MOG group. Variations to the Forest Priorities must be approved by CALM District office.

4.1.3 Earthmoving equipment is cleaned down thoroughly before entry to the site, transfer and when transferring from a job handling Dieback-infected or Uncertain soil to a job handling Dieback-Free or Uncertain soil. Regardless of the status of previously handled soil, all equipment is also thoroughly cleaned down at every service.

4.1.4 Areas are stripped separately according to dieback category.

4.1.5 Topsoil to 15cm depth is removed and directly re-spread or stockpiled in a like area as shown on a Rehabilitation Operations Plan.

4.1.6 Overburden is removed and stockpiled on-site in an area of the same dieback category.

4.1.7 Gravel, where present, may be removed separately for construction purposes.

4.2 Field Operations For Dieback Control In Stripping In a Secured Site *(Non Secured Site)*

4.2.1 All light vehicles, including CALM and Water Authority light vehicles must be cleaned-down before leaving or entering limited access roads and other

designated areas. All light vehicles including CALM and Water Authority vehicles will comply with the designated access plan for dieback control.

4.2.2 Unwanted tracks are to be blocked and designated access over stripped areas to haul roads is to be approved by the Minesite Environmental Scientist.

4.2.3 Clean-down points are to be established at dieback boundaries in locations as designated on the approved Access Plan.

4.2.4 Any topsoil and all overburden stockpile locations will be marked by Alcoa in accordance with the Rehabilitation Operations Plan. Criteria for stockpile site selection will be as follows:-

* site to have the same dieback category as the soil to be stockpiled,

* topsoil is to be stockpiled for the minimum possible time in the smallest practicable stockpiles,

* area used is to be kept to a minimum.

4.2.5 Equipment to be cleaned in accordance with Section 4.2.3 above as well as the following:-

* *touchup cleandown to be performed at the disease boundary following transport of equipment from the workshop,*

* equipment is to operate in a single dieback category,

* a minimum amount of water is to be used on haul roads to avoid soil pick-up, while still allowing for dust suppression.

4.2.6 Service vehicles will comply with the same provisions applying to other mobile equipment when accessing cleared areas.

4.2.7 Drainage control sufficient to prevent runoff to the surrounding forest is to be established. This may be achieved by:

* establishing a bund or channel at the lower clearing edge,

* or excavating a gravel pocket to produce an infiltration sump.

* where necessary on steep, erodible sites or above healthy high dieback hazard forest stripping a band along the lower edge of the area and blasting immediately, before the remainder of the area upslope is stripped,

* directing drainage to sites approved on a Forest Protection Plan. The approved drainage method will be used to establish where drainage will be required (Fig. 1).

4.3 Dieback-Free Topsoil

4.3.1 Wherever possible Dieback-Free topsoil is to be returned directly to a designated Dieback-Free area for rehabilitation. The timing and route of transfer are to be as per the Soil Movement Plan.

4.3.2 Alternatively Dieback-Free topsoil is to be stockpiled for the shortest possible time in the smallest practicable stockpile within the same area.

4.4 Dieback and Uncertain Topsoil

4.4.1 Dieback topsoil to be stockpiled for the shortest possible time in the smallest practicable stockpile within the same area.

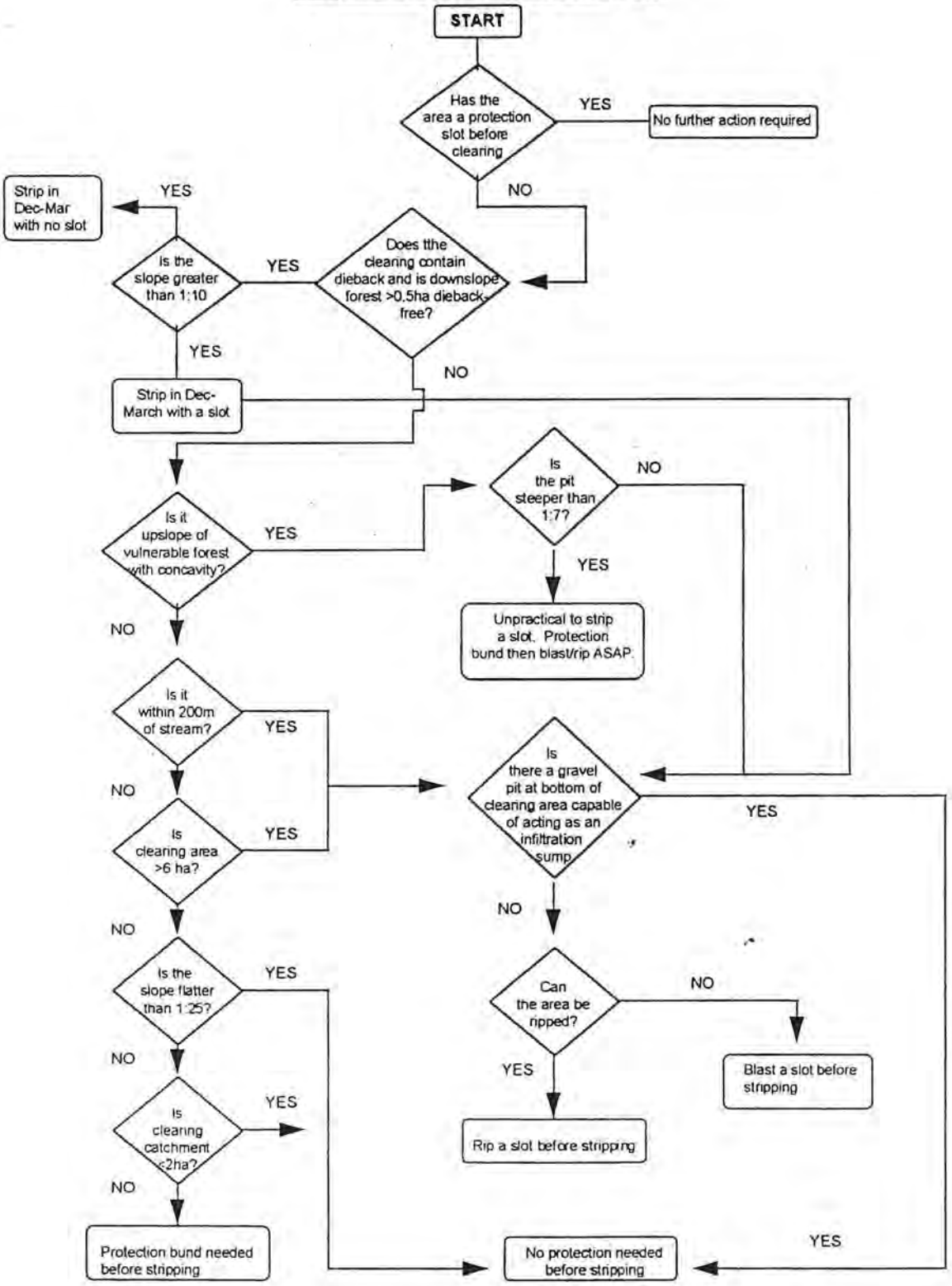
4.4.2 Where sufficient quantity is present Uncertain topsoil will be handled and stockpiled separately but treated in the same way as Dieback topsoil.

Direct return may occur, provided dieback soil is returned to dieback site.

4.5 Overburden and Gravel

Overburden is to be stockpiled on an area designated in the Soil Movement Plan. The minimum area is to be used. Dieback-Free gravel is to be conserved and utilised on Dieback-Free sites as required. Other gravel may be used as appropriate or stockpiled as per overburden.

FIGURE 1
DIEBACK AND STREAM PROTECTION - SECURED SITE
FLOW CHART FOR
2. DRAINAGE SLOTS BEFORE STRIPPING



5.0 SOIL RETURN SEQUENCE

5.1 Sequence

Topsoil and overburden return may be carried out in a number of areas over the same time period. Soil return follows the sequence below.

5.1.1 New dieback boundaries are marked with pegs in the field.

5.1.2 Earthmoving equipment is cleaned down thoroughly before entry to the mine. Equipment must be cleaned down leaving Dieback or Uncertain areas before entering the haul road so that soil does not fall onto the haul road during transport. Regardless of the status of previously handled soil, all equipment is also thoroughly cleaned down at every service.

5.1.3 Soil is returned according to the new dieback categories. All areas will be classed as Dieback, Dieback-Free or Uncertain.

5.1.4 Overburden is usually returned from stockpiles to an area of the same dieback category.

5.1.5 Topsoil is returned either directly or from stockpiles to an area of the same dieback category.

5.2 Field Operations For Dieback Control During Soil Return In A Secured Site

5.2.1 The general provisions listed under Section 7 above will also apply to soil return after mining.

5.2.2 New dieback boundaries are to be re-established following landscaping.

5.2.3 Designated access will be as per the Access Plan. Inter-pit transfer of topsoil must also comply with the Soil Movement Plan.

5.2.4 Equipment is to be cleaned as follows:

* equipment to be clean before entering the mine/*a Dieback-Free area*,
* equipment to operate in a single disease category,
* minimal water to be used on haul roads to avoid soil pick-up on tyres.
* equipment must be cleaned down on exit from dieback affected areas or Uncertain areas.

5.2.5 Equipment servicing provisions to be as per Section 4.2.6 above.

5.3 Overburden

Overburden is to be returned from stockpiles to the same disease category as it was stripped.

5.4 Dieback-Free Topsoil

Dieback-Free topsoil to be returned to a designated Dieback-Free area, via designated access, as per the Rehabilitation operations Plan.

5.5 Dieback and Uncertain Topsoil

Dieback and Uncertain topsoil is to be returned from stockpiles to appropriate new Dieback areas within the same pit.

PRESCRIPTION FOR DRILLING AND BLASTING IN BAUXITE MINES

CONTENTS

1.0 INTRODUCTION

1.1. General

Following topsoil and overburden removal, drilling and blasting are carried out. These operations occur below natural ground level. After blasting, future drainage is confined naturally within the pit boundaries and directed downwards into the soil profile.

Drilling here refers to blasthole drilling on cleared areas. It should not be confused with exploration or grade control drilling.

1.2 Access and dieback Boundaries

1.2.1 Dieback boundaries are maintained and observed throughout the drill and blast operation.

2.0 DIEBACK CONTROL STRATEGIES

2.1 General

2.1.1 The basic strategies governing dieback control during drilling and blasting will be by containment and hygiene. Control of disease introduction to the surrounding forest will be by:-

* dieback mapping
* access designation and control
* drainage control (to be wholly within pit or into Dieback)
* appropriate equipment cleanliness

Disease intensification will be controlled by draining roads and stripped areas to designated points.

2.1.2 After blasting a pit comprising several dieback areas can become one area. For hygiene between the pit and all other areas the classification of this new area is dieback unless it is comprised of only Dieback-Free areas, in which case it must be treated as Dieback-Free.

2.2 Access Control/Hygiene

2.2.1 Access to and from the pit will be on haul roads or access tracks as designated in the site access map and prescribed in the Access Prescription.

2.2.2 All vehicles leaving Dieback or Uncertain areas during drilling and blasting must be clean unless entering a Dieback site.

2.2.3 All drilling equipment leaving a area during drilling and blasting must be clean on leaving Dieback or Uncertain. *If dieback downslope, then no protection needed.*

2.3 Drainage Control

2.3.1 Prior to blasting of the lower edge of the pit drainage must be consistent with the approved Forest Protection Plan.

2.3.2 Once the lower edge of the pit is ripped or blasted any drainage reaching that lower edge must infiltrate below the caprock.

PRESCRIPTION FOR EXTRACTION OF BAUXITE

CONTENTS

1.0 INTRODUCTION

1.1 This prescription specifies the agreed framework for the extraction of bauxite ore from State Forest.

2.0 DIEBACK CONTROL STRATEGIES

2.1 General Controls

2.1.1 The main strategy for controlling dieback during ore extraction is planned drainage so that water is controlled within the haul road and pit system and discharged at designated points so as not to infect new areas of forest or intensify existing dieback.

2.1.2 Hygiene within the haul road/pit system is limited during ore extraction because only minimal amounts of soil containing organic matter are involved in this operation and the environment is intrinsically hostile for the fungus. Dieback areas need to be known by planners and loader operators, to ensure dieback material is not inadvertently carried throughout the secured system or used in road building.

2.2 Specific Controls

The following specific methods are used:-

2.2.1 Water will not be allowed to flow freely into surrounding forest but will be drained to designated discharge points or to places where it will infiltrate below the caprock layer. Rapid discharge of water is desirable provided the Water Authority water quality objectives can be met. However, the current state of technology does not allow for widespread discharge in active water catchment areas.

2.2.2 Access between the haul road/pit system and the surrounding forest will be controlled according to the Access Prescription.

2.2.3 Transfer and survival of dieback within the haul road/pit system is to be minimised by:-

* preventing the introduction of diseased soil onto the haul road/pit system.

* wherever possible dieback areas should be mined under hot conditions to reduce the opportunity for the disease to survive.

* limiting road watering so that surface water does not accumulate.

* using water free of inoculum for dust suppression.

* manipulating the site prior to rehabilitation to kill off or disfavour any fungal infections which may have been introduced, e.g.. by inducing deep drainage or by 'sun baking'.

* *No dieback boundaries are required. Equipment can move freely in a pit. Equipment can enter and leave the pit at anytime, via the haul road.*

* *Any equipment leaving the pit via the forest is subject to the provisions of the Access prescription.*

3.0 PLANNING

3.1 Haul Roads and Access Planning

3.1.1 Haul routes from pits will be presented on the Annual Clearing notice and agreed by the MOG group. Specific access around the site is defined as part of the Access Plan prepared by Alcoa and approved by CALM District Office. The Water Authority will be consulted on specific aspects of this plan.

3.1.2 Haul roads are to be within pits wherever possible. Where haul roads are outside pits they are to be placed just above the dieback line.

3.1.3 Drainage is planned to infiltrate water below caprock layer *not on the surface.*.

3.2 Mine Planning

3.2.1 Dieback management requirements will be evaluated by the site MES and endorsed by CALM prior to the annual MOG review.

4.0 FIELD OPERATIONS FOR ORE EXTRACTION

4.1 Supervision

Alcoa staff will be responsible for the implementation of this prescription. CALM District Office will be responsible for periodic checking and general supervision.

4.2 Access

Access is to be confined to routes approved by CALM *and the Water Authority* via the Five Year Plan and the Access Plan.

4.3 Equipment Design and Cleandown

4.3.1 All light vehicles, (including CALM, WAWA, Service etc) must be cleaned down before leaving or entering limited access roads and other designated areas. All light vehicles will comply with the designated access plan for dieback control.

4.4 Pit Drainage

4.4.1 In pits with deep bauxite, runoff will be collected and infiltrated into the pit floor. below the level of the caprock. Where this is not possible, in-pit drainage will be according to the drainage plan approved by CALM District and the Water Authority.

4.4.2 Water will be discharged to a sump or filter as low in the profile as possible, provided all Water Authority guidelines can be met.

4.4.3 Areas of infiltration will be located where conditions downslope are not conducive to transfer of infiltrated water to surface soils in forest which is vulnerable to dieback (i.e. Dieback-Free or where the existing dieback impact is low).

4.5 Haul Road Watering and Drainage

4.5.1 All haul roads requiring watering will be internally drained to designated points approved by the Water Authority.

4.5.2 Pit drainage will be collected within the pit for infiltration in-situ or discharge to a point approved by the District CALM office and the Water Authority.

4.5.3 In-pit haul roads will also be formed up with drainage to a designated point.

4.5.4 All water used for construction and dust suppression will be free of inoculum to a standard to be agreed between CALM and Alcoa.

4.5.5 Avoid overwatering the haul roads as excessive watering results in large amounts of mud adhering to vehicles.

4.6 Field Controls

4.6.1 A downslope barrier will be established where a pit is above Dieback-Free or existing low dieback impact forest. Pit drainage water will be diverted away from areas above these forest types or infiltrated below the caprock layer consistent with 4.4.3. *Where this is not possible water will be discharged directly to a point designated by the Minesite Environmental Scientist in consultation with CALM District Office.*

PRESCRIPTION FOR REHABILITATION OF BAUXITE MINES

CONTENTS

1. INTRODUCTION

1.1 Environmental aspects of bauxite mine planning, operations and rehabilitation in the jarrah forest are complex. Overlapping tenures and legislation are involved, together with interactions between land use and biological factors.

1.2 However, the complexity of the system must not deter the formulation and clear statement of objectives, strategies and most up-to-date techniques. This statement can then provide an agreed basis for review and up-date by all parties involved as well as operating guidelines for field personnel.

1.3 The first such statement was entitled "Rehab. 80". It was produced by the Department of Conservation and Land Management (CALM.) in consultation with Alcoa.

1.4 Following a period of implementation and further research and analysis by Alcoa and CALM., previous prescriptions were withdrawn and replaced by this prescription after joint review.

"Rehab. 94-96" is the current document describing techniques to be used in bauxite mine rehabilitation in the higher rainfall zone of the jarrah forest.

1.5 New techniques (i.e., departures from this prescription) may be introduced as research projects, as long as:

- the location and timing is approved by CALM. in consultation with the Water Authority where water catchments are concerned.

- accepted research procedures for experimental design, measurement and follow-up are fulfilled.

1.6 The prescription will be reviewed annually, at which time new strategies or techniques will be considered for incorporation.

Input for this review will be considered from the interested groups or those involved in the rehabilitation operation. The review will be co-ordinated by CALM. Any proposed changes to objectives, strategies or operational techniques will be fully documented, outlining the reasons, and detailing the data to support the proposed change. They will be subject to comment and acceptance by appropriate government authorities and the mining company.

2. THE OBJECTIVE

Bauxite mine rehabilitation is to be consistent with the Regional Management Plan. The overall objective of bauxite mine rehabilitation in the jarrah forest is to maximise the forest's potential by:

Establishing a stable, self regenerating jarrah ecosystem, planned to enhance or maintain water, timber, recreation, conservation and/or other nominated forest values".

Specific goals (not listed in order of importance since priorities may vary with designated land use) are:

2.1 Water values: to ensure that mined areas provide acceptable water quality and quantity.

2.2 Timber: to grow a forest which has the potential for sawlog production.

2.3 Recreation: to maintain existing recreational values where possible and to provide increased opportunities for forest based recreational activities in accordance with CALM. regional and district recreation plans.

2.4 Protection: to conserve the residual soils; to control dieback spread and to manage potential fire hazards.

2.5 Landscape: to create a rehabilitated landscape visually compatible with the adjoining indigenous forest.

2.6 Conservation: to encourage the development of floral, faunal and soil characteristics of the indigenous jarrah forest ecosystem.

2.7 Economical management: to produce a rehabilitation system which can flourish (in the short term) and become self sustaining (in the long term) without continual applications of nutrient/management resources.

To meet multiple use forestry goals, long term rehabilitation management must be compatible with that of surrounding jarrah forest (in terms of points 2.1 - 2.7)

3. REHABILITATION STRATEGIES

These are:

3.1 The development of prescriptions for rehabilitation procedures for each mined area, in accordance with the designated CALM management plans.

3.2 To conduct research programmes to improve rehabilitation procedures. In the event of research information becoming available, modification to this prescription may take place before the next review by mutual agreement.

3.3 The monitoring of rehabilitated areas to determine their capacity to sustain long-term production of the forest values listed in the objective, and

3.4 The development of remedial treatments should monitoring reveal that rehabilitation objectives were not achieved.

4. REHABILITATION PLANNING

Rehabilitation planning occurs at two levels:

i) The first is broad-scale regional mine site planning on a five year time scale.

ii) The second is annual detailed operational planning on a pit-by-pit basis.

4.1 Regional Planning: the mining company is required to produce an annually updated five year mining and management plan for government approval. Those plans should be drawn up in consultation with appropriate government departments and should consider the following regional aspects:-

- the sequence of mining and rehabilitation
- access for mining, public and future management
- location of mine facilities
- dieback management
- aesthetic and landscaping considerations
- fire protection planning
- integration of mining into land use plans so as to minimise adverse impact on priority uses
- requirements for long-term management
- broad description of site vegetation types and reconnaissance for rare flora and fauna
- water management systems and water course protection
- proximity to private property.

4.2 Annual Operational Planning : detailed conceptual proposals for each mine pit should be prepared before rehabilitation. Each proposal should be jointly prepared by CALM., mining company staff and discussed with the Water Authority in water catchment areas and should consider the following specific factors:-

- pit identity
- dieback management, drainage, erosion control and water management, specifying measures to be used from initial drilling through to completed rehabilitation;
- treatment and management of land over non-ore bodies within and adjacent to ore i.e. "islands" of unmined forest;
- species to be used;
- any special features to be incorporated or retained (e.g. pit walls) as part of the rehabilitated landscape;
- internal access to pits for future forest management;
- location of mining facilities/structures;
- scheduling in sensitive areas;
- rock management;

- movement, stockpiling and replacement of top soil and overburden, in relation to dieback spread within and downslope of the pit.
- identification of features such as permeability, slope, waste islands, rocks, state of forest downslope, wetness of pit, thin overburden, sudden slope changes etc, which may require special handling;
- any research projects on the pit, including method and timing of decommissioning of the project at its conclusion.
- The long term management strategy for the rehabilitated area as planned by CALM.

The conceptual rehabilitation plans will be endorsed by the CALM. District Manager following discussions with other government agencies where appropriate.

Contentious or unusual areas will be referred to the Regional Manager or the Mining Operations Group.

Research proposals frequently will not be finalised until after the completion of conceptual plans. Such proposals, in the form of approved working plans, should be submitted no later than the 1st of December. Where the research project differs significantly from standard practice the means and time of decommissioning the project should be specified.

Research proposals, and other departures from the conceptual plan, should be jointly considered by the CALM. District Manager and Alcoa and interested Government Departments.

4.3 Fire Protection Provisions

These are outlined in detail in Fire Protection Plans produced for each mine site. CALM. District Manager will ensure that conceptual rehabilitation proposals are formulated in conjunction with the minesite protection plans.

5. DIEBACK MANAGEMENT

The following dieback management controls are applicable.

Landscaping

1.0 Introduction

Landscaping involves the battering down of vertical pit faces and the construction of contour banks and sumps. All operations occur within the pit, below natural surface, on clay subsoil.

This prescription for dieback control in landscaping is to be applied in conjunction with the rehabilitation prescription.

2.0 Sequence of Landscaping Operations

2.1 Because it is a subsurface operation on the clay mine floor, landscaping can occur under any weather conditions provided the approved rehabilitation design can be achieved.

2.2 Earthworks are carried out according to the rehabilitation plan as follows:

2.2.1 Vertical faces are re-shaped to achieve acceptable grades.

2.2.2 Sumps are constructed in clay floor material.

2.2.3 Contour banks and drains are constructed as required.

2.2.4 Heavy equipment leaves the pit via the haul road system.

2.2.5 Service and supervisory vehicles access the pit, via the haul road system, to service the heavy equipment.

3.0 Dieback Control Strategies

3.1 Containment

3.1.1 All run-off is contained within the pit, approved drainage routes and the haul road drainage system.

3.1.2 Water is ponded below caprock level away from adjacent forest.

3.2 Hygiene

3.2.1 Equipment must not drive into the adjacent forest.

3.2.2 To avoid pushing infected material into the pit, earth is pushed up to the vertical faces from within the pit where the pit abuts infected forest. Elsewhere the faces may be pushed down.

3.3 Access

3.3.1 Dieback boundaries may be required. Dieback-Free areas may need to be protected from Dieback areas above or adjacent to the area. *Equipment can enter and leave the pit at any time, via the haul road system.*

3.3.2 Any equipment leaving the pit via the forest is subject to the provisions of the Access Prescription.

3.3.3 Equipment must be cleaned down on entry to the secured site, or if leaving a Dieback or Uncertain area.

Soil Handling - refer to Soil Handling prescription.

Ripping

1.0 Introduction

Ripping occurs on the new surface after soil has been returned to the pit. Dieback control strategies appropriate to surface operations are therefore required. (Soil return is covered in the Topsoil and Overburden Handling prescription.) A high degree of runoff control will be provided by the pit drainage structures.

Ripping is carried out to break up subsoil compaction to permit tree root penetration, assist infiltration, assist surface water detention and key the surface soils into the clay subsoil.

Ripping is carried out with a winged tine to promote vertical heave and lateral cracking under all subsoil moisture conditions.

This prescription for dieback control during ripping is to be applied in conjunction with the rehabilitation prescription.

2.0 Dieback Control Strategies

2.1 Before topsoil return new dieback boundaries are pegged on contour. *Soil is returned on the contour. This facilitates ripping a pit continuously.*

2.2 Dozers are cleaned down
1. at entry to the mine.
2. before exit from Dieback or Uncertain areas unless entering a Dieback area.

2.3 Winged tine ripping can occur provided soil is not transferred to adjacent Dieback-Free forest or Uncertain area or from Uncertain area to Dieback-free area.

Dieback, Uncertain and Dieback-Free areas are ripped separately with clean down as in 2.2 above.

Erosion Control, Seeding, Planting And Fertilisation

1.0 Introduction

All the above activities involve the use of similar equipment. The operations all occur on the new soil surface, with drainage control provided by the pit structure.

Erosion control works are defined here as those works which occur after topsoil return. Construction of sump and contour banks are covered under the Landscaping prescription.

Erosion control works involve the use of equipment such as CAT 910, Bobcat, or D6 to construct waterways. Jute mesh, seed and bitumen and applied by hand. Fertiliser is broadcast by helicopter.

Hand planting and fertilising require transportation of tree seedlings and fertiliser by light vehicles. Planting and spot fertilising are done by staff on foot.

This prescription for dieback control is to be applied in conjunction with the rehabilitation prescription.

2.0 Rehabilitation Operations Sequence

2.1 Erosion control structures are built prior to the onset of autumn rains. These may comprise waterways, sumps, overflows and filters. Waterways may cross from Dieback-Free to Dieback areas. Sump overflows and filters will be low in the landscape, often in Dieback.

2.2 Handseeding generally occurs prior to the autumn rain. Fertilizer is spread by helicopter in early spring.

2.3 Planting of tree seedlings and spot fertilisation are carried out by hand, following significant opening rains. This operation is supported by light vehicles transporting supplies.

3.0 Dieback Control Strategies

3.1 Erosion Control Structures

3.1.1 Erosion control structures should be built under dry conditions. Equipment should be clean before entry to Dieback-Free or Uncertain areas.

3.1.2 Where it is necessary to construct a waterway from a Dieback-Free to a Dieback area, it should be constructed under dry soil conditions. Equipment should work from Dieback-Free to Dieback.

3.1.3 Equipment should be cleaned down before leaving a Dieback or Uncertain area unless entering an adjacent Dieback area.

3.2 Broadcast Seeding and Fertilising

3.2.1 Broadcasting under dry soil conditions will minimise dieback spread. Where tractor-mounted equipment is used it should be clean before entry to Dieback-

Free or Uncertain areas and cleaned down before transfer from Dieback or Uncertain to Dieback-Free or Uncertain.

3.2.2 Where aircraft are used no opportunity for dieback spread should exist.

3.3 Hand Planting and Fertilisation

3.3.1 Due to the need to operate under wet conditions, these operations require particular attention to dieback control.

3.3.2 Vehicles not carrying plants and fertiliser should be confined to defined access tracks. All vehicles should be clean before entering Dieback-Free and uncertain areas and cleaned down before leaving Dieback and Uncertain areas unless entering on adjacent Dieback area.

3.3.3 The opportunity for dieback spread by planters working on foot will be limited. Planters should be aware of dieback hygiene requirements and avoid deliberate transfer of excessive amounts of mud or soil between dieback categories.

3.3.4 Access tracks should be located as low in the profile as possible with all drainage water directed into the pit or into resistant vegetation.

3.3.5 Hand tools should be clean before transfer from Dieback or Uncertain areas to Dieback-Free areas.

3.3.6 The use of Dieback-Free nursery stock will prevent dieback introduction from this source.

6. PREPARATION OF PITS FOR PLANTING

6.1 When mining is completed, the following earthworks will be carried out.

6.1.1 Deep ripping of compacted pit floors which may be covered with more than 0.5 metres of fill.

6.1.2 Landscaping.

6.1.3 Replacement of overburden, then top soil.

6.1.4 Deep or shallow ripping, or scarification as required. (See 6.6)

6.1.5 The construction of water management structures such as contour and grade banks, waterways and sumps.

6.2 Landscaping: Pit walls will be battered and smoothed. Waste islands, and pit floor will be shaped and filled. Occasionally pit walls may be retained if prescribed in a recreation plan. In this case visitor safety needs to be considered e.g. perched boulders, long-term stability of cliff wall.

6.3 Overburden and top soil will be evenly respread over all areas to be rehabilitated. The distribution of this material from pit to pit will be in accordance with the following requirements:

i) No transfer of infected material to dieback free sites which are above significant areas of dieback free vegetation.

ii) Endeavour to move soil under moisture conditions appropriate to its dieback status in accordance with arrangements agreed with the District Manager.

iii) Attention is to be paid to the need to avoid significant damage to the structure of topsoil as a result of handling (stripping or cultivating) when the soil is excessively wet. The guidance of the site environmental scientist should be sought if doubt exists regarding the soil moisture status. Generally soil is considered excessively wet if surface ponding is occurring or the soil is clearly at or above field capacity".

6.4 Unmined areas

Islands or inliers of low grade ore often occur within a pit and at times non ore areas beyond the pit boundary will be identified for stockpiling purposes. Clearing of these areas should be kept to an absolute minimum. However, there will be occasions when they are both cleared and stripped. When this need occurs, it will be justified to the satisfaction of the District Manager.

When this occurs, either the area will be completely landscaped or the unmined caprock will be 'popped' with explosives to provide planting sites and minimise surface runoff. The exception to this will be those areas, identified on conceptual plans as being within a noise restriction zone or inside safe blasting distance from private property. Blasted craters will be graded level before respreading overburden and top soil. Overburden/top soil should be at least 30 cm. deep and scarified, on contour as an aid to erosion control. Deep ripping in these areas should normally be avoided in order to reduce the appearance of surface rocks.

Vegetation establishment and growth on unmined areas have tended to be less successful than that of the adjacent rehabilitated mine pits.

In addition to the routine planting and/or seeding of these sites a supplementary seeding mix will be applied.

A seed mix comprising understorey and appropriate eucalypt spp., as designated in 8.5 of this prescription, will be applied to these areas at a rate in excess of 1 kg/ha, sufficient to ensure comprehensive vegetation establishment on the waste island.

6.5 Rock management

During the pit preparation work, care must be taken not to import, or bring to the surface, large boulders - which would make the future forest floor untrafficable. If boulders are brought to the surface enough rocks must be removed from the rehabilitated area to allow access for future management including fire control, silviculture, and other tending or harvesting operations. The removal of rocks may occur before or after planting provided the objective of avoidance of soil compaction and erosion control are not compromised and plants are not damaged.

6.6 Ripping

Deep ripping is required to fracture the compacted pit floor to allow root penetration and, water infiltration; to provide an "anchor" for the returned top soil; and to control the overland flow of water. Joint inspection by CALM. and Alcoa of pits prior to ripping will be carried out where appropriate to determine specific requirements. In General

i) All of the rehabilitated areas require either contour or grade ripping,

ii) Deep ripping should be done using a winged tine to maximise subsoil fracture; batters and banks need not be deep ripped, but must be scarified or shallow ripped. This avoids bringing up rocks, but still controls erosion and prepares a seed bed;

iii) The distance between parallel riplines will depend on soil conditions, but must ensure a continuous fracture of the compacted subsoil;

iv) Ripping should be as deep as possible and should not be less than 1.2 metres.

v) Where soil erosion control provisions will not be compromised, the ground surface should be levelled wherever possible during or after deep ripping by use of a flattening bar. Any alternative techniques which ensure erosion control while producing a smoother surface are to be encouraged.

vi) To avoid bringing up rocks, cleared, unmined areas should be scarified on contour.

6.7 Fauna Return

Revegetation practices have the objective of restoration of the jarrah forest ecosystem. As such, faunal habitats are anticipated to develop over time as the system approaches climax. Where opportunities occur to enhance the capability of rehabilitated minepits to provide the widest range of fauna habitats, these opportunities should be exploited .

In all cases where specific activities in this area are proposed (eg. establishment of chuditch mounds and fauna corridors) they should be discussed with and approved by the relevant CALM. and Alcoa wildlife research groups before implementation.

7. WATER MANAGEMENT

7.1 Careful water management must be considered in every phase of the operation from initial clearing and road construction through to completion of rehabilitation.

7.2 A variety of water management systems may be adopted, depending on land use priority, site, characteristics and the nature of the specific catchment or storage facility.

7.3 Criteria for Success: irrespective of the system which is used, it must satisfy the following basic criteria:

- there must be a minimum of top soil erosion within pits,
- rehabilitation and associated activities will not contribute to any significant or long term deterioration in water in adjacent streams relative to the designation of water use in any particular catchment.
- there must be no long-term ponds of water lying either within or below pits or roads unless planned.
- the need for long-term maintenance must be minimal,
- peak flood levels should not be increased by mining in catchments such that they endanger dams on the catchment;
- the system must be acceptable in terms of costs, aesthetics and the land use priority.

7.4 Water Management Systems

Pits may be designed and constructed so as to:-

i) retain and infiltrate water; or

ii) discharge water.

A combination of retention and discharge techniques may be used. A recurrence interval of once in twenty years will be used as the rainfall design period.

7.4.1 Water retention and infiltration will be achieved by:-

i) infiltration and silt trapping in the contoured rip lines; and

ii) collection of overland flow, either in a series of midslope contour banks and a pit bottom sump, or by a system of grade discharge banks directing overland low to predetermined sump areas within the pit.

Where used, contour interceptor banks will be constructed at up to 10 metre vertical intervals. Such banks may not exceed 1 metre in height nor have steep sides which present an obstacle to future access. Where specified, contour interception banks must be provided with suitably constructed overflows and non-erodible spillways. Construction of these devices must be completed before the first Autumn rains.

Grade discharge banks will connect to a stabilised waterway.

Well drained sites may require no engineered drainage structures.

Sump and drain locations will be indicated on the conceptual rehabilitation plans.

7.4.2 Water Discharge: Where this is prescribed it will be achieved by:

i) infiltration and silt trapping in the contoured or grade rip lines, and

ii) control of overland flow by grade banks, waterways and slow release detention ponds or filter systems.

Grade banks should be constructed so as not to erode, and to be located with a maximum 10 metre vertical interval. Distance apart should depend upon site characteristics and should be such that any potential erosion is contained between two grade banks, and does not create serious management problems such as accessibility, safety and loss of top soil.

Waterways should collect discharge from grade banks and deliver water to the discharge system. The discharge system from the detention pond or filter system should provide a major passageway for water; avoid long-term detrimental effects of silt and water on forest or stream vegetation; minimise forest soil erosion, and not significantly increase turbidity levels in forest streams. In addition in water catchment areas any discharge into the stream shall comply with the requirements of the Water Authority.

7.5 Unless planned, drainage from mine access roads, haul roads, mine site facilities or from pits must not flow uncontrolled into unmined dieback-free forest, but must be channelled (via ponds or filters) directly into the lowest part of the landscape at agreed locations.

7.6 All erosion control earthworks other than deep ripping with the winged tine must be completed and effective before the first Autumn rains (i.e., generally before 30th April each year).

Winged tine ripping effectively shatters the clay zone all year round.

Standards will be monitored and remedial action specified as appropriate and as agreed to by Alcoa/CALM. officers.

8. EUCALYPT ESTABLISHMENT

8.1 Seeding/Planting Layout and Design

8.1.1 As a general rule, tree species will be established as mixtures. Monocultures may occasionally be planted in localised portions of the landscape.

Every mixture must include species native to the Darling Range. Species mixes will be determined in advance and specified in the rehabilitation plan by CALM.

8.1.2 Plant spacing will be varied according to the detailed site rehabilitation objectives. In some areas such as at prominent view points or vistas and along selected areas of road, areas may be left unplanted. In other instances, trees may be planted in small groups or clumps to minimise the rigid plantation effect created by row planting on a regular spacing.

8.1.3 The most economic and effective method of establishment should be chosen. Seeding is the preferred option. The desired stocking rate should be sufficient to produce a well-formed tree. A standard of 2000→ 2500 seedlings per hectare by broadcast seeding should be achieved and 1250 plants per hectare for planted stock. Alcoa will assess the areas 9 months after seeding.

8..4 Do not plant trees in drainage channels.

8.1.5 Start planting in June when the soil is wet to depth. Cease planting by the end of the second week in August. Seeding will be undertaken in April/early May.

8.1.6 Seedling specifications: plants in jiffy pots or paper pots, at least 5-30 cm. in height with a minimum of 2 true pairs of leaves. Pots and soil mix sterile. Exposed roots to be trimmed before planting.

8.2 Before seeding or planting all pits will be inspected by CALM. officers. Parts of pits which are deemed by CALM. to be inadequately prepared, may not be planted until they are adequately prepared.

8.3 Access for rehabilitation crews must be pre-planned and specified so as to minimise traffic through unmined forest to minimise disease spread; and across the prepared pit to minimise erosion.

8.4 The CALM. District Manager must ensure a detailed record of species seeded or planted and treatments applied is made at the completion of the job.

8.5 Selection of Tree Species for Seeding/Planting: Criteria for selection of tree species are:

i) Compatible with land use objectives specified in Regional Management plan

ii) Site suitability index

iii) Tolerance to dieback

iv) Fire resistance

v) Capacity for roots to penetrate the compacted kaolin layer

vi) Useful timber

vii) Proven species longevity, growth to maturity and regeneration in the mine pit environment

vii) Visual compatibility with indigenous forest
viii) Useful food and nectar sources for fauna

Following are the species to be used in bauxite mine rehabilitation in the western, high rainfall area:

Eucalyptus marginata
Eucalyptus calophylla
Eucalyptus patens
Eucalyptus megacarpa

The criteria for determining the distribution of the different species will be determined by position in the landscape and the risk and hazard of dieback disease. Risk and hazard will be determined by agreed procedures which are currently under development.

Alcoa staff and the CALM. District Manager will agree on site criteria when selecting species in the preparation of conceptual plans.

Definitions of Risk and Hazard

Risk is an external force or agent that would bring *Phytophthora cinnamomi* (P.c.) to a site. Hazard is the degree to which conditions within the site favour the proliferation of the P.c. fungus once it has been introduced. The ability of plants to resist an infection is included as part of hazard rating.

8.5.1 Species Selection Criteria

1. 50% bullich 50% blackbutt

   Only to be used for stream crossings and the parts of pits with RL's similar to the adjacent bullich zone. This will be a very small proportion of rehabilitation.

2. 60% jarrah, 20% marri, 20% blackbutt

   To be used in pits where the majority of the area is composed of gullies, bowls and/or sumps or where the water gaining sites are large (>.5 ha). This will be a small component of each year's rehabilitation.

3. 80% jarrah, 20% marri

   To be used on all sites not covered by 1 and 2.

   If sufficient jarrah seed is available, then priority for the 80/20 mix should go to the dieback free areas with the infected sites receiving the 60/40 mix.

8.6 Seed Sources for Seedlings

All seed to come from a range of provenances (locations to be approved by CALM.).

8.7 Fertilizer

Where direct eucalypt seeding is the selected method of establishment, a broadcast fertilising regime of 500 kg/ha of a mixture DAP/K_2SO_4 plus micronutrients will be applied.

Where planting is used for establishment apply 200 grams of Diammonium phosphate per plant. Fertilizer to be placed approximately 15 cms from the base of the planted seedling in a spear hole or stamped depression.

8.8 Success Criterion for Seeded/Fertilised Areas

The success criterion for eucalypt seedlings in year one is 2,000 stems/ha with 65% of this figure being the lowest acceptable value as assessed at 9 months on a whole pit basis.

8.9 Success Criterion for Planted/Fertilised Areas

80% survival of planted species at 9 months after planting.

Areas of 0.5 hectares and above which fail to meet the criterion set out in 8.8 and 8.9 are to be rescheduled for replanting/reseeded the next winter.

9. UNDERSTOREY ESTABLISHMENT

9.1 The aim of understorey establishment is to generate a diverse and vigorous understorey which will rapidly contribute to soil stabilisation, erosion control and the build-up of soil nutrients and organic matter. At the same time, development of fuels and fire risks should be kept to tolerable levels.

9.2 Base species for the seed mix, comprising about 75% of the mixture, will include the major northern jarrah forest legume species. Jarrah seed is to be applied to all sites. The final mixture will be determined by agreement between Alcoa and the CALM. District Managers.

It will take into account such factors as seed availability and where the mixture will be used. A large diversity of minor jarrah forest species should make up the balance, including other nitrogen fixing species (*Allocasuarina* and *Macrozamia* spp.). Macrozamia seeds to be sown separately and pressed into the soil at a rate of 2 kilograms of seed per hectare.

9.3 Specific species and specific mixes should be applied to particular sites e.g., water logging tolerant species for sumps, wild flower species for roadsides and recreation areas (see Section 4.2), and species of low flammability and height for special fire management zones.

9.4 As a general rule, non-indigenous and high *Phytophthora cinnamomi* susceptible species should not be used. However, use of a low level of D.B. susceptible species (about 10 - 20 seeds) will provide for future dieback monitoring.

9.5 Understorey seed mixes will be determined in advance and specified in the rehabilitation plan for each pit and for specific sites within pits.

9.6 Fertiliser

Areas to be seeded will be broadcast fertilised with 500 kilograms per hectare of super, copper, zinc, molybdenum. (N.B. item 8.7 where eucalypts are seeded).

9.7 Application Rate

Mixed understorey seed will be sown at the rate of 1 - 2 kilograms per hectare with the major legume seed mix no more than 1.0 kilograms per hectare.

Seeding is to be done after ripping by ground application and to be completed by 1st June each year.

9.8 Initial Success Criterion

1.5 - 2.0 legumes/m^2 with a minimum of 1/m^2 being the desirable density of legumes for rehabilitation.

Areas of 0.5 hectares or greater not stocked at this rate to be reseeded the following Autumn. Light scarification and control of insect predation may be necessary to promote seed germination in areas reseeded in Year 2.

10. ROADS

10.1 The road network which remains after rehabilitation must conform to a predetermined plan. The basic planning principle is to aim for the minimum number of well surfaced roads low in the landscape consistent with provision for public access, fire and disease protection.

10.2 This plan will be drawn-up from approved 5 year mining plans, and will cater for -

i) access for mining

ii) access for rehabilitation

iii) access for future forest and catchment management including fire protection.

10.3 Unwanted roads will be rehabilitated by:

i) if possible and economical recovery of gravel for reuse elsewhere

ii) blasting of caprock and/or breakup of all compacted material

iii) overburden and top soil return

iv) ripping and erosion control

v) seeding and planting in harmony with surrounding forest.

vi) earthworks and revegetation practices for haul road rehabilitation will be modified to ensure rehabilitation success meets the same standards as mine pit rehabilitation. Revised practices will include multiple ripping, increased overburden/topsoil depth (where this material is available) and increased see/fertiliser application rates.

1994/1996
DIEBACK FOREST REHABILITATION
PRESCRIPTION

CONTENTS

1. INTRODUCTION

As a result of commitments made by Alcoa in the revised Wagerup ERMP (1978) a program previously known as the Forest Improvement and Rehabilitation Scheme (FIRS) and is now known as Dieback Forest Rehabilitation (DFR) has been developed.

The program will be funded by Alcoa. Operational procedures will generally be conducted by CALM and annual works programs will be jointly planned by Alcoa and CALM.

This prescription sets out objectives and guidelines based on the best information available in January, 1995.

2. OBJECTIVES

The prescribed treatments are applied to unmined forest within the bauxite mining envelope. The objectives are:

* To rehabilitate forest in which the overstorey has been extensively destroyed by disease.

* To undertake remedial work where disease impact has caused instances of catchment stream turbidity.

* To treat the forest so as to render it less susceptible to mining related dieback disease impact.

The overall objective of the program is to rehabilitate forest degraded by dieback in a way which will improve the potential of the forest to meet the designated land use objectives. More site specific objectives and aims are then developed.

3. SITE OBJECTIVES

Before any prescription is chosen overall objectives for a site are to be specified. These objectives may include:

(i) minimising soil erosion
(ii) increasing habitat
(iii) increasing biodiversity
(iv) improving amenity
(v) restore productivity
(vi) do nothing

4. SPECIFIC AIMS

For each site considered for treatment specific aims are to be determined which will enable the objectives for that site to be met. These aims may include:

1. establish more vegetation cover

2. establish structure - Overstorey/Understorey

3. remove dead stags

4. improve the health of existing vegetation

To determine the appropriate rehabilitation treatment for the site or whether a treatment is in fact necessary each site will be evaluated against a set of criteria.

5. CRITERIA

The following set of criteria should be evaluated to determine the necessity to undertake rehabilitation prescriptions and how the site fits with other land use objectives.

- vegetation site type (as per Havel)
- extent of degradation - size of the area, impact on site
- diversity of vegetation, impact of disturbance
- slope
- landform (ridge/midslope/gully)
- soil type
- logging history
- burning history
- landscape values
- adjacent land use
- surface drainage and any other known hydrological factors
- availability of funding
- other values such as aesthetic considerations and conservation

6. TREATMENT STRATEGIES

Treatment strategies will be developed to meet the requirements of the specific site. They will be based on the objectives and specific aims outlined in section 3 and 4 above. Treatments should only be undertaken where previous treatments indicate a high likelihood of success.

Sites can be placed within a matrix (Figure 1) based on the quality of the overstorey and understorey.

Sites which need to be treated and there is a low likelihood of success, will be deferred until an appropriate prescription is developed involving Alcoa and CALM research and operational trialing.

Figure 1 Treatment options matrix

Overstorey Quality	Understorey Density/Richness			
	0	LOW	MEDIUM	HIGH
0				
LOW				
MEDIUM				
HIGH				

Treatment options/strategies available include:

- Fertiliser
  - rate
  - timing
  - method of application
  - type
- Ground Disturbance
  - Nil
  - Scarify
  - Rip - deep
    - shallow
    - combination
- Drainage Modification
- Debris
  - leave
  - mulch
  - heaping
  - no heaping
  - burning
  - no burning
  - harvest - commercial
    - non-commercial
  - ground habitat
- Understorey
  - leave
  - remove
  - enhance - seeding
    - planting

- Overstorey	- leave	
	- remove	- commercial
		- non-commercial
	- enhance	- seeding
		- planting

The need to carry out a treatment to prevent soil erosion will be readily identified by any observed impact on stream water quality and the identification of the cause from disease affected forest or the loss of habitat protection for known limited distribution native fauna.

The applicability of any treatment will be determined by agreement between a CALM District Officer and Alcoa Mine Environmental Scientist. Agreement will be reached on (a). The need for treatment (b). The timing of treatment (c). The nature of the prescribed treatment. It is the responsibility of CALM Mining Co-ordinator and Alcoa Team leader Mine Planning and Operations Group (MEPOG) to ensure consistency in treatment applications between Districts.

Treatment of high impact dieback affected forest should as a general rule be conducted in any region only after the conclusion of mining in that region or sufficiently in advance of mining or logging in the region to permit the development of dense vigorous vegetation before mining commences in the area.

When planning the DFR treatment for a particular compartment of forest the stream zones are selected first. The remainder of the unmined forest dependent on the objectives and criteria specified, will be prescribed a treatment based on the options stated above.

In all instances the selected strategy must be fully integrated into relevant mine plans and long term forest management plans.

7. PLANNING

It is the objective to ensure that all planning within this program will be integrated into 10 year Dieback Management Planning developed for all other aspects of mining operations.

Operationally a 5 year rolling DFR plan will be developed which reflects relevant 5 year mine plans. An annual works programme covering the calendar year will be developed by September each year which reflects programmed treatment areas and available finance. All plans will be subjected to joint agreement by CALM and ALCOA.

It is the joint responsibility of the District Manager and Mine Environmental Scientist to ensure that:-

* The appropriate prescription is chosen or written.

* A detailed plan of proposals is prepared.

* A works programme covering manpower, machinery and season is drawn up and priorities assigned.

* CALM/ALCOA responsibilities are specified.

* A monitoring program is carried out.

Works programmes will be reviewed at a minimum interval of three monthly to ensure compliance with prescription and budget. The District Manger will be responsible for the production of an annual summary related to areas treated, prescriptions used and costs.

When completion of works programmes has been verified to the satisfaction of CALM District Manager and Alcoa Mine Environmental Scientist, all relevant data will be recorded on Alcoa GIS with all data available to CALM CIMSYS.

CALM District and Region records will be maintained which will permit rapid verification of invoices submitted by CALM to ALCOA against work carried out.

'Research projects associated with Dieback Rehabilitation operations which are to be funded by Alcoa, are subject to the same project appraisal/approval process by CALM and Alcoa as for mine rehabilitation research'.

8. REVIEW AND CONTROL

This prescription will be reviewed biannually and updated as necessary, on the basis of:

* New research findings.

* Results from monitoring data.

9. PRESCRIPTIONS

The following prescriptions are based on current best practice, but may vary according to the site specific objectives, aims and criteria evaluation.

9.1 Treatment (1) - Stream Zone Protection

9.1.1 Preamble

Where disease impact on unmined forest has resulted in soil erosion with potential for increasing turbidity levels in catchment streams, these areas will be selected for remedial treatment.

9.1.2 Aim

To protect the existing vegetation in the stream zone so that it can filter sediment and provide a habitat refuge for fauna and aid the maintenance of stream water quality.

9.1.3 Method

(i) Where necessary, and particularly in catchment areas, bare areas within stream zones should be seeded with understorey after appropriate soil preparation, to enhance their ability to filter out sediment. Alternative treatments for small areas, such as the placing of cut brush may be implemented.

(ii) Drainage control earthworks will be carried out as required by each situation.

9.3 Treatment (2) - Reduction of susceptibility to Disease of Unmined Forest

Pending publication of the 1988/92 study of the effectiveness of Banksia removal, no work will be carried out under this section on operational scale in 1994/96.

9.4 Treatment (3) - Rehabilitation of High Impact Dieback Affected Forest

9.4.1 Objective

Areas of unmined, dieback degraded forest will be rehabilitated in a way which will maximise the potential of the forest to fulfil the designated land uses of the area.

9.4.2 Operational Procedure

(i) Establish site specific objectives and aims

(ii) Apply evaluation of criteria

(iii) Review treatment options

(iv) Select area to receive a rehabilitation treatment and prescribe treatment timing.

(v) Site Preparation may include-

Sites which require more intensive site preparation through the creation of ash-beds and the preparation of rip lines for planting. Scarification for seed bed preparation is mandatory for understorey establishment.

Consideration should be given to the stem injection of surviving jarrah trees with phosphorus acid. Where available habitat trees are to be retained at a minimum density of twice that defined in jarrah silvicultural specification 1/92 to compensate for losses of mature habitat trees from adjacent mined areas. Dead/dying trees of habitat conformation should be retained where no other exist.

For identified open sites, where treatment is required scarifying for seedbed preparation is mandatory. Retention of existing understorey and habitat trees is to be maximised.

(vi) Carry out felling of stags within 100 metres of burn boundary and where dangerous to dieback rehabilitation operation.

(vii) Carry out erosion control works as required and close unwanted roads especially when adjacent to stream zones. Avoid draining water into dieback-free or lightly affected forest.

(viii) Burn to reduce the hazard for young rehabilitation or to create ash-beds.

Opportunities for creation and the protection of fauna habitat are to be exploited.

(xi) Sites which require intensive site preparation should have seed spread at 1kg/ha (defined mix) with 500 kg/ha of Super No. 1 (including Copper) by tractor. Plant 625 spha and fertilise using 200g of DAP/plant, following the onset of winter rains. Eucalypts may be established by direct seeding. If this technique is used then either 800 spha derived from seed are to be individually fertilised with DAP pellet one year after seeding or broadcast 500 kg/ha DAP in August after seeding, dependant on susceptibility of site to weed infestation. Seeding should be carried out as soon after scarification as possible.

For more open sites - Establish eucalypts at a minimum density of 200 spha all by planting. Fertilise with Super No.1. at rate of 500 kg/ha Each tree fertilised with 200 g DAP pellet. Understorey establishment by application of 1.5 kg DFR seed mix per ha onto comprehensively scarified seed bed.

Notes.

a. All seed must be treated with suitable low toxicity (human) ant repellent.

b. Understorey seed mix determined in relation to site and relevant mine rehabilitation mix. Objective will be to use a legume dominated mix which may comprise the mine rehabilitation mix from which the rarer species have been excluded.

c. All Sites which have planted eucalypts will also receive 0.4 kg/ha jarrah seed.

d. The CALM Silviculture Specification 1/92 "Regeneration in Forest affected by P.c." will provide the basis of the treatment and will only be deviated from as indicated above.

Tree species to be used in treatment of sites are to be in accordance with the following guidelines.

	Lowland Site	Upland Sites
E. calophylla	20%	40%
E. patens	40%	60%
*E. megacarpa**	40%	

* *E. megacarpa* is only to be used when adjacent to a natural stand of *E. megacarpa*.

Eucalypt seed and seedlings and understorey seed will be supplied by Alcoa. Seed will be provenance correct.

Details of all revegetation activities will be recorded by CALM District Staff for transfer on verified completion, to Alcoa's GIS.

10. MONITORING

All sites will be monitored at 9 months after seeding/planting to determine and record

1. Tree seedling density (if seeded)(spha)
2. Tree survival (if planted)(%).
3. No. of understorey plants per m^2 from seeding activity of the works.

Sites will be re-monitored at age 5 years to ensure site improvement has been maintained. Any site deterioration from 9 month data will be noted. These data should be considered jointly by CALM/ALCOA with a view to further treatment or prescription review.

10. SURVEYING

All areas are to be surveyed on completion using a method agreed between Alcoa and CALM.

INTERAGENCY AGREEMENT
FIRE CONTROL

INTERAGENCY AGREEMENT
DEPT OF CONSERVATION AND LAND MANAGEMENT & ALCOA

Title of Agreement: Fire control Responsibilities - Minesite Area of Influence

Area Covered by Agreement: Interior of area bounded by Alcoa roadblocks, which is known locally as Alcoa's area of influence.

Period of Agreement: Commencing November 1 1994 and then for the duration of the Working Arrangement Document.

TASKS	AUTHORITY RESP. TASK	COST	COMMENT
1. Planning and Records	CALM	Alcoa	
2. Hazard Reduction			
Forest	CALM	Alcoa	
Buildings/structures	Alcoa	Alcoa	
3. Fire Prevention			
Training Alcoa Personnel	Joint	Joint	
Access and Water Supply	Alcoa	Alcoa	
Maps, Signs, Traffic Control	Alcoa	Alcoa	
4. Fire Detection	CALM	CALM	
5. Fire Suppression			
Standby	Joint	Joint	
Fire Equipment			
a) Dozers/graders	Alcoa	Alcoa	
b) Light duty	Joint	Joint	
c) Heavy duty	CALM	CALM	
d) Water Tankers	Alcoa	Alcoa	Only on well made roads - no chemical additives.
e) Weather readings	Joint	Joint	
f) Dieback Hygiene	Joint	Joint	
Initial Attack	Joint	Joint	Nearest force first attack
Subsequent Suppression	Joint	Joint	Under CALM direction
Mop-up and patrol	CALM	Joint	Under CALM direction
Declaration of fire safe	CALM	CALM	
6. Publicity of Fire Control	CALM	CALM	
7. Law Enforcement	CALM	CALM	

POINTS OF CLARIFICATION FOR THE CALM/ALCOA INTERAGENCY AGREEMENT

A. It is acknowledged that ALCOA resources will be released from any fires as soon as possible and definitely before three (3) hours duration, except in extreme situations. These situations will be agreed between the most senior Alcoa and CALM representatives.

B. ALCOA must obtain the approval of the District Manager prior to lighting any fires on State Forest, and any such lightings must be in accordance with the Bush Fires Act and CALM Act. Any fires ALCOA light must be regularly checked by ALCOA staff to ensure they are within the expected boundary.

C. ALCOA are to assume the role of first attack for fires detected by ALCOA or CALM, occurring in the minesite area of influence; unless advised by CALM to the contrary. CALM is to be immediately advised of any such fires.

D. There will be no transferring of funds to meet the provisions of this Interagency Agreement except from ALCOA to CALM for forest hazard reduction works in accordance with the agreed Minesite Protection Plans.

E. Contact procedures to initiate this Agreement will be to the CALM Duty Officer at the relevant office i.e. Willowdale and Huntly to CALM Dwellingup on telephone 538 1001, and Jarrahdale to CALM Jarrahdale on telephone 525 5177 or CALM Mundaring on telephone 295 1955 (please note Duty Officers rotate between Mundaring and Jarrahdale and an answering machine will give the current Duty Officer's number). If CALM initiates the call it will be to Security, who will make the necessary contact within Alcoa.

F. Jarrahdale Alcoa security have the ability to communicate with CALM via the CALM radio network. In a fire situation this allows the Alcoa equipment to be in communication with CALM through Alcoa security for the protection and security of the Alcoa men and equipment at the fire.

G. CALM will supply all Alcoa employees used on fire suppression duties under the direction of CALM with the same supply of food and drinks as CALM employees.