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 1996-1998

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SECTION 1: OVERVIEW OF WORKING ARRANGEMENTS

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 DURING 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 or 60 metres.
- Grade control drilling at spacings of 30 metres and 15 metres.
- Removal of marketable timber.
- Stacking and burning forest residues.
- Removal of topsoil and overburden either to stockpiles or into rehab by direct return.
- Secondary overburden removal.
- Ripping/drilling and blasting caprock.
- Extracting bauxite ore by loading and transport to a crusher.
- Crushing and transport to refinery.
- Rehabilitation of mined pits.
- Ongoing management of rehabilitated areas.

Jarrah forest surrounding bauxite mining operations is rehabilitated if it is heavily degraded. These operations are carried out under the Dieback Forest Rehabilitation programme (DFR).

Prescriptions exist for:

- Forest access control
- Exploration and ore development drilling
- Logging and clearing and burning of forest residue
- Soil handling
- Drilling and blasting
- Extraction of bauxite
- Rehabilitation
- Dieback forest rehabilitation
- Fire control (interagency agreement)

3. ORGANISATIONAL RESPONSIBILITIES

3.1 Department of Conservation and Land Management

Under the provisions of the CALM Act 1984, 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 and CER (1995).

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 Environmental Review and Management Programme (ERMP)

- Although developed as part of the Wagerup ERMP these undertakings are being applied to other mine sites, ie., Jarrahdale and Huntly.

- Alcoa submits a mining and management programme which specifies areas and methods for mining and rehabilitation. Five year mine plans are submitted for Jarrahdale, Huntly and Willowdale and ten year mine 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 (MOG) before approval is recommended to the Executive Director.

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

- Rehabilitation takes into account the designated land use. The Mine Environmental Scientist is responsible for planning rehabilitation. Rehabilitation includes the following stages:

  ⇒ Reshaping mined areas to fit local landforms,
  ⇒ Return of topsoil,
  ⇒ Contour ripping,
  ⇒ Establishing 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 severely dieback affected forest adjacent to its mining areas. Prescriptions have been developed and works are funded by Alcoa through the Dieback Forest Rehabilitation Programme (DFR).

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

3.3 Water Corporation

The Water Corporation has particular responsibility for the protection and production of water supplies and operates under an agreement with the Water and Rivers Commission. Alcoa and CALM consult Water Corporation and Water and Rivers Commission staff as required. The Water Corporation is represented on the Mine Management, Planning and Liaison Group (MMPLG) and MOG groups and contributes to mine planning and operations through these forums as well as by direct communication with the Mine Environmental Scientist.

The following sections comprise detailed prescriptions which specify objectives, strategy, technical specifications and works programme requirements including timing, resources and funding. Responsibilities for the co-ordination and review of the existing prescriptions is between CALM's Mining Co-ordinator and Huntly Mine Environmental Scientist who coordinates the Alcoa Mine Environmental Planning and Operations Group (MEPOG). The above representatives will have primary responsibility for the annual review of prescriptions. Existing prescriptions are reviewed formally bi-annually and necessary amendments made.

SECTION 2: DIEBACK MANAGEMENT

1. DIEBACK CONTROL PRINCIPLES

The dieback control principles that are applied by Alcoa of Australia Ltd with agreement from CALM have been developed to meet the overall objective of effectively minimising the spread and intensification of forest diseases, principally those 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 in a region and access control applied to the forest.

Alcoa's mines may use one of two dieback management strategies. A "Dieback-Free Mining System" is used at Huntly, and a "Conventional Mining System" is used at Jarrahdale and Willowdale. The choice of strategy is based on a number of criteria but principally on the area and distribution of dieback within the mine envelope. Irrespective of the strategy used at a mine every attempt will be made using the principles outlined in this manual to meet the overall objective. The prescriptions in this document have been developed for all Alcoa Mines and may vary depending on which dieback management strategy has been selected.

As with other forest operations dieback control in bauxite mining operations will be in accordance with CALM policy. This policy and associated operational procedures were developed from those for forest operations other than mining.

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

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

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

iii. Mining is limited in extent at any one time and can employ 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 dieback management systems. As a result, the measures which are used are based on the same principles expressed in 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. Where a dispute arises, it will be resolved between Alcoa mine staff and CALM District staff. If this fails to resolve the issue, then regional staff will be involved.

If disagreement still remains then the issue is to be referred to the Mine Management Planning and Liaison Group (MMPLG) for resolution.

2. DEFINITIONS

2.1 Dieback Free Mining System

This is 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.
(c) A haul road network which is constructed and maintained dieback-free.
(d) A high level of hygiene existing with access to well maintained and effective cleandown facilities.
(e) Well developed drainage controls including the appropriate use of 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 category and understand 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.

2.2 Conventional Mining System

The Conventional Mining System (used at Willowdale and Jarrahdale Mines) is used where there is a high percentage of dieback infection pre-existing in the mining area, or it is not secured effectively to be confident of its dieback status. The strategy involves:

(a) A reliance on seasonal constraints for hygiene management.
(b) Less use of quarantine measures.
(c) Stringent requirements for field cleandown.

2.3 Drainage Slot

A drainage slot is a section of orebody that is fractured using ripping or blasting to provide a pathway for water to infiltrate below caprock into the soil instead of running off into forest downslope. Slots are used to protect dieback free forest below mining areas from dieback disease and to prevent turbid run-off from affecting forest and stream zones below mining areas.

3. DEVELOPMENT OF A DIEBACK FREE MINING SYSTEM FOR HUNTLY

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:

(a) minimise soil movement from infected to uninfected areas,
(b) minimise the survival of *P. cinnamomi* in the event of inoculum being transported into uninfected areas.

Prior to the late 1980's, mining at all of Alcoa's mines was located 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, mining at Huntly moved into areas with a majority of dieback-free forest and it became 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. showed that 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. Clearly, whilst the procedures involved in mining may be different from surface operations such as logging, the underlying principles are maintained to achieve the primary objectives of dieback control.

4. 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 priority 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 conventional site. The Forest Priority system will be reviewed continuously to ensure that appropriate hygiene is applied to all operations, and to ensure that effective mine production is maintained.

Forest areas 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 1). 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 be treated as Priority 2 then this will be done as per Table 2.

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 1
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. Includes areas which are uninterpretable due to burning, 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 case by case. For example, distance from a higher risk category is taken into account when deciding whether to designate an area as Priority 1 or Priority 2.

PRIORITY THREE

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

Table 2
PROCEDURE FOR RE-CLASSIFYING FOREST AREAS FROM PRIORITY ONE TO PRIORITY TWO

Before the start of each drilling season, each drill hole planned is assigned a priority. The aim is to assign priority one to as many areas as possible, in the knowledge that some of these areas may need to be changed to priority two if unforseen operational constraints arise. For example, more wet weather may be experienced through summer than normal. The least secure areas within priority one are ranked, and those ranked lowest are the first to be considered for reclassification to priority two should the need arise.

The steps to be taken before areas are re-classified are:

(1) Establish Forest Priority from Hygiene map information.

(2) Site geologist assesses 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 or other relevant information.

(4) Consider areas of Priority 1 which have not been effectively quarantined since interpretation for re-classifying to Priority 2.

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

(6) Size of Priority One Areas

Before any areas are downgraded 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 ideally 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.

5. 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 uses the Dieback-Free Mining System or the Conventional Mining System. They are summarised in Table 1.

5.1 Assessment Requirements by CALM

5.1.1 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 using the 5 Year Mine Plans submitted to MMPLG. At Huntly access to DRA is covered for operations with prescriptions here by a permit system. This is described in detail in section 8.1.2 Permission for Access to DRA.

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. Alcoa is responsible for the compilation of the disease evaluation form and its submission to CALM for consideration and if acceptable approval.

The evaluation will only be undertaken again if the activity or hygiene status radically changes in nature. Permits will be issued on the original evaluation provided. Alcoa personnel are 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.

5.1.2 Planning by Alcoa

Alcoa will produce plans annually for areas within a Dieback-Free Mining System. These areas will have been mapped for vegetation and dieback hygiene. They will be covered by an access plan (compiled annually in August), and incorporate drainage control (planned in January), soil movement (ongoing plan), and rehab plans (ongoing plan) for current operations.

Within a non-secured site, Priorities and Access Plans 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 the clearing schedule.

5.2 Dieback 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 an operation commences in an area.

Table 3
DIEBACK CONTROL PROCEDURES FOR BAUXITE MINING IN DIEBACK FREE AND CONVENTIONAL MINING SYSTEMS

STAGE	ORGANISATION	PROFILE LOCATION	CONTROL PRINCIPLES AND STRATEGIES	SECURED SITE PROCEDURES	NON-SECURED SITE PROCEDURES
DFR	CALM	Surface	As per CALM Timber Harvesting Manual January 1996 Sect. 5	Access as per mine access plan	Access as per mine access plan
Survey and exploration	Alcoa	Surface	As per CALM Timber Harvesting Manual	As per agreed access plan	Access as per mine access plan
Grade control		Surface	January 1996 Sect. 5	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	Preferably log at least 10/15 yrs ahead of mining	CALM traditional hygiene procedure
MFP			January 1996 Sect. 5	MFP may be 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	Alcoa	Surface → Caprock	Containment Modified hygiene	Drainage control to enable operation in MOIST soil	Forest Priority set
Drill and blast	Alcoa	Subsurface	Containment	Cleandown applied leaving DB areas	Cleandown at dieback boundary
Ore extraction	Alcoa	Subsurface	Containment	Dieback areas mined wherever possible when HOT conditions exist	No constraints
Landscaping	Alcoa	Subsurface	Containment	Cleandown etc.	No constraints
Soil Return	Alcoa	New surface	Containment Modified hygiene	Dieback soil handled under dry soil conditions	Cleandown prior to access to dieback-free
Ripping	Alcoa	New surface	Containment	Cleandown between dieback categories	
Rehab Management	Alcoa	New surface	Containment	Drainage of perimeter tracks critical	

Table 4
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

* Each High Potential Risk area will be assessed, and designated dieback or dieback-free depending on how recent the information on the hygiene map is. In some cases a larger operational buffer will be applied.

6. PRESCRIPTION FOR SURVEY AND DRILLING IN STATE FOREST

6.1 Introduction

6.1.1 The Ore Development Process

(a) Geological mapping and aerial photography interpretation are used to delineate prospective areas.

(b) 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.

(c) 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 grade control drilling.

(d) 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.

6.2 Sequence of Operations

6.2.1 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.

6.2.2 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 include:

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

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

(c) 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.

Operations in DRA are subject to permit conditions described in section 8.1.2 Permission for Access to DRA.

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 subject to appropriate access requirements being met.

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 Co-ordinator if this is possible without risking dieback spread.

6.2.3 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 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 available from the Mine Environmental Scientist at the commencement of the drill programme.

6.2.4 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 and CALM accredited interpreters.

6.2.5 Notification

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

6.3 Dieback Hygiene

6.3.1 Objective

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

6.3.2 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 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.

6.3.3 Access

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

Cleandown
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.

6.3.4 Operating Conditions

Operations are permitted in Dieback forest under all soil conditions subject to appropriate access being available.

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 Mine Environmental Scientists and Drill Co-ordinator to maximise opportunity to continue operations without compromising forest hygiene.

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 moist soil conditions exist.

6.3.5 Field Hygiene Practice

Uncertain and Dieback-Free Forest
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).

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.

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.

Where practical, 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.

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

Dieback Forest
Cleandown between holes is not necessary. Moist low-lying flats or creeks should not be crossed by machinery.

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.

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

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

7. PRESCRIPTION FOR SALVAGE LOGGING, MINOR FOREST PRODUCE REMOVAL, CLEARING AND BURNING PRIOR TO BAUXITE MINE DEVELOPMENT AND FOREST COMPENSATION ARRANGEMENTS

7.1 Sequence of Events

(a) Five year mining plans for Swan Region (10 year Willowdale) revised annually by Alcoa and available to Executive Director September - October.

(b) Inspection and consideration by Districts, and Mining Operations Group (MOG). Comments and recommendations from Executive Director to Mine Management Planning and Liaison Group (MMPLG).
Note: CALM is represented on the MMPLG.

(c) The above plans are submitted to the Minister for approval about December.

(d) Alcoa submits clearing notices in March/April. It is the objective to provide two year advance proposals to facilitate planning and implementation of appropriate intensive dieback management measures. A minimum of six months notice is required.

(e) Areas that are the subject of the clearing notice are marked in the field by Alcoa.

(f) Areas of non ore or marginal ore within the proposed clearing boundary, for which there is an operational need for clearing ie., access, overburden storage, gravel supplies, earthworks fill, drainage control, etc., will be identified on the clearing notice plans. The justification for clearing these areas will be demonstrated and the appropriate management strategy agreed upon with M.O.G.

(g) Clearing proposals subject of the notice are assessed by Districts and M.O.G. The M.O.G. Chairman (Swan Region Manager) recommends to the Executive Director.

(h) Executive Director will advise of his approval or otherwise of the clearing notice prior to June.

(i) Field marking of agreed proposals are checked and adjusted by Alcoa according to approvals.

(j) In July Alcoa submits to Swan Region a clearing schedule for next twelve months. The schedule is updated every 6 months to give guidance for dieback demarcation and timber salvage operations.

(k) Changes to the plan are possible provided adequate notice is given to allow for dieback demarcation, timber salvage, clearing and burning.

(l) CALM check area for dieback and demarcate categories in the field. A hygiene map is given to Alcoa. This information should already pre-exist for the areas covered in the clearing notice.

(m) Detailed planning is undertaken by Alcoa incorporating dieback management for forest protection, soil movement, access and rehabilitation. These plans specify the

Forest Priority, drainage protection, season of operation and hygiene requirements dependent on the mine dieback strategy.

(n) Hygiene boundaries are maintained by Alcoa after clearing.

(o) CALM arrange salvage of saw-logs and minor forest produce.

(p) Alcoa heaps and burns unsaleable debris that is not required for fauna habitat construction in rehabilitation.

7.2 Objectives

To carry out the sequence of events with maximum efficiency having due regard for:

(a) Timber salvage and clearing being confined to areas which are to be mined.

(b) Minimising the spread of dieback disease into dieback free forest.

(c) Minimising fire damage to surrounding forest.

7.2.1 Clearing Boundary Management

Boundaries of proposed clearing areas are marked in the field by Alcoa using yellow plastic tape attached to trees or stumps.
Following M.O.G. approval and release of areas for clearing approval Alcoa will overmark the yellow plastic tape with white paint.

Alcoa will present drainage proposals as part of the one year clearing schedule updated at six monthly intervals.

Alcoa will meet any other M.O.G. imposed conditions.

7.3 Dieback Control Strategies

7.3.1 General

Any prescription for dieback control in mining will meet the requirement of the CALM Department's Policy Statement 3 (revised).

The basic strategy for dieback control during clearing and burning will be to use containment and hygiene. Control of disease introduction to surrounding forest will be by:

- dieback mapping and categorisation,
- access designation and control,
- drainage control where appropriate,
- appropriate equipment cleanliness.

Disease intensification will be controlled by:

- Draining roads and cleared areas to designated points using the network approved in the Access Plan.

Disease control between dieback categories will be by hygiene and control of access and drainage.

7.3.2 Dieback And Priority Demarcation

CALM will assign all forest to various dieback hygiene categories. Each of the categories will be indicated in the field and on 1:10,000 scale plans given to Alcoa. For operational purposes the forest will be designated as Dieback, Dieback-Free or Uncertain. Uncertain forest areas are also designated and regarded as Dieback-Free for entry of vehicles but Dieback for exit.

Dieback management requirements will be evaluated for each dieback category individually. Forest priorities will be established for each pit and shown as part of the clearing schedule for approval by CALM District Office.

The clearing notice will show the dieback status of the areas to be mined. In the conventional mining system operations will occur according to the Priority System. The Priority set will be shown on maps approved by the District CALM office.

7.3.3 Access Control

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

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

Field operations will be confined to a single disease category. Transfer from one to another requires specific hygiene measures, as set out below.

7.3.4 Soil Conditions and Cleandown

All equipment will be clean on entry to dieback free areas (or the Dieback Free Mining System at Huntly). At Huntly, this means that all equipment must be clean on leaving Dieback or Uncertain areas.

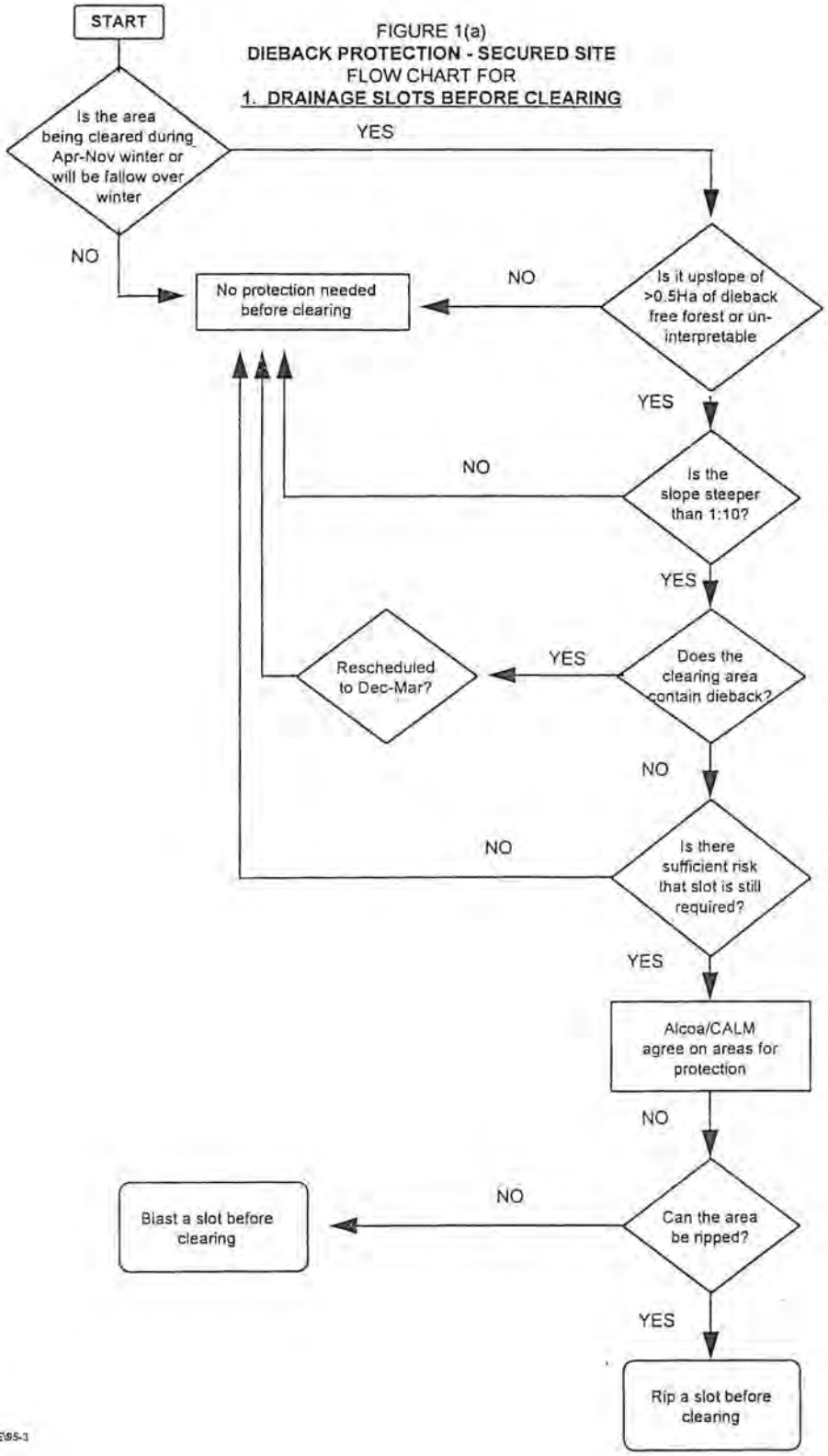
Soil moisture operating condition for each area will be established using an evaluation matrix, and the appropriate priority followed (see Fig 1).

Soil moisture operating conditions will be defined according to the Priority System. Operations in Dieback can occur under any soil moisture conditions provided the machines clean down prior to entry to Dieback-Free or Uncertain.

In the conventional mining system Alcoa can only plan to clear Dieback Free or Uncertain areas in soil moisture conditions which comply with the allocated priority.

In the Dieback Free Mining System drainage protection (blasted slots) will be shown on the clearing schedule and approved by the CALM District Office. Figure 1 is a guide used in planning drainage protection requirements.

FIGURE 1(a)
DIEBACK PROTECTION - SECURED SITE
FLOW CHART FOR
1. DRAINAGE SLOTS BEFORE CLEARING



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7.3.5 General Dieback Hygiene Requirements

All light vehicles, including CALM and Water Corporation light vehicles must be cleaned-down before leaving or entering limited access roads and other designated areas. All light vehicles including CALM and Water Corporation vehicles will comply with the designated access plan for dieback control.

Hygiene boundaries are to be maintained under the direction of the Clearing Supervisor.

Unwanted tracks will be blocked and access will be via routes designated on the Access plan.

Touchup clean-down points where required will be located at hygiene boundaries as designated.

All equipment operators must be trained in hygiene principles and the techniques of vehicle inspection and clean-down. Alcoa will be responsible for training their own staff and contractors. CALM will train Alcoa staff when required.

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

Drainage control to prevent runoff to the surrounding forest is to be established with any discharge directed to approved points.

Access is to be confined to routes approved by CALM.

7.3.6 Dieback-Free Areas

All vehicles must be clean before entry to dieback free areas, or the Dieback Free Mining System at Huntly.

Priorities shown on the clearing notice plan indicate the soil moisture conditions required for clearing dieback-free areas.

Prior to entry into dieback-free areas, each vehicle is to be inspected by the operator to ensure no soil has been picked up in-transit. Such inspection will be monitored from time to time by both Alcoa and CALM staff. Cleandown is required at the dieback boundary or nominated cleandown point if the vehicle is not clean.

Any machine which is to clear Dieback-Free forest must be clean upon entry. Low-loaders are to use nominated access and to be clean on entry to Dieback-Free roads and forest. Where clean-down is required at the entry point it must be at an approved clean-down point. Operators will be required to inspect their vehicles prior to and after clean down.

7.3.7 Uncertain Forest

As for "dieback-free forest", except that prior to leaving Uncertain forest, vehicles and plant are to be free of soil and vegetation.

7.3.8 Dieback Areas

Prior to leaving Dieback areas, vehicles are to be free of soil and vegetation.

7.3.9 Dieback Boundaries

CALM will reinspect dieback boundaries established for surveying and drilling operations prior to commencement of clearing operations.

Dieback boundaries are established by means of yellow painted blazes on trees along the boundary. The yellow blazes face into the dieback infected forest.

Dieback boundary markings removed during timber salvage will be replaced by CALM. Any removed during clearing will be replaced by Alcoa using yellow 50mm x 25mm pegs. Where necessary, the direction of dieback free forest will be indicated by one side of the peg being painted green, ie., green side faces dieback free. Yellow bunting with appropriate signs may also be used.

7.3.10 Forest Produce Removal

Salvage of merchantable timber in State Forest is performed by CALM logging contractors.

A similar level of hygiene will apply to timber removal operations as will be applied to clearing operations. Under Huntly's Dieback Free Mining System, forest produce removal may occur under moist soil conditions provided hygiene demarcation, clearing boundary and access conditions allow.

CALM is responsible for ensuring that operator's equipment is cleaned down when required.

CALM is responsible for clear definition of dieback and coupe boundaries during forest produce removal.

7.4 Clearing Methods

A Forest Officer will inspect each clearing area prior to the commencement of clearing operations to ensure that merchantable timber has been removed.

Any non-merchantable timber debris remaining within the clearing areas is pushed by bull-dozer, heaped and burnt by Alcoa. CALM will direct Alcoa concerning fire protection requirements.

During the dozing operations a small amount of suitable timber debris is set aside for creation of fauna habitat in rehabilitation.

During bull-dozing operations, cleared areas are raked to remove large surface rocks and tree roots. Depending on the quantity of rocks present the raked material may be heaped and burnt or separately removed by loader and truck using approved access. Material moved from a Dieback-Free area should normally be returned to a like area. If material is to be moved from a Dieback or Uncertain area it must go to a Dieback area.

The hygiene boundary is to remain clearly marked by Alcoa, during clearing operations.

Where an approved mining area contains more than one dieback category, the categories are to be cleared separately with appropriate cleandown between categories. Clearing work should be arranged to minimise vehicle movement across dieback boundaries and to limit the number of cleandown occasions. The method of split phasing should be adopted.

Machines that have been cleaned down on entry to Dieback-Free and have accessed the area under the given Priority condition, may continue to operate within the area, if a rainfall event occurs which does not allow surface flow. Machines are not allowed to access Priority 1 areas under moist conditions because of the possibility of introducing the fungus to the area.

7.4.1 Drainage Control

Drainage and run off management from washdown points is to be provided to the satisfaction of CALM.

Temporary drainage control is to be established on slopes where this is considered necessary by joint agreement between CALM and Alcoa, e.g., a strip at the bottom of the slope may be cleared first and run-off contained by blasting or ripping the caprock along the boundary of adjoining forest.

7.4.2 Burning Debris

The burning operations must comply with the provisions of the Bushfires Act 1954 and CALM Act and are subject to any permit conditions.

In State Forest CALM is responsible for prescribing the conditions. CALM retains the power of veto over burning in State Forest or during the Restricted Burning period private Property within 3km of State Forest. On Alcoa private property the same burning conditions apply as on any other private property. The local CALM office must be advised prior to burning commencing.

All burning is banned during the prohibited period as prescribed by the Bushfires Act 1954, normally December 15 until March 15. CALM will seek to arrange necessary extensions under permit where burning cannot be completed during the prescribed period.

It must be noted that burning approval in the prohibited season will only be granted by Bushfires Board if it is satisfied that precautions against escapes are adequate. This requires wide burnt buffers bounded by safe tracks. Preparation in the summer prior to burning may be necessary for track maintenance followed by buffer burning in spring or autumn. Time for adequate preparation is essential.

Heaps are to be located so that surrounding forest is not damaged when the heaps are burnt, and are to be a minimum of 20m from the forest unless otherwise authorised by CALM.

Hygiene procedures during burning activities are to be consistent with those used throughout the clearing operations.

7.5 Forest Compensation

7.5.1 Legislation

The Alumina Refinery Agreement Act 1961 provides for compensation to be paid by Alcoa to CALM for loss of forest in connection with mining. Subsequently the Alumina Refinery (Pinjarra) Agreement Act 1969 made provision to review the amount of compensation payable at seven(7) yearly intervals calculated from 1st January, 1970. Each review has regard to the average hardwood log royalty during the financial year preceding the commencement of the new seven year term.

The current term covers the period 1st January 1991 to 1st January 1998. Rate of compensation during this period is $3,100 per hectare.

7.5.2 Method of Payment, Assessment and Reconciliation of Areas Cleared

(a) Alcoa provides CALM with an area estimate of forest clearing requirements for the coming year in January.

(b) CALM invoices Alcoa based on above estimate and compensation payment made in advance by 31st January.

(c) At December 31 each year Alcoa ensures all areas cleared during the year are captured in Alcoa's GIS (Geographic Information System).

(d) Alcoa produces plans and calculations covering the years clearing using GIS. Computer data compatible with CALM systems is supplied to CALM for checking of plots and area calculations.

(e) Comparisons are made against clearing notices and compensation payments reconciled. The spatial definition of reconciled areas to be reflected in GIS format and signed off by Alcoa and CALM. Endorsed plans, generated from this information, are to be held by CALM and Alcoa.

(f) Every 3 years suitable remotely sensed data is to be acquired by Alcoa to enable a spatial audit to be undertaken by CALM of the reconciled area. Any errors or omissions identified during this audit process to be reconciled by Alcoa and CALM.

8. ACCESS CONTROL IN STATE FOREST

8.1 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).

The prescription has been designed to control access during mining related activities in State Forest. It applies specifically to normal forest access tracks. Haul road locations will be reviewed and agreed under the Five Year Mining Plan and Annual Clearing Notice.

8.1.1 Control of Access

The control of access will enable all forest operations including mining to meet the dieback management 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.

8.1.2 Permission for Access to DRA

These working arrangements have been compiled taking into account the regulations controlling access to DRA.

To facilitate administration of large numbers of permits for access into DRA at the Huntly Mine, all mining vehicles and contractors under the direct control of Alcoa will be issued with a sticker to be displayed prominently on windscreen or other visible position conveying permission by CALM to enter DRA under the conditions prescribed in these Working Arrangements.

Operations that are not covered by the prescriptions in this document will require a Disease Hygiene Evaluation and Prescription approved by CALM who will then issue a DRA Permit.

Alcoa is responsible for ensuring that employees and contractors are trained and supervised.

The area covered by this permit system is that shown on the Huntly 5 Year Mine Plan submitted to MMPLG.

Compliance with access and dieback hygiene may be audited at any time by CALM Officers.

8.2 Access Sequence

8.2.1 Pre-Mining Access

Ten year mine plans are reviewed by Alcoa and CALM to identify all forest tracks, using aerial photography and/or field checking where necessary.

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

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

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 8.3.5 below.

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 physically upgraded by Alcoa or CALM to all-weather standard.

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

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.

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

8.2.2 Post Mining Access

CALM and the Water Corporation will identify long term access requirements to Alcoa five years prior to mining, with particular regard to public access depending on landuse and minesite fire protection requirements. Long term access routes will be selected taking into account the dieback status of the area and the need for protection of State Forest.

8.3 Dieback Control Strategies

8.3.1 General

Dieback control during forest access to and from the minesite will involve use of hygiene.

8.3.2 Access Designation

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.

8.3.3 Hygiene Practice

Tracks nominated as 'limited access' may be used under no soil movement conditions by clean vehicles. Limited access tracks should be regarded as dieback "suspect". All vehicles leaving the track to enter Dieback-Free forest must be inspected and if necessary cleaned down.

8.3.4 Standards

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

This can be achieved under moist soil conditions by:

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

⇒ By maintaining free draining, well constructed access roads.

This can be achieved under dry soil conditions by:

⇒ Blowdown with compressed air, and

⇒ Brushing down.

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).

8.3.5 Track Upgrading

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

Dieback-Free gravel should be used in dieback-free or uncertain 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.

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

Upgraded all-weather roads will be constructed to shed water and dry quickly. Drainage from all-weather tracks will be such that dieback-free forest will not be unnecessarily placed at risk.

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

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

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

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

8.3.6 Supervision

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

8.3.7 Haul Road Construction (General Comments)

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. In the Conventional Mining System, areas with dieback-free forest below will require haul road construction under dry soil conditions.

In the Dieback Free Mining System, only dieback free gravel may be used to construct haul roads and roadside drains.

In the Conventional Mining System, haul road sumps are located so that they discharge into dieback forest wherever possible.

Haul roads are compacted during construction, which prevents dieback spores from moving through the road base.

In the Dieback Free Mining System, 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.

In the Conventional Mining System, all haul road drains adjacent to Dieback-Free and existing dieback infection in low hazard forest will be compacted to stop the dieback fungus travelling through the drain to the native forest, thereby preventing the introduction or intensification of disease in downslope forest.

9. PRESCRIPTION FOR SOIL HANDLING IN BAUXITE MINES

9.1 Introduction

9.1.1 General

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'.

9.1.2 Definitions

"Topsoil" is here defined as the uppermost part of the soil profile (0-150mm) containing the highest concentrations of organic matter, nutrients and plant propagules.

"Overburden" is the friable material under the topsoil and above the designed orebody. Overburden generally ranges from 0 to 40cm thick. It is generally sandy gravel with varying amounts of organic matter. Distinct pockets containing suitable gravel are at times extracted separately for haul road construction. Gravel extraction is also covered by this prescription.

9.2 Sequence Of Operations

9.2.1 Stripping Sequence

Topsoil and overburden stripping occur throughout the year, and usually occur on a number of areas with different dieback disease categories following the priority system where appropriate. Stripping follows the sequence below.

For the Huntly Dieback Free Mining System, a detailed plan describing how drainage will be managed is developed by Alcoa and approved by the District Office. The plan covers relevant aspects of drainage, access, soil movement and rehabilitation.

Under the Conventional Mining System, Forest Priorities are planned and are shown on the Annual Clearing schedule, and are approved by the MOG group. Variations to the Forest Priorities must be approved by CALM District office.

Earthmoving equipment is cleaned down thoroughly before entry to the mine, 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 cleaned down when serviced.

Areas are stripped separately according to dieback category.

Topsoil to 150mm depth is removed and directly re-spread or stockpiled in a like area as shown on a soil movement plan.

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

Gravel, where present, may be removed separately for construction purposes as required, or is treated as overburden.
In mid winter topsoil and overburden handling operations may be suspended during very wet soil conditions to avoid damage to the soil structure.

9.2.2 Soil Return Sequence

Topsoil and overburden return may be carried out in a number of areas simultaneously and can occur throughout the year, although the majority of soil return occurs between November and April. Soil return follows the sequence below.

New dieback boundaries are marked with pegs in the field, before soil return starts.

In the Dieback Free Mining System, 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 or root material does not fall onto the haul road during transport. Regardless of the status of previously handled soil, all equipment is also thoroughly cleaned down before servicing.

In the Conventional Mining System, earthmoving equipment must be clean before entering a dieback free area. This is usually done by cleaning the equipment thoroughly at the wash bay at the workshops, then removing any dirt collected along the haul road before the equipment enters the dieback free area.

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

Topsoil is returned either directly or from stockpiles to an area of the same dieback category. Dieback-Free topsoil is to be returned to a designated Dieback-Free area. Dieback and Uncertain topsoil is to be returned from stockpiles to appropriate new Dieback areas.

Equipment returns soil in a single disease category.

Service vehicles will comply with the same access and dieback hygiene provisions as earthmoving equipment.

9.2.3 Direct Return

Direct Return is the immediate placement of freshly stripped soil onto an area being rehabilitated. This removes the need for a stockpile, and in some cases forest clearing for storage of soil, reduces the damage to soil by soil storage, and making soil handling more efficient over certain distances.

Sequence is as described above except for the stockpiling stage.

9.3 Dieback Control Strategies

9.3.1 General

Planning
Dieback control during topsoil and overburden stripping will be by containment and hygiene. Control of disease spread to surrounding forest or intensification is achieved by:

- dieback mapping and categorisation,
- access designation and control,
- appropriate equipment cleanliness,
- draining roads and stripped areas to designated points,
- preventing surface and near surface water from leaving mine pits.

Movement of disease from dieback areas to other categories is prevented by using hygiene, limiting access, drainage control and seasonal restrictions.

In the conventional mining system scheduling should be in line with the Forest Priorities set for other stages of the mining operations. e.g.. clearing and rehabilitation.

In the Dieback Free Mining System priorities do not apply, however additional drainage control is undertaken following an agreed plan.

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

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.

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

Dieback categories will be maintained during topsoil and overburden handling. Occasionally dieback lines may be rationalised by the Mine Environmental Scientist. These include removing dieback spot infections from upslope areas to low in the landscape, and replacing dieback lines on contour prior to the return of soil to protect dieback free soil from eventual infection. Large rationalisation if required must be discussed with the local CALM District.

Dieback management requirements will be evaluated for each pit individually.

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.

As a rule all Dieback soil will be placed low in the landscape, and away from Dieback Free forest. Dieback-Free soil will be returned high in the landscape.
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 should where possible be on pitfloor or is to be kept to a minimum,
- soil storage directly above dieback free forest is to be minimised,
- drainage to be prevented from running into the forest.

9.3.2 Soil Conditions and Hygiene

In the Dieback Free Mining System all equipment must be clean on entry to the mine. 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. Equipment is to be clean before returning to Dieback Free areas from Dieback or Uncertain areas.

In the Dieback Free Mining System the priority system does not apply because drainage control is established prior to clearing or stripping areas.

In the conventional mining system 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.
In the Conventional Mining System, 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 (to a 'no soil movement condition) and access control prevents other vehicles accessing this road from a dieback area during the soil transfer operation.

9.3.3 Drainage Control

Drainage control sufficient to prevent runoff to the surrounding forest is to be established.

In the Dieback Free Mining System the priority system does not apply because drainage control is established prior to clearing or stripping areas. Drainage control is determined considering the issues in Figure 1. A suitable drainage protection plan is agreed between the Dwellingup district and the Huntly MES in January each year.

Drainage control may be achieved by:

- ripping or blasting a slot around the bottom perimeter of a pit to divert water to infiltrate,
- establishing a bund or channel at the lower clearing edge,
- or excavating a gravel pocket to produce an infiltration sump,
- in exceptional circumstances directing drainage to sites approved by CALM. The approved drainage method will be used to establish where drainage will be required (Fig. 1 gives a guide to the selection of these areas).

9.3.4 Access Control

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

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

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

All light vehicles, including CALM and Water Corporation light vehicles must be cleaned-down before leaving or entering limited access roads and other designated areas. All light vehicles including CALM and Water Corporation vehicles will comply with the designated access plan for dieback control.

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

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

- 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,
- in the Conventional Mining System, touchup cleandown to be performed at the disease boundary following transport of equipment from the workshop.

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

9.3.5 Dieback-Free Topsoil

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.

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

9.3.6 Dieback and Uncertain Topsoil

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

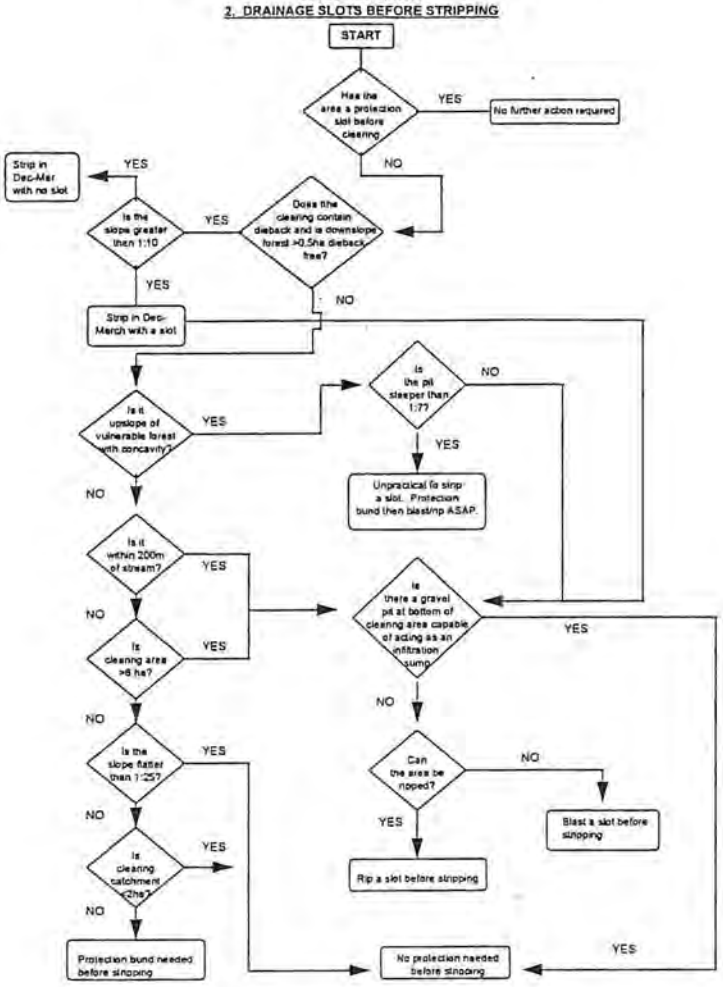
Where sufficient quantity is present Uncertain topsoil will be handled and stockpiled separately but treated in the same way as Dieback topsoil.

In the Conventional Mining System, dieback soil may be transported to a different pit for direct return, provided the second pit is also dieback, or the target location is at the bottom of a dieback free pit and is above dieback forest

9.3.7 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 can be separated and utilised on Dieback-Free sites as required. Other gravel may be used as appropriate or stockpiled as overburden.

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



10. PRESCRIPTION FOR DRILLING AND BLASTING IN BAUXITE MINES

10.1 Introduction

10.1.1. General

Following topsoil and overburden removal, drilling and blasting, or caprock ripping 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.

10.1.2 Access and Dieback Boundaries

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

10.2 Dieback Control Strategies

10.2.1 Conventional Mining System

In the Conventional Mining System, areas ready to be drilled and blasted are classed as Dieback, and no specific dieback hygiene is needed.

10.2.2 Dieback Free Mining System

Areas are treated with full hygiene until the area has been blasted or ripped.

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.

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

All vehicles leaving Dieback or Uncertain drilling and blasting areas must be clean, unless travelling to an adjacent dieback free area which is upslope of dieback forest. In this case the dieback free area is re-classified as dieback, and the dieback line must be moved accordingly.

10.2.3 Drainage Control

There will be no discharge from the pit area to the surrounding forest.

Temporary control of surface drainage may be needed before an infiltration slot is blasted.

An effective slot must be ripped or blasted in areas where runoff protection is needed. The slot must be adequate to allow run-off to infiltrate into the soil beneath the caprock.

11. PRESCRIPTION FOR EXTRACTION OF BAUXITE

11.1 Introduction

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

11.2 Dieback Control Strategies

11.2.1 General Controls

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.

The need for hygiene within the haul road and 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 unsuitable for the fungus.

In the Dieback Free Mining System, the pits and haul road network are maintained free of the disease.

In the Dieback Free Mining System, the 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,
- scheduling mining of dieback areas where possible for summer to reduce the opportunity for the disease to survive,
- using water free of inoculum for dust suppression.

In the Conventional Mining System, the pits and haul road network are assumed to be diseased.

11.2.2 Haul Roads and Access Planning

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 Corporation will be consulted on specific aspects of this plan.

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.

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

11.2.3 Mine Planning

Dieback management requirements will be evaluated by the site MES and endorsed by CALM prior to the annual MOG review.
In the Dieback Free Mining System, dieback areas need to be known by planners and loader operators, to ensure dieback material is not inadvertently carried over haul roads or used in road building.

11.2.4 Supervision

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

11.2.5 Cleandown

All 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.

11.2.6 Pit Drainage

In pits with deep bauxite, runoff will be collected and infiltrated into the pit floor below the level of the caprock.

Pit infiltration areas will not be located above downslope forest which is vulnerable to dieback disease (ie., Dieback-Free or where the existing dieback impact is low) if a better alternative exists.

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

11.2.7 Haul Road Watering and Drainage

All haul roads will be drained to sumps or into mine pits.

Sumps should not be allowed to discharge or be pumped into dieback free forest.

For the Dieback Free Mining System, water used for construction and dust suppression will be treated with chlorine to ensure it is free of inoculum.

SECTION 3: PRESCRIPTION FOR REHABILITATION OF BAUXITE MINES

1. INTRODUCTION

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.

However, the complexity of the system must not deter the formulation and clear statement of objectives and strategies, and the employment of the most up-to-date techniques. This document provides operating guidelines for field personnel, and is the basis for review by the parties involved.

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

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.

This section of the Working Arrangements describes the current agreement on the techniques to be used in bauxite mine rehabilitation in the higher rainfall zone of the jarrah forest.

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

- the location and timing is acceptable to CALM and the Water Corporation (where water catchments may be affected),
- accepted research procedures for experimental design, measurement and follow-up are fulfilled.

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 Alcoa. 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 Forest Management Plan, 1994 - 2003. The objective of bauxite mine rehabilitation in the jarrah forest is to maximise the forest's potential by:

> *Establishing a self sustaining jarrah forest ecosystem, planned to enhance or maintain water, timber, recreation, conservation and other nominated forest values. Rehabilitated areas must become amenable to similar management practices employed in the surrounding jarrah forest.*

Specific goals include:

- Water values: to ensure that mined areas provide acceptable water quality and quantity.
- Timber: to grow a forest which has the potential for sawlog production.
- 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.
- Protection: to conserve the residual soils; to control dieback spread and to manage potential fire hazards.
- Landscape: to create a rehabilitated landscape visually compatible with the adjoining indigenous forest.
- Conservation: to encourage the development of floral, faunal and soil characteristics of the indigenous jarrah forest ecosystem.
- 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 management resources greater than those needed by the unmined forest (for example, fertiliser applications).

3. REHABILITATION STRATEGIES

These are:

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

(b) 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.

(c) The monitoring of rehabilitated areas to determine their capacity to sustain long-term production of the forest values listed in the objective.

(d) The development of remedial treatments should monitoring reveal that rehabilitation objectives were not achieved.

4. REHABILITATION PLANNING

Rehabilitation planning occurs at two levels:

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

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

4.1 Regional Planning

Alcoa produces an annually updated five year mining and management plan for submission to government. These plans are drawn up in consultation with appropriate government departments after consideration of environmental aspects such as:

- 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,
- occurrence of site vegetation types and rare flora and fauna,
- water management systems and water course protection,
- proximity to private property.

4.2 Annual Operational Planning

Alcoa personnel prepare rehabilitation plans for each mined area seasonally. These are available to CALM and WAWA for comment on request. Specific issues may include:

- dieback management, and drainage and erosion control, specifying measures to be used from initial drilling through to completed rehabilitation,
- treatment and management of "islands" of forest within mined areas,
- plant species to be used,
- any special landscaping requirements,
- access to pits for future forest management,
- research trials, including details of decommissioning,
- scheduling of rehabilitation operations,
- movement, stockpiling and replacement of top soil and overburden,
- the long term management strategy for the rehabilitated area as planned by CALM.

4.3 Fire Protection Provisions

These are outlined in detail in Fire Protection Plans produced for each mine.

5. REHABILITATION OPERATIONS

Rehabilitation can be broken into a number of stages. These are Landscaping, Soil Return, Contour Ripping and Seeding.

5.1 Landscaping

5.1.1 Introduction

Landscaping involves the battering down of vertical pit faces and the construction of contour banks and sumps.

5.2 Sequence of Landscaping Operations

Because it doesn't involve soil, landscaping can occur under any weather conditions provided the approved rehabilitation design can be achieved.

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

- Deep ripping of compacted pit floors which may be covered with more than 0.5 metres of fill.
- Vertical faces are re-shaped to achieve acceptable grades.
- *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.
- Pits are landscaped to retain water.
- Contour banks and drains are constructed if required.
- Heavy equipment leaves the pit via the haul road system.
- Service and supervisory vehicles access the pit, via the haul road system, to service the heavy equipment.

5.3 Unmined Areas

Islands or inliers of low grade ore (waste) 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 a minimum. If an island of greater than 0.5ha needs to be cleared it should be discussed with the District CALM Officer.

When this occurs, either the area will be completely landscaped or the unmined caprock will be fractured 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 30cm. 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 sufficient to ensure comprehensive vegetation establishment on the waste island.

5.4 Dieback Control Strategies

5.4.1 Containment

All run-off is contained within the pit, or released via approved drainage routes.

Water holding areas are located above forest which is not susceptible to dieback spread or intensification, where possible. Water is ponded below caprock level.

5.4.2 Hygiene

In the Dieback Free Mining System, dieback boundaries are re-established. Equipment must be cleaned down on exit from a Dieback or Uncertain area.

In the Conventional Mining System, equipment can enter and leave the pit at any time, via the haul road system unless the area is dieback free.

Equipment must not drive into the adjacent forest.

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

During landscaping in summer, surface conditions are unfavourable for the survival of the dieback fungus. This may be used to reduce the dieback inoculum in suspect or dieback areas.

5.5 Soil Return

Overburden and top soil will be evenly respread over all areas to be rehabilitated.

Infected material should not be returned to dieback free sites which are above significant areas of dieback free vegetation.

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

Attention is to be paid to the need to avoid significant damage to the structure of topsoil as a result of stripping or returning) when the soil is excessively wet. The guidance of the Mine 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".

5.6 Contour Ripping

Ripping occurs on the new surface after soil has been returned to the pit. Dieback control strategies appropriate to surface operations are required.

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 subsoil.

Ripping is carried out on contour with a winged tyne to promote vertical heave and lateral cracking. The winged tyne is effective in moister soil than a conventional tyne.

Straight tynes and scarifying tynes are used in areas unsuitable for the winged tyne.

Deep ripping is required to fracture the compacted pit floor to allow root penetration and water infiltration. Joint inspection by CALM and Alcoa of pits prior to ripping may be carried out.

(a) All of the rehabilitated areas require contour ripping,

(b) Deep ripping should be done using a winged tine to maximise subsoil fracture; some 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;

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

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

(e) 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.

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

5.7 Dieback Control Strategies

Before topsoil return new dieback boundaries are pegged. These are sometimes modified from the pre-mining boundaries so that contour ripping can be carried out in a single dieback category.

In the Dieback Free Mining System, dozers are cleaned down before exit from Dieback or Uncertain areas unless entering a Dieback area. 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.

5.8 Fauna Return

Revegetation practices have the objective of restoration of the jarrah forest ecosystem. As such, fauna 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.

6. WATER MANAGEMENT

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

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.

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 quality in adjacent streams,
- there must be no long-term ponds of water lying either within or below pits or roads unless planned and designed,
- 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 drainage system must be acceptable in terms of costs, aesthetics and the land use priority.

6.1 Water Management Systems

Pits may be designed and constructed so as to:

(a) retain and infiltrate water, or

(b) 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.

6.2 Water Retention and Infiltration

Will be achieved by:

(a) infiltration and silt trapping in the contoured rip lines, and

(b) 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 flow 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 May 1.

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.

6.3 Water Discharge

Where this is prescribed it will be achieved by:

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

(b) 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 Corporation.

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.

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

Winged tine ripping effectively shatters the clay zone under most conditions.

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

6.4 Dieback Control Strategies

6.4.1 Erosion Control Structures

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

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.

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

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.

6.5 Seeding, Planting and Fertilising

6.5.1 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.
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.

6.5.2 Rehabilitation Operations Sequence

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

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.

6.5.3 Broadcast Seeding and Fertilising

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.

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

6.5.4 Hand Planting and Fertilisation

Due to the need to operate under wet conditions, these operations require particular attention to dieback control.
Vehicles not carrying plants and fertiliser should be confined to defined access tracks. Plant carrying vehicles must only enter a pit as a last resort as soil moisture conditions will be moist at this time of year, and therefore should only operate on access routes planned by Alcoa for each pit. 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.

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.

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

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

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

7. EUCALYPT ESTABLISHMENT

7.1 Seeding/Planting Layout and Design

As a general rule, tree species will be established as mixtures. Every mixture must include species native to the Darling Range. Species mixes will be determined in advance and specified in the rehabilitation plan by Alcoa and approved by CALM.

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.

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 1300 plants per hectare for planted stock. Alcoa will assess the areas 9 months after seeding.

Do not plant trees in drainage channels.

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 immediately after contour ripping usually from December to May.

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 to be free of dieback fungus.

Before seeding or planting all pits may 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.
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.

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.

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

Eucalyptus marginata (jarrah)
Eucalyptus calophylla (marri)
Eucalyptus patens (blackbutt)
Eucalyptus megacarpa (bullich)

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.

7.2 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.

7.3 Species Selection Criteria

1. 50% bullich 50% blackbutt

   Only to be used for stream crossings and the parts of pits with elevation 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.

7.4 Seed Sources for Seedlings

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

7.5 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.

7.6 Success Criterion for Seeded/Fertilised Areas

The success criterion for eucalypt seedlings in year one is 1300 stems/ha as assessed at 9 months on a whole pit basis.

7.7 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.

8. UNDERSTOREY ESTABLISHMENT

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.

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.

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 and species of low flammability and height for special fire management zones.

As a general rule, non-indigenous and high *Phytophthora cinnamomi* susceptible species should not be used. Non-indigenous species may only be used with the consent of the CALM Mining Coordinator. However, use of a low level of dieback susceptible species (about 10 - 20 species) will provide for future dieback monitoring.

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

8.1 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.

8.2 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.

9. ROADS

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.

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

- access for mining,
- access for rehabilitation,
- access for future forest and catchment management including fire protection.

Unwanted roads will be rehabilitated by:

- if possible and economical recovery of gravel for reuse elsewhere,
- blasting of caprock and/or breakup of all compacted material,
- overburden and top soil return,
- ripping and erosion control,
- seeding and planting in harmony with surrounding forest,
- 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.

SECTION 4: DIEBACK FOREST REHABILITATION PRESCRIPTION

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:

(a) minimising soil erosion
(b) increasing habitat
(c) increasing biodiversity
(d) improving amenity
(e) restore productivity
(f) 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, being mindful of the requirements of the native fauna,

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 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.

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 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 Coordinator 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 CALM 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

(a) 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.

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

9.2 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 an operational scale.

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

9.3.1 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.

9.3.2 Operational Procedure

(a) Establish site specific objectives and aims.

(b) Apply evaluation of criteria.

(c) Review treatment options.

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

(e) 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 2/91 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.

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

(g) 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.

(h) 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.

(i) 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 stems per hectare and fertilise using 200g of DAP/plant, following the onset of winter rains but only if direct seeding is unlikely to meet the establishment criteria. It is preferable to establish eucalypts by direct seeding. If this technique is used then either 800 stems per hectare 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 stems per hectare 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:

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

(ii) 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.

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

(iv) The CALM Silviculture Specification 4/89 "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)(stems per hectare).
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.

11. SURVEYING

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

SECTION 5: INTERAGENCY AGREEMENT FIRE CONTROL

1. 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 and areas adjacent to and under mine rehabilitation, 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	

2. 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 ie., 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.