14 APPENDIX C – LAND MANAGEMENT PLAN

LAND MANAGEMENT PLAN

ANGLESEA

Location of Hard Copies

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2	Mine Manager	
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Introduction

Location

The Anglesea site is situated on unreserved Crown Land, 41 kilometres southwest of Geelong, and two hundred metres north of the town of Anglesea.

The site consists of Alcoa freehold and a 7097-ha area of Crown Land leased under provisions of the *Mines (Aluminium Agreement) Act 1961* which grants Alcoa of Australia Ltd exclusive right to explore and extract coal found within the area for 50 years, until 2011, with the right of 50 years renewal.

Alcoa mines brown coal in an open cut mine to fuel its 160-MW Anglesea PowerStation located within the lease area. The electricity produced is transmitted via a 35-km high voltage power line to Alcoa's aluminium smelter and fabricating mills at Point Henry, near Geelong. The PowerStation supplies approximately 40% of Point Henry's power requirements.

Site description

Originally referred to as the Alcoa Lease, the site at Anglesea is now the Anglesea Heath. The Anglesea Heath consists of two main areas:

Mining Area: Coal Mine & PowerStation: 545 ha of lease and freehold where mining and power generation areas and administration offices are located.

Land for Conservation: 6676 ha of lease.

There are also 22 ha of additional freehold, currently supporting a variety of land uses, located between the Mining area and the Anglesea township.

Mining Area

Exploration for brown coal began here in the late 1950's to supplement dwindling brown coal reserves from mines in the Barwon region.

Results of exploratory drilling by the then Mines Department, Roche Brothers and later Western Mining Corporation indicated a large economically-viable coal deposit immediately to the north of Anglesea. Roche Brothers commenced open cut mining operations with two small pits at the western end of this deposit in 1959. Later control of the deposit passed to Western Mining Corporation - who after approaching Alcoa became part of Alcoa of Australia Ltd – and in 1961 Alcoa was granted a long-term lease over the deposit.

As drilling information at the time was largely incomplete, the Roche Brothers open cut was established in error on the lower of two coal seams instead of the thicker upper main seam. With the major customer base shifting to alternate fuel sources, the output from the Roche Brothers open cut dwindled from 169,000 tonnes in 1959 to 14,300 tonnes in 1968. The coal reserve in this section of the lower seam was all but exhausted when Alcoa commenced open cut mining operations in 1969.

Since 1969 Alcoa has mined approximately 1.1 million tonnes of brown coal each year from the main upper seam within the open cut.

Land for Conservation

The area offers one of the most diverse and spectacular areas for flora, scenic landscape and wildlife communities in Victoria. A remarkable number of flora species exists here with over 620 native plant species including 79 species of orchids. This represents approximately one-quarter of Victoria's complement of flora species and half of the State's orchid flora. The heathy woodland community appears to be the richest and most diverse found in Victoria probably only exceeded by some heathy communities in southwestern Western Australia (LCC, 1987), which the listing of much of this area on the National Estate Register recognises.

The heathy woodland complex in the study area is of exceptional quality with only serious disturbance or degradation occurring in a few locations. The entire lease area was burnt by wildfire on Ash Wednesday, 16 February 1983 and several ecological burns have been carried out since.

Land Management Plan

A unique agreement between Alcoa and NRE, allows government and industry to jointly manage the Land for Conservation and ensure that this important area is protected. This area has been named the Anglesea Heath and is managed using the Anglesea Heath Management Plan. Alcoa employs an MINE Environmental Scientist and funds a Parks Victoria Ranger to implement the strategies and actions of this Management Plan including the protection of threatened species, track rationalisation and rehabilitation. Both the Agreement and the Management Plan allow continued use and management of the Mining Area and any future expansion of that area in accordance with the requirements of the *Mines (Aluminium Agreement) Act 1961*.

Freehold

In addition to the Mining area and Land for Conservation, Alcoa has 22 hectares of freehold land adjacent to the Anglesea township.

The Environment

Climate

Anglesea has a Mediterranean type climate, with a hot, dry summer and a cool, wet winter. The site receives an average of 600-700 mm of rain each year, most of it falling between May and October.

Temperatures are warm to hot in summer and mild in winter, with occasional frosty mornings. A typical daily range in January is 15 to 30°C with average maximum temperatures reaching 23 to 25°C, and a typical daily range in July is 5 to 15°C with the average minimum temperatures down to 4 to 5 °C.

Geology and Soils

Soils developed on the Tertiary sediments of the Anglesea area generally exhibit acid duplex profiles from three distinct profile types developed from differing parent materials. The main characteristic of the vast majority of soils in the area is the distinct texture contrast between the light-textured sandy surface soil and the clay subsoil.

Sandy podzols and podsolic soils tend to be developed on older Tertiary sediments and therefore tend to be more prevalent on the lower sections of slopes. These highly leached acidic soils are characterised by sandy topsoils and low fertility with deficiencies in Phosphorus, Potassium, Nitrogen, Copper, Zinc and Molybdenum.

Lateritic podsolic soils are generally developed on the plateau remnants of the Tertiary peneplain. The A horizons of these soils have a loamy texture with a organic A1 and bleached A2 horizon, changing sharply to well structured silty clay at around 40 cm depth. Ironstone blocks and nodules are ubiquitous at around 1.0 metre depth. Deficiencies in Phosphorus, Potassium, Copper and Molybdenum are common in these soils (Pitt, 1977).

Acid peaty soils are developed in local creek beds and may be up to several metres in depth. Although nutrient levels are high, they are not freely available to plants due to a pH less than 4 (Kentish and Bourne, 1983).

Vegetation

The vegetation of the area consists of dry heathlands and heathy open forests and woodlands. Marshy Creek and Salt Creek flow south and east respectively through the area and are characterised by broad swampy areas dominated by shrublands of *Melaleuca squarrosa* (Scented Paperbark) (LCC, 1987).

Land Management Plan

This Land management plan outlines the current management strategies for the PowerStation, Mining area and freehold that is managed by Alcoa of Australia Ltd. This includes the rehabilitation strategy for the open cut mine in addition to land management issues associated with the mining area and freehold including liability, environmental protection, pest plant control, fire management and protection of indigenous flora and fauna. The Land management plan concentrates on environmental impact, appropriate land-use, community use of Alcoa freehold, being a 'good neighbour' and increasing active management of the area to maintain the natural values of the area.

Land Management Plan

The management of the Land for Conservation will not be addressed here as this area is managed cooperatively by Alcoa and Parks Victoria with the Anglesea Heath Management Plan. Reference to the Anglesea Heath will occur, as it is the intention of this plan to manage the Mining Area and freehold in a manner consistent with the surrounding lease.

References

- D0076435 Land Conservation Council Melbourne Area District 1 Review Final Recommendation
- D0075635 Anglesea Heath Management Plan
- Kentish, K.M. and Bourne, A.R. (1983) Mine Rehabilitation: A study of revegetation and fauna return at Anglesea, Victoria. Submitted by K.M.Kentish for MSc. Deakin University
- Pitt, A. (1977) Soils of the Otway Ranges and Surrounding Coastal Plain. Proceedings of the Royal Society of Victoria. Vol 89: 69-75
- Rolland, C. (19??) The ongoing rehabilitation of the Anglesea Brown Coal Mine

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Environmental Management Overview

Anglesea's Environmental Management System is based on the ISO14001 standard. The lead component of the system is the Environmental Health and Safety Policy, which sets the overall direction for environmental performance for the site. This section of the Land Management Plan describes the key elements of the Environmental Management System that are relevant to the area of Land Management.

Alcoa's Environmental, Health and Safety Policy

Anglesea has embraced the Corporate Environmental, Health and Safety Policy as it's own. In addition to the Corporate EHS policy, Anglesea has added a number of principles committing the site to continuously improve it's EHS performance.

The EHS policy is available internally on all computers via the internet, on all noticeboards or from administration. Externally the policy is available from the Community Relations Officer at Anglesea or from Alcoa Australia's web site.

This policy supports the Alcoa EHS Value that we will work safely in a manner that promotes the health and well being of the individual and the environment.

Policy

It is Alcoa's policy to operate worldwide in a safe, responsible manner which respects the environment and the health of our employees, our customers and the communities where we operate. We will not compromise environmental, health or safety values for profit or production.

All Alcoa employees and contractors are expected to understand, promote and assist in the implementation of this policy and the accompanying principles.

Principles

In support of Alcoa's Environmental, Health and Safety Policy, the following principles have been developed to provide additional direction on accountability and on specific issues.

- We value human life above all else and manage risks accordingly.
- We relentlessly pursue, and continually improve EHS systems and processes to achieve an EHS incident-free workplace.
- We do not compromise our EHS value for profit or production.
- We comply with all laws and set higher standards for ourselves and our suppliers where unacceptable risks are identified.
- We support pollution prevention and sustainable development, by incorporating social responsibility, economic success and environment excellence into our decision making process.
- We measure and assess our performance and are open and transparent in our communications.
- We supply and use safe and reliable products and services.
- We use our EHS knowledge to enhance the safety and well being of our communities.
- We are all accountable for conforming with and deploying our EHS value and principles.

At Anglesea Power Station, all employees and contractors will demonstrate our commitment to this EHS Policy and Principle Statement by progressively reducing our environmental, health and safety impacts and the intensity of our resource and energy use by participating in programs to:

- ensure environmental, health and safety factors are integrated into business planning through the Alcoa Business System as part of the implementation of comprehensive environmental and safety management systems;
- systematically address key environmental impacts for the power station and mine, such as land management issues, equipment noise, air quality, process water usage and discharge, energy efficiency and greenhouse gas emissions.

- working together to actively care for ourselves, our team-mates and other people in our area, our neighbours and the environment;
- actively share our improvements and achievements within the station, other Alcoa locations and with the community in which we operate.
- Engage and consult with employees and the community on health and safety and environmental issues.

References

- D0089618 Anglesea Environmental Health and Safety Policy

Land Management Plan

Identification of Significant Aspects & Impacts

Anglesea's environmental policy, improvement plans and management programs are developed to ensure that activities at the site are managed to minimise impacts on the environment. In developing the Environmental Management System a systematic review of all operations was carried out to identify potential environmental impacts.

A risk assessment process was used to rank the environmental aspects and impacts according to potential environmental impact, frequency or likelihood of occurrence, legislative or other requirements, stakeholder concerns (including community and employees) and financial liability.

All potential impacts ranked as 'significant' must have systems in place to mitigate or minimise the impact on the environment.

The potential significant environmental impacts relevant to land management include, but are not restricted to,

- Spread of Phytophthora due to the movement of equipment and soil and drainage of water from Phytophthora-affected to Phytophthora-free areas;
- Disturbance of areas that have heritage values, rare and endangered species and ecosystems;
- Reduced localised biodiversity due to clearing and loss of habitat;
- Increased stream turbidity due to runoff from disturbed areas; and
- Unsustainable revegetation due to ineffective rehabilitation techniques.

References

- D0024281 Victorian Operations Aspects and Impacts – Identification and Evaluation Procedure
- D0055198 Identification of Significant Environmental Aspects
- D0055446 Master Index Aspects and Impacts Register for Anglesea PowerStation
- D0055319 Significant Environmental Aspects and Impacts Register – Mine + Land Management

Legal and other requirements

The process for identifying and accessing legal requirements and other environmental standards, guidelines and voluntary signatory agreements to which the Alcoa subscribes is described within the reference documentation of this section.

The identification, review and communication of legal and other requirements such as Government guidelines, Corporate standards and voluntary agreements is also assisted by an external legal consultancy who conduct a quarterly review. Any changes or new legislation is then communicated to the environmental personnel.

Regulatory Requirements

The Anglesea Environment Management System as part of the ISO14001 certification maintains a register of standards and statutory obligations that apply to Alcoa's operations.

A legal counsel system covers all the acts potentially relevant to Anglesea. An external legal firm maintains the system and updates are communicated to environmental personnel quarterly to ensure the sites are kept up to date with new legislation and standards.

The following are some principal Acts and Regulations that apply to the area of Land Management for Anglesea.

Fire Management

- Country Fire Authority Act 1958

  This Act governs the management and extinguishment of fires in the country area of Victoria and establishes the Country Fire Authority, Regional and Municipal Fires/ Prevention Committees and the Country Fire Authority Appeals Commission.

  This Act controls the lighting of fires at Anglesea for the control of undergrowth fuel sources.

Flora and Fauna Management

- Environment Protection and Biodiversity Conservation Act 1999

  The purpose of the Legislation is the protection of the environment and conservation of biodiversity. The Act establishes a regime of inter-governmental agreements, management plans, approvals and permits for certain actions to be taken in, or affecting, the environment in general, or particular aspects of the environment.

- Flora and Fauna Guarantee Act 1988 & Flora and Fauna Guaranteed Regulations 2001

  The purpose of this Act is to establish a legal and administrative structure to enable and promote the conservation of Victoria's native flora and fauna and to provide for a choice of procedures that can be used for the conservation, management or control of flora and fauna and the management of potentially threatening processes.

- Wildlife Act 1975 & Wildlife Regulations 2002

  The purposes of this Act are:

  (a) to establish procedures in order to promote:

  (i) the protection and conservation of wildlife; and

  (ii) the prevention of taxa of wildlife from becoming extinct; and

  (iii) the sustainable use of and access to wildlife; and

  (b) to prohibit and regulate the conduct of persons engaged in activities concerning or related to wildlife.

  The Act establishes the framework for the protection and conservation of wildlife and regulates the conduct of persons engaged in activities concerning or related to wildlife. The Regulations establish a framework for the protection of wildlife in Victoria and a licensing system in relation to wildlife.

Land Management Plan

Cultural Heritage

- Aboriginal Heritage Act 2006

  The main purpose of this Act is to provide for the protection of Aboriginal cultural heritage (Aboriginal places, objects or human remains) in Victoria.

  The Act regulates high impact developments with the potential to harm Aboriginal cultural heritage by requiring that a Cultural Heritage Management Plan be prepared prior to development commencing. The Act also regulates smaller developments by prohibiting certain activities without a permit.

- Aboriginal and Torres Strait Islander Heritage Protection Act 1984

  This Act makes provision for the preservation and protection from injury or desecration of areas, places and objects in Australia and in Australian waters, being areas, places and objects that are of particular significance to Aboriginals in accordance with Aboriginal tradition.

  This Act establishes a general regime applying to all States and a regime to protect Aboriginal places and objects in Victoria.

  The Act provides for the declaration of protected places, areas and objects, which gives rise to obligations and responsibilities.

- Heritage Act 1995

  This Act provides for the protection and conservation of places and objects of cultural heritage significance and the registration of such places and objects, and establishes the Heritage Council and a Victorian Heritage Register.

  A site within the Anglesea lease area is listed on the Heritage Register, whilst archaeological sites have not yet been identified.

Land Management

- Conservation, Forests and Lands Act 1987 and regulations (including the Conservation, Forests and Lands (Anglesea Heath) Regulations 2000)

  The purposes of this Act are--

  (a) to create a body corporate called the Director-General of Conservation, Forests and Lands, to define its powers and to transfer to it the functions of the Forests Commission, the Soil Conservation Authority and the Vermin and Noxious Weeds Destruction Board, and to abolish those bodies;

  (b) to provide a framework for a land management system and to make necessary administrative, financial and enforcement provisions;

  (c) to establish a system of land management co-operative agreements;

  (d) to make consequential amendments to various Acts.

- Planning & Environment Act 1987

  The purpose of this Act is to establish a framework for planning the use, development and protection of land in Victoria in the present and long-term interests of all Victorians.

  This Act includes the Victorian Planning Provisions to assist in providing a consistent and coordinated framework for planning schemes in Victoria. Native Vegetation Retention Controls and the need for a planning permit to clear native vegetation have been in place since 1989 in all Victorian Planning Schemes through these Provisions.

Mineral and Stone extraction

- Mines (Aluminium Agreement) Act 1961

  This act describes the agreement between Alcoa and the State to establish Alcoa's lease.

- Mineral Resources (Sustainable Development) Act 1990

The purpose of this Act is to encourage an economically viable mining industry which makes the best use of mineral resources in a way that is compatible with the economic, social and environmental objectives of the State.

The objectives of this Act are:

a) to encourage and facilitate exploration for minerals and foster the establishment and continuation of mining operations by providing for:

   i) an efficient and effective system for the granting of licences and other approvals; and

   ii) a process for co-ordinating applications for related approvals; and

   iii) an effective administrative structure for making decisions concerning the allocation of mineral resources for the benefit of the general public; and

   iv) an economically efficient system of royalties, rentals, fees and charges; and

b) to establish a legal framework aimed at ensuring that:

   i) mineral resources are developed in ways that minimise impacts on the environment; and

   ii) consultation mechanisms are effective and appropriate access to information is provided; and

   iii) land which has been mined is rehabilitated; and

   iv) just compensation is paid for the use of private land; and

   v) conditions in licences and approvals are enforced; and

   vi) dispute resolution procedures are effective; and

   vii) the health and safety of people is protected in relation to work being done under a licence; and

c) to recognise that the exploration for, and mining of, mineral resources must be carried out in a way that is not inconsistent with the Native Title Act 1993 of the Commonwealth and the Land Titles Validation Act 1994.

- Extractive Industries Development Act 1995

The main purposes of this Act are to:

(a) provide a co-ordinated assessment and approvals process for extractive industries;

(b) ensure that extractive industry operations are carried out with safe operating standards and in a manner that ensures the rehabilitation of quarried land to a safe and stable landform;

(c) provide a procedure for notification of proposed extractive industries to licence holders under the Mineral Resources (Sustainable Development) Act 1990;

(d) provide for the payment of royalties for stone extracted from Crown land.

For the purposes of this Act land in the leased area within the meaning of the definition of 'leased area' in the agreement set out in the Schedule to the *Mines (Aluminium Agreement) Act 1961* is deemed to be private land of which Alcoa of Australia Proprietary Limited is the owner for any purpose other than the determination and payment of royalty to the Crown.

Pest plant and animal management

- Catchment and Land Protection Act 1994

This Act aims, amongst other things, to set up a framework for the integrated management and protection of catchments and to set up a system of controls on noxious weeds and pest animals. The Act establishes and set up the powers of the Victorian Catchment Management Council and Regional Catchment and Land Protection Boards. However, it also imposes certain positive obligations, which are potentially relevant to Alcoa.

The Act includes provisions, which impose obligations to control the spread of noxious weeds and established pest animals. Alcoa has implemented weed control measures at all of its Victorian sites.

References

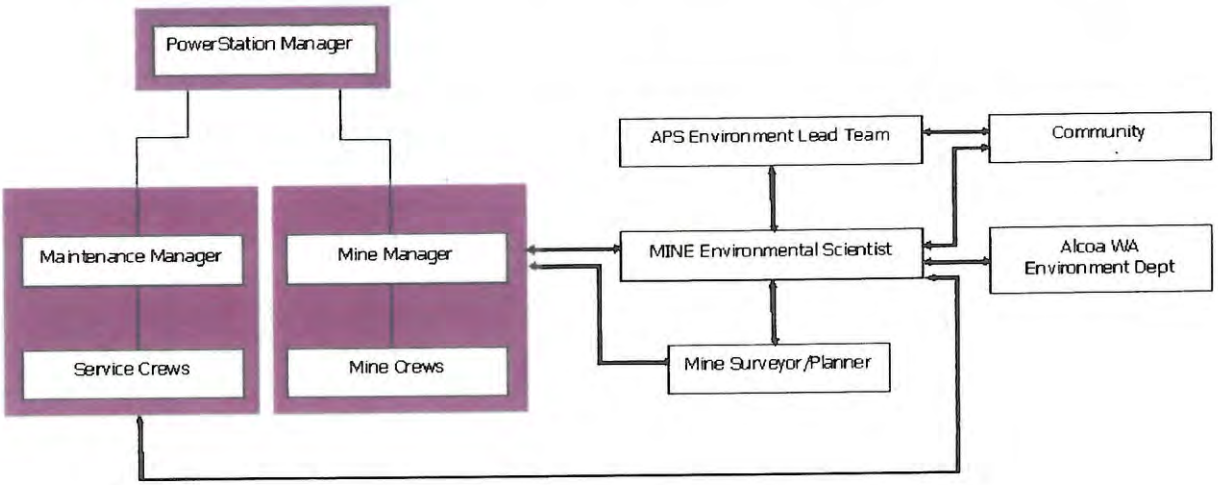
- D0022980 Identification and access to Legal and other environment requirements
- D0044859 Legal Requirements – ISO14001
- D0042662 Environmental Management Legal, Regulatory and Guidance document register
- D0032156 Environmental Related Legislative Requirements
- Environmental Legal Manual for Victoria at U:\ENVIRONM\Legal\

Land Management Plan

Land Management Structure & Responsibility

The environmental performance of the Anglesea site is the responsibility of the PowerStation manager. The mine staff and Environmental Lead Team act as a support group and the MINE Environmental Scientist is accountable for implementing and maintaining the sites land management programs.

The following diagram summarises the Anglesea's land management structure in support of the MINE Environmental Scientist.



The MINE Environmental Scientist is responsible for:

- Ensuring that the site's environmental management system requirements are established, implemented and maintained in accordance with the ISO 14001 standard
- Assisting with the setting of environmental goals for the mine.
- Coordinating the mine's environmental activities
- Implementing corporate environmental policies

All employees and contractors are expected to understand and apply Alcoa's Environmental Policy and the Environmental Values of Alcoa.

References:

- D0072789 Victorian Operations Environmental Responsibilities

Environmental Communication

Anglesea is committed to communicating promptly and openly with employees, stakeholders and the community. Communication on land management and environmental issues is undertaken in several different ways.

Internal Communication

Environmental communication is undertaken within Alcoa at various levels and via various methods. Communication not only occurs within the site, but between Alcoa operations world wide and with the Corporate Department in Pittsburgh.

Anglesea has a monthly Environmental Lead Team meeting involving environmental staff, the Mine Manager and other department supervisors where appropriate. These meetings discuss environmental issues such as incidents, performance, new legislation or other requirements, audit findings and actions and any new projects that may require environmental input.

Internal reports are used to communicate to management. Environment staff submit weekly bullets and monthly reports to the PowerStation Manager and quarterly reports on environmental performance to the Corporate office.

The Environment Report, produced every month, contains environmental data and environmental information of interest. The newsletter is directed at employees but is also read by Alcoa environment staff at other locations, external stakeholders including the EPA and community members.

Environmental Incident Reporting

All employees are required to report environmental incidents. Environmental incidents are to be captured in the EHS Incident Management System under the Environmental Incidents menu. Incidents are entered into the system in accordance with the Environmental Incident Reporting Guidebook, accessed from this site.

All employees have access to the system either directly or through their supervisor. The report covers what happened, what was done immediately to rectify or control the situation, and corrective actions to be undertaken to prevent recurrence of the incident.

The EOH Consultant approves all incidents. Environmental Incidents are reviewed at daily morning meetings and weekly site management meetings. Outstanding corrective actions appear on the user's screen as a reminder and remain until the action is completed.

An incident matrix is used to determine the category of incident and the internal and external reporting requirements. Incidents classed as major are communicated to all Alcoa facilities to highlight to other sites the potential for environmental impact and actions taken.

External Reporting Requirements

Alcoa is required to submit external reports, as part of legal and other external requirements. Reporting on the site's operations is an important component of the site's environmental communication processes. The Environmental Reporting Requirements Register lists the key routine reports generated to communicate both internally and externally with key stakeholders.

References:

- D0031004 Environmental Incident Reporting
- D0066815 Environment Metrics Reporting
- D0069046 Environmental Reporting Requirements Register
- Anglesea Monthly Environment Reports
- Anglesea Environmental Angle

Training and Inductions

Environmental training is undertaken to ensure that personnel whose work may have a significant impact on the environment have received training appropriate for their job and are suitably competent.

The main sources of environmental training are:

- Inductions
- Environmental Training
- Operational Training

Minimum competencies for key job functions are established in the Learning Management System (LMS). This system contains profiles to define the training required for each position. LMS is also used to access training packages and record when training is completed. LMS can be used to run reports to identify when retraining is due.

Employees and Contractors Inductions

All new employees and contractors receive an induction that covers Alcoa's Environmental, Health and Safety policy and the environmental management systems for significant impacts such as Phytophthora, spills and waste.

Environmental Training

Employees receive formal and informal training in areas relevant to their duties, as well as general environmental awareness training. Training requirements for personnel in the management of significant environmental impacts such as Phytophthora, hydrocarbon management and spill cleanup, turbidity and noise management are identified, scheduled and managed as per the training needs identification process. The aim of this training is to raise awareness of the impact and ensure that people understand how their actions can minimise or prevent that impact from occurring.

Operational Training

Procedures and standard work instructions (SWIs) are written for critical activities that may have a significant impact on the environment. A computer based document management system (Paradigm) contains all procedures and SWIs which have been adopted by the mine. Operational training is undertaken using these procedures via the LMS system.

The aim of this training is to ensure that all personnel understand their roles and responsibilities and the importance of following SWIs and procedures. The training focuses on ensuring that personnel understand the potential impacts on the environment their activities may have if they do not follow these standardised procedures.

References

- D0093573 General Plant EHS Induction
- D0073238 Environmental Training Matrix
- D0061776 Environmental Awareness Training

Mine Rehabilitation

The current rehabilitation objective for the Anglesea site is to establish a diverse, self-sustaining heathy woodland ecosystem that maintains or enhances the surrounding land use such as conservation, recreation and other natural values.

The method outlined on the following pages provides the principle strategy of mine rehabilitation at Alcoa Anglesea where possible. An alternative strategy may be required in particular circumstances where, for example, there is an absence of topsoil for direct return, the slope is too steep to hold topsoil placement or the slope will be inundated with water. Rehabilitation then may employ the placement of subsoil as a growth medium, the application of a seed mix and/or hydro mulch with supplementary planting of tube stock. Irrespective, of the method employed, all strategies will strive to utilise indigenous species and provide habitat functionality contiguous with the surrounding heathy woodland.

The heathland vegetation at Anglesea is established on predominantly sandy soils. These soils are characteristically low in nutrients, and together with limited water availability and unlimited light, growing conditions will only be slightly altered by the first succession of plant species. Therefore, the species that first establish on the site will control the long-term vegetation of the site. For this reason as many species as possible need to be introduced to the site at the establishment phase of mine rehabilitation.

Pre-stripping Management

The value of the seed bank within the topsoil in the rehabilitation process means that some attention to the management of the area is required prior to stripping.

Ongoing weed control is necessary to minimise the build-up of undesired species in the topsoil.

Management of fire is also important in the years prior to stripping. Whether it is wildfire or ecological burns, care needs to be taken with fire to ensure that the seed bank is not depleted and has adequate years post-fire for the soil seed bank to be replenished. Areas directly in front of the mine path will need time after fire to replenish a depleted seed bank.

Disturbance to the pre-stripping area can also be detrimental to bradysporous species that have the potential to be harvested as mulch. The seed in persistent woody fruits on species such as Banksia and Leptospermum may represent many years of seed production. Disturbance in the immediate years prior to harvesting can compromise this source of seed.

Access directly in front of the mine path in unmined vegetation will be restricted to minimise the risk of spreading Phytophthora throughout the area. The presence of Phytophthora has lethal effects on a number of indigenous species including Xanthorrhoea, Isopogon, various pea species and most plants in the Proteaceae family. Phytophthora can remove these species from the ecosystem and remove the propagules (seed, rhizomes, woody fruits) that would be used to reestablish these species in the rehabilitation area as well as infect the soil to be used in the rehabilitation areas and prevent the growth of these species in the rehabilitation area indefinitely.

Botanical Survey

The area that is scheduled for clearing each year to enable mining of the annual mine plan is subject to a pre-mining flora survey. Following the method for the botanical monitoring, this information is used as a benchmark of what can be expected with regard to species diversity and abundance for the mine rehabilitation area that utilises the area's mulch and topsoil.

Clearing

Area Cleared

At Anglesea approximately 2 to 4 hectares is cleared annually. The area 'open' (including open cut mine, haul roads and PowerStation infrastructure) will vary each year depending on the area of new clearing and the area rehabilitated.

Disposal of Vegetation

The understorey is harvested for mulch to be utilised later in the rehabilitation process. Timber debris and logs are reclaimed to be utilised for the track closure and rehabilitation program within the Anglesea Heath or within the Mine Rehabilitation Area itself.

Landscaping

After the return of overburden is completed, a minimum one metre of clay/gravel that is found naturally below the topsoil/subsoil layer is returned. The slope is then smoothed to blend the mined area into the surrounding landscape. Topsoil/subsoil is then returned to the landscaped surface.

Soil Handling

The soil layer varies from almost nothing to several hundred mm in gullies and low-lying areas. Typical soil depths are in the range 100 to 200mm. The top 50 - 100 mm is topsoil, and contains most of the seeds and other propagules, as well as much of the soil's organic matter. The soil beneath the topsoil and above the overburden is referred to as subsoil and while it may contain some organic matter and be a suitable substrate for plant establishment, the amount of seed and other propagules is significantly less than the topsoil.

The soil is double stripped, to keep the seed and organic matter rich topsoil separate from the subsoil, and the soil is re-spread in the reverse order - subsoil first with topsoil on top. In 2007 the subsoil itself was double stripped separating the first 100mm from below the topsoil from the remaining subsoil. This followed on from a research project looking at rhizome propagules depth within the soil (Anderson, 2007). Monitoring in 2008 will indicate whether this has contributed to species diversity and or abundance.

Soil handling is most efficient if the amount of soil stored in stockpiles is minimised and the amount of soil re-spread immediately on landscaped areas ('direct return') is maximised. Direct return also has benefits for the quality of the rehabilitation. There are many species where seed collecting for propagation and broadcast seed is impractical, very expensive or even impossible. For many of these species, the natural seed in the returned topsoil is the best way to re-establish these species in the rehabilitated areas. Further, these species may only be present in rehabilitation areas with direct return of fresh topsoil. As well as encouraging the regeneration of native plants from propagules in the soil, damage to the soil's structure and loss of organic matter and nutrients are minimised with direct return.

If soil handling is undertaken in summer, when the soil is at its driest, the number of plant species which re-establish in the returned soil is maximised.

Mulch

Immediately prior to clearing and topsoil stripping, the vegetation of the heathland is harvested for application as mulch. The woody vegetation will contain the seeds of species that hold mature seed as persistent woody fruits in the canopy and is a possible source of seed for re-establishing heathland communities. The mulch can be harvested in a similar manner to 'slashing' an area with the 'slash' material collected. The mulch should not be applied at any great depth, otherwise it may compromise seedling emergence from the topsoil. Rather it should be lightly scattered across the surface. Mulch should be applied in drier months to allow the sun to dry out the woody fruits releasing the seeds prior to the autumn rainfall.

Rehabilitation Ripping

Ripping breaks up the compaction of the area that result from heavy rubber tyred mining equipment. It also reduces water runoff on slopes by increasing the soil's surface and sub-surface water storage capacity. After soil return, the entire surface is ripped on contour to a minimum depth of 1.5 metres. A trial in 2007 will look at the value of double ripping with the first ripping prior to subsoil/topsoil return.

Recalcitrant Plants

The heathland that re-establishes in rehabilitated areas is primarily of species arising from the topsoil. Trials in the 2003 rehabilitation indicated that there was no significant increase in species diversity or

species abundance with the application of mulch (Jeffery, 2005). At this stage, broadcast seed is only applied for a selected few species.

Propagation of some plants has been initiated as some species do not appear to be coming back in sufficient quantities into the rehabilitation. All the seed collected for propagation is collected from the area around the mine so that it is provenance correct. As rehabilitation techniques are refined it is envisaged that the number of species that require propagation and planting into rehabilitation areas will be reduced. Planting of recalcitrants will occur in the autumn/winter of following years after the botanical monitoring of the rehabilitation area has been completed.

Fauna Return to Rehabilitated Areas

All fauna are displaced during mining because their habitat is removed.

The heathy woodland vegetation surrounding the mining area has very little timber debris on the surface. Therefore the active introduction of timber from the stripped area in to the rehabilitation area is not currently pursued.

The presence of *Xanthorrhoea australis* plays a pivotal role in the provision of habitat for the small mammals of the heathland communities. The successful establishment of this species in the rehabilitation areas is crucial to the long-term viability of the area for fauna as part of the Anglesea Heath. In addition to the application of broadcast seed and planting of 2 year-old seedlings, trails continue for the establishment of mature grass trees salvaged from the mining area.

Monitoring of fauna return to rehabilitated areas has not been undertaken since Kentish assessed early rehabilitation areas in 1983. It is envisaged that a long-term program will need to be initiated to monitor mammals, birds, reptiles and invertebrates once a suitable vegetation structure is established. An investigative study was conducted in 2009 examining the invertebrate community of four mine rehabilitation sites, an un-mined heathy woodland site and a site that had been recently burnt (McKenzie, 2009).

Recording/Reporting

The MINE Environmental Scientist records the location of all soil removal, landscaping, soil return, ripping and seeding. These records are collated, transferred to maps and entered into the GIS system. From this system, details of each operation, and the location and date that it occurred can be recalled and used to explain differences in rehabilitation species numbers.

Rehabilitation Monitoring

The rehabilitated area established in 2002 was the first rehabilitation area to be monitored for biological diversity and comparison to undisturbed heathland. Each rehabilitation area is monitored at 18 months post-establishment to check that botanical diversity targets are met and to locate and identify areas that require any remedial treatment to control weeds or repair erosion damage.

References

Standards

- Corporate Standard - Bauxite Mine Rehabilitation Standard and Guidelines
- D0116295 Mine Rehabilitation Targets
- D0170184 EVC Benchmark Heathy Woodland

Reports

- D0075636 2003 Mine Rehabilitation Activity Summary
- D0113607 2005 Mine Rehabilitation Activity Summary
- D0133501 2006 Mine Rehabilitation Activity Summary
- D0170643 2007 Mine Rehabilitation Activity Summary

Land Management Plan

- D0179544 2009 Mine Rehabilitation Activity Summary
- D0087513 2003 Assessment for the presence of Phytophthora cinnamomi
- D0087515 2003 Archaeological Survey
- D0108571 2005 Archaeological Investigation Survey
- D0145127 2006 Archaeological Investigation Survey
- D0146022 2007 Archaeological Investigation Survey
- D0147441 2007 Memorandum of Understanding Alcoa and Wathaurong Cooperative
- D0208450 2010 Cultural Heritage Management Plan (CHMP)
- D0100639 2005 Pre-Mining Survey (2003)
- D0151134 2005 Pre-Mining Survey Draft (2004)
- D0120532 2006 Pre-Mining Survey (2005)
- D0149509 2007 Pre-Mining Survey (2006)
- D0084565 2002 Mine Rehabilitation Botanical Monitoring (2003)
- D0151133 2002 Mine Rehabilitation Botanical Monitoring Draft (2004)
- D0120729 2002 Mine Rehabilitation Botanical Monitoring (2005)
- D0120730 2003 Mine Rehabilitation Botanical Monitoring (2005)
- D0145401 Mine Rehabilitation Botanical Monitoring (2006)
- D0170192 Mine Rehabilitation Botanical Monitoring (2007)
- D0176476 Mine Rehabilitation Botanical Monitoring (2008)

Research

- Anderson, N. (2007) Mapping and quantification of topsoil seed reserves in the Anglesea Heath vegetation assemblage. Vacation Student Report prepared for Alcoa World Alumina Australia
- Botanic Gardens of Adelaide (2008) Depth and quantification of topsoil seed reserves in the Anglesea Heath vegetation assemblage. Prepared for Alcoa World Alumina Australia
- Jeffery, E.M. (2005) Mulch and smoke effects for mine rehabilitation in heathy woodland of southwest Victoria. Submitted by E.M. Jeffery for MMinRes. University of Queensland
- Kentish, K.M. and Bourne, A.R. (1983) Mine Rehabilitation: A study of revegetation and fauna return at Anglesea, Victoria. Submitted by K.M.Kentish for MSc. Deakin University
- McKenzie, J. (2009) Regeneration of invertebrate communities in the Anglesea Heath: comparing coal mine rehabilitation with previously burnt heathy woodland. Vacation Student Report prepared for Alcoa World Alumina Australia
- Palmer, E. (2008) Characterisation of soil and overburden materials for rehabilitation of the Anglesea Heath vegetation assemblage. Vacation Student Report prepared for Alcoa World Alumina Australia

Presentations

- D0097988 2005 Mine Rehabilitation Training
- D0115700 2006 Mine Rehabilitation Training
- D0133567 2007 Mine Rehabilitation Training

Procedures

- D0110020 Describe Mine Rehabilitation
- D0170782 Mine Rehabilitation Operator Checklist

Land Management Plan

- D00?? Describe Landscaping
- D0110073 Clearing Process – Roles + Responsibilities
- D00?? Describe Topsoil handling
- D0110097 Describe Mine Rehabilitation Ripping
- D0110092 Seed Collection Schedule
- D00?? Describe Seed Collection
- D0118853 Sending Seed for Research
- D00?? Describe Mulch Collection and Application
- D00?? Describe Supplementary Planting
- D0088386 Seedling Storage and Care
- D00?? Botanical Monitoring

Land Management Plan

Land Management Program

Management Zones

The zoning scheme has been modelled on those used in the Anglesea Heath Management Plan. The purpose of the zoning scheme is to:

- provide a geographic framework for management;
- indicate which management directions have priority; and
- provide a basis for assessing the suitability of future activities.

Five management zones will apply to the Mining Area and freehold: the Conservation I Zone, Interim Conservation I Zone, Conservation II Zone [Waterways & Wetlands], Conservation III Zone and the Conservation IV Zone.

Conservation I Zone

The Conservation I Zone is designated to protect sensitive natural environments and to provide for minimal-impact recreation activities subject to ensuring minimal interference with natural processes. Conservation I Zone is applied to areas containing sensitive natural environments or ecosystems, which are unable to sustain the impact of significant levels of dispersed recreation activity and other land use. The Zone includes areas within the mining area not included in the 2014 mine plan, rehabilitation areas from 2002 onwards and several parcels of Alcoa freehold.

Interim Conservation I Zone

The Interim Conservation I Zone is designated with the same level of protection as the Conservation I Zone with the knowledge that this area will be incorporated into the open cut mine with the 2014 mine plan.

Conservation II Zone [Waterways & Wetlands]

The Conservation II Zone is designated to protect the waterways and wetlands within the Mining Area.

Conservation III Zone

The Conservation III Zone is designated to protect less-sensitive natural environments and to provide for sustainable recreation activities or other land use without significant impact on natural processes. The zone comprises natural areas that are significantly modified and accessible to the community.

Conservation IV Zone

The Conservation IV Zone is the area designated to the open cut mine, power generation and pre-2002 mine rehabilitation areas.

References

- D0204847 Management Zone Map
- D0082587 Land Management A3
- ANG Land Management Agenda and Minutes

Flora

The high diversity of vegetation types and the diversity of species within them are the primary reason why the majority of Anglesea Heath surrounding the Mining Area and freehold is listed as a significant natural place on the National Estate Register.

In 1986, the Land Conservation Council commissioned Charles Meredith to produce a floristic vegetation map of the Anglesea Heath showing the distribution of flora communities. Meredith observed that there were two broad vegetation categories: heathy communities and forest communities (LCC, 1987). The heathy communities occur on infertile sandy soils and contain five separate sub-communities, namely: Heathy open forest I, Heathy woodland I, Bald Hills heathland, Urquhart Bluff heathland and Closed shrubland. The forest communities occur on more fertile clay soils and contain three separate sub-communities, namely: Riparian open forest I-II, Fern gully, and Damp open forest.

In 2003 the Department of Sustainability and Environment Native vegetation in Victoria has been classified according to Ecological Vegetation Classes (EVCs). There are approximately 300 EVCs statewide.

The Mining Area and freehold is characterised by Heathy woodland I with Closed shrubland present along the Salt Creek, Marshy Creek and Anglesea River systems.

The impact on flora that will not be mined within the Mining area and on the freehold has been unregulated. The flora communities' integrity will decrease if measures are not taken to control threatening processes. These threatening processes include an unregulated track network, soil erosion, pest plant invasion and unmanaged land use including recreation. Any impacts on vegetation communities are likely to flow on to other values such as fauna habitat and diversity.

Botanical Surveys

The area has been well investigated by botanists. Within the Mining Area, Alcoa has completed a flora survey for the Mt Ingoldsby area adjacent to Coalmine Road. This survey was used to map the vegetation types, and to find listed flora. No listed flora species were located in the area to be mined in the flora survey undertaken by Ecology Australia (Carr *et al.*, 1995).

Aims

- Protect indigenous flora and vegetation communities
- Maintain flora diversity
- Reduce and eliminate fragmentation of vegetation and other threats to flora

Strategies

- Minimise the impact of an industrial site on flora
- Minimise the impact of recreational activities, introduced species and other uses upon the flora
- Rationalise the road and track network to reduce fragmentation of vegetation communities
- Develop appropriate management programs to protect intact vegetation and significant flora species including operational training, communication with employees and on ground activities

Actions

General

- Implement the recommendations of the Recovery Plan for *Grevillea infecunda* (Anglesea Grevillea)

Conservation I Zone

- Identify and map sites of quality vegetation, threatened, significant and localised flora species
- Implement action plans where necessary for the protection of quality vegetation, threatened, significant and localised flora species which may include the following activities: fencing, restrict

access of employees, restrict recreational opportunities and community access, revegetation of degraded areas and pest plant removal.

- Consultation with the MINE Environmental Scientist is required for plant selection for any revegetation activities.

Interim Conservation I Zone

- Identify and map sites of quality vegetation, threatened, significant and localised flora species
- Include in mine rehabilitation plan, action plan for protection of quality vegetation, threatened, significant and localised flora species
- Implement action plans for protection of threatened, significant and localised flora species which may include the following activities seed collection, plant propagation, salvage and transplant of particular species and pest plant removal.
- Consultation with the MINE Environmental Scientist is required for plant selection for any revegetation activities.

Conservation II Zone [Waterways and Wetlands]

- Identify and map sites of quality vegetation, threatened, significant and localised flora species
- Implement action plans where necessary for the protection of threatened, significant and localised flora species which may include the revegetation of degraded areas and pest plant removal.
- Consultation with the MINE Environmental Scientist is required for plant selection for any revegetation activities.

Conservation III Zone

- Identify and map sites of quality vegetation, threatened, significant and localised flora species
- Consultation with the MINE Environmental Scientist is required for plant selection for any revegetation activities.

Conservation IV Zone

- Identify and map sites of quality vegetation, threatened, significant and localised flora species
- Consultation with the MINE Environmental Scientist is required for plant selection for any revegetation activities.
- Planting within established garden beds in built up areas must adhere to the Surf Coast Shire Urban Planting guide list for Anglesea.

References

- D0082587 Land Management A3
- D0076435 Land Conservation Council Melbourne Area District 1 Review Final Recommendation
- D0072571 Flora, Fauna and Biological Significance of the Mt Ingoldsby Section of the Alcoa Anglesea Lease Area, Victoria.
- Department of Sustainability and Environment and Government of Australia National Recovery Plan for the Anglesea Grevillea *Grevillea infecunda*
- D0082890 Surf Coast Shire Urban Planting Guide

Land Management Plan

Fauna

The wide range of plant communities in Anglesea Heath and their species diversity provide habitat for a range of fauna. Twenty-nine native mammal species have been recorded in Anglesea Heath including the New Holland Mouse *(Pseudomys novaehollandiae)*, which is critically endangered in Victoria, and the rare Swamp Antechinus *(Antechinus minimus)*.

The waterways in Anglesea Heath, particularly those close to the Anglesea River mouth, provide habitat for a rare fish, the Spotted Galaxias *(Galaxias truttaceus)*.

There is only very limited information on the distribution, abundance and habitats of reptiles, amphibians and invertebrates.

Management actions undertaken for the protection of fauna in the Mining Area and freehold will focus on the conservation of habitat.

Aims

- Conserve indigenous fauna and maintain species diversity and genetic diversity
- Maintain and/or enhance the integrity of fauna habitat

Strategies

- Ensure habitats are established/managed to provide the optimum requirements for a range of species
- Minimise the impact of pest animals, pest plants and other threatening processes

Actions

General

- Implement the recommendations of the Action Statements for New Holland Mouse and Rufous Bristlebird
- Work in conjunction with the recovery team, as required, for the New Holland Mouse

Conservation I Zone

- Minimise habitat fragmentation through a process of track rationalisation and rehabilitation
- Develop procedures to protect fauna habitat (fallen timber, hollow trees, dead trees)
- Enhance existing fauna habitat through revegetation works and pest plant removal
- Construct fauna habitat in rehabilitation areas (timber, logs, Xanthorrhoea)
- Monitor fauna return into rehabilitation areas

Interim Conservation I Zone

- Preserve and salvage elements of fauna habitat (timber, logs, Xanthorrhoea) for relocation into rehabilitation areas

Conservation II Zone [Waterways and Wetlands]

- Minimise habitat fragmentation through a process of track rationalisation and rehabilitation
- Enhance existing fauna habitat through revegetation works and pest plant removal
- Develop procedures to protect fauna habitat (fallen timber, hollow trees, dead trees)
- Establish additional habitat for avian fauna i.e. nestboxes

Conservation III Zone

- Minimise habitat fragmentation through a process of track rationalisation and rehabilitation

- Develop procedures to protect fauna habitat (fallen timber, hollow trees, dead trees)

Conservation IV Zone

- Develop procedures to protect fauna habitat (fallen timber, hollow trees, dead trees)

Procedures

- D00?? Fauna Habitat Description
- D00?? Fauna Monitoring Schedule
- D00?? Xanthorrhoea Establishment Description

References

- D0082587 Land Management A3
- D0072571 Flora, Fauna and Biological Significance of the Mt Ingoldsby Section of the Alcoa Anglesea Lease Area, Victoria.
- Department of Sustainability and Environment Action Statement No. 49 Rufous Bristlebird
- Department of Sustainability and Environment Action Statement No. 74 New Holland Mouse
- Kentish, K.M. and Bourne, A.R. (1983) Mine Rehabilitation: A study of revegetation and fauna return at Anglesea, Victoria. Submitted by K.M.Kentish for MSc. Deakin University

Pest Plants

The infestation and spread of pest plants is a major management issue. Pest plants pose a considerable risk to the natural values of the area by depleting the diversity and integrity of flora and fauna that occur there. Sixty-three pest plant species are known to occur in Anglesea Heath. Many are environmental weeds that are native to Australia (a native plant species is classified as a weed if it is planted or germinates where it does not naturally occur).

The infertile soils of Anglesea Heath are not particularly conducive to exotic weed species. This, coupled with the fact that many disturbed areas within Anglesea Heath are surrounded by indigenous vegetation, means that large sections of Anglesea Heath are relatively weed-free. However, areas of disturbance act as dispersal points for pest plants threatening otherwise intact vegetation communities.

Numerous pest plant species in Anglesea Heath have escaped from adjoining areas previously planted with species that are now known to be environmental weeds. Areas such as along Coalmine Road were revegetated and landscaped with non-indigenous species, some of which are now known to be environmental weeds. These species have the potential to spread beyond existing boundaries, providing a seed source that potentially allows pest plants to germinate and spread into Anglesea Heath.

In general woody weeds are the most threatening pest plants in Anglesea Heath, as the woody weed species that occur in Anglesea Heath are particularly invasive, including Coast Wattle *(Acacia longifolia* var. *sophorae* and Boneseed *(Chrysanthemoides monilifera).*

Other environmental weeds in the area include: Coast Tea-tree *(Leptospermum laevigatum),* Sweet Pittosporum *(Pittosporum undulatum),* Giant Honey Myrtle *(Melaleuca armillaris),* Green Honey Myrtle *(Melaleuca diosmifolia),* Wirilda *(Acacia retinoides)* and Myrtle Wattle (Western Australian province) *(Acacia myrtifolia)* (Carr, 1995).

Depletion of the natural values of Anglesea Heath is probable without appropriate management of pest plants. This management needs to be cooperative, involving all land management agencies in the region.

A preliminary list of major environmental weeds of the area has been compiled (see Appendix ?).

Aims

- Maintain biodiversity
- Minimise the introduction and spread of pest plants
- Minimise the impact of pest plant control programs on indigenous flora and fauna

Strategies

- Control and where possible eradicate pest plants through the employment of an integrated program
- Monitor and evaluate the effectiveness of all pest plant control programs

Actions

General

- Continue to support community groups in their activities to control the spread of weeds
- Develop, implement and maintain a GIS weed-mapping and weed-monitoring program
- Maintain representation on the Flora and Fauna Action Unit – regional unit consisting of representatives of Surf Coast Shire, VicRoads, Department of Sustainability and Environment, Parks Victoria and local interest groups for an integrated and cooperative approach to pest plant management

Conservation I Zone

- Develop and implement a yearly pest plant control strategy incorporating the following principles:
  - prioritise protection of areas of high biodiversity

- prioritise control of weeds with a high potential to spread and become uncontrollable
- prioritise works to reduce fuel load for fire protection
- identify and control new or isolated infestations before they spread
- prioritise works to complement adjacent stakeholders pest plant programs i.e. Parks Victoria

- Consultation with the MINE Environmental Scientist is required for plant selection for any revegetation activities

Interim Conservation I Zone

- Develop and implement a yearly pest plant control strategy incorporating the following principles:
  - prioritise protection of soil seedbank
  - prioritise control of weeds with a high potential to spread and become uncontrollable in rehabilitation areas
  - identify and control new or isolated infestations before they seed
- Consultation with the MINE Environmental Scientist is required for plant selection for any revegetation activities

Conservation II Zone (Waterways and Wetlands)

- Develop and implement a yearly pest plant control strategy incorporating the following principles:
  - prioritise protection of areas of high biodiversity
  - prioritise control of weeds with a high potential to spread and become uncontrollable
  - identify and control new or isolated infestations before they spread
- Consultation with the MINE Environmental Scientist is required for plant selection for any revegetation activities

Conservation III Zone

- Develop and implement a yearly pest plant control strategy incorporating the following principles:
  - prioritise works to reduce fuel load for fire protection
  - prioritise works to complement adjacent stakeholders pest plant programs i.e. Parks Victoria
- Consultation with the MINE Environmental Scientist is required for any revegetation activities

Conservation IV Zone

- Develop and implement a yearly pest plant control strategy incorporating the following principles:
  - prioritise works to reduce fuel load for fire protection
  - prioritise works to complement adjacent stakeholders pest plant programs i.e. Parks Victoria
- Consultation with the MINE Environmental Scientist is required for plant selection for any revegetation activities.
- Planting within established garden beds in built up areas must adhere to the Surf Coast Shire Urban Planting guide list for Anglesea.

References

- D0082587 Land Management A3
- D0082890 Surf Coast Shire Urban Planting Guide

Phytophthora Cinnamomi

Phytophthora cinnamomi (Cinnamon Fungus or Dieback) is an introduced pathogen that invades plant roots, of susceptible species preventing water transport in the root systems, which results in death or severe drought effects. It is responsible for extensive 'dieback' of native vegetation and is widespread in forests, woodlands and heathlands, ranging from Western Australia to Queensland.

Phytophthora has been listed as a threatening process under the *Victorian Flora and Fauna Guarantee Act 1988,* and the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). In Anglesea Heath, Phytophthora has lethal effects on a number of indigenous species including Grass Trees, Horny Cone Bush, various pea species and most plants in the Proteaceae family.

The occurrence of Phytophthora within the Mining Area and Alcoa freehold has been mapped, indicating it is widespread. The pathogen is most frequently spread downhill with drainage water. Zoospores swim or are carried in this water. It is commonly spread and transported in gravel and other road construction materials, on vehicle tyres, horses' hooves and people's shoes. Native animals may also transport the pathogen as they move from an infected area to an uninfected area. The greatest risk of spread of the disease is likely to be any large-scale earth works that involve the movement of soil.

The most effective and appropriate control method for reducing the spread of Phytophthora at this stage is by protecting uninfected areas from contamination by restricting access.

The dieback control strategy is to prevent healthy areas from becoming infested; and to prevent disease intensification in existing infestations. The majority of the heathland at Anglesea is dieback affected and hence a dieback mining system must be put in place where dieback management practices restrict the access to dieback-free areas.

Dieback management needs to be considered in all aspects of mine planning, from exploration drilling to rehabilitation after mining.

Aims

- Protect healthy vegetation from infection
- Minimise the spread of Phytophthora cinnamomi

Strategies

- Prepare a comprehensive Cinnamon Fungus management strategy that:
- maps the incidence of Cinnamon Fungus in Anglesea Heath;
- outlines detailed measures to manage and control infestations and protect non-infected sites.

Actions

Conservation I Zone

- Access in pre-mining areas is restricted.
- Unnecessary tracks will be assessed and rationalised and those that are left open are classified as either "all weather" or "limited access" tracks. All weather tracks, most of which are low in the landscape and traverse dieback areas may be used at all times, while limited access tracks, most of which are higher in the landscape and traverse dieback-free areas may be used only in dry soil conditions by clean vehicles.
- Mining equipment is not permitted to leave haul roads and mining areas to minimise the risk of spreading dieback in unmined heathland.
- Vehicles are not permitted to leave formed roads and tracks to minimise the risk of spreading dieback in unmined heathland
- The occurrence of dieback will be mapped using symptoms in heathland areas. Boundaries will be marked in the field between areas classified as 'dieback-free'.

Because *Phytophthora cinnamomi* spores are water borne, drainage must be considered in all operations from exploration to rehabilitation. The following points summarise the activities to be used to minimise the risk of spread of the disease:

- Dieback areas are detected in the field prior to mining development. Dieback boundaries are marked in the field and on maps
- Movement of machinery and other vehicles across dieback boundaries is restricted
- Timely information on dieback occurrence is collected, field operations are scheduled so that they are carried out at times unfavourable to disease spread.
- Vehicles are cleaned when moving between dieback and dieback-free areas, using brushes or compressed air to remove dust, or portable high pressure water pumps to remove mud
- Soils of different dieback status are kept separate during stripping, stockpiling, soil return and road building
- Most dieback-free soil is handled in dry conditions, at a time least favourable to the fungus
- Where dieback-free areas must be crossed with roads, the road surface and drains are constructed to ensure there is no runoff of water into the dieback-free area
- Runoff from dieback areas is prevented from draining onto roads or dieback-free areas

Interim Conservation I Zone

- Minimise Phytophthora spread through a process of track rationalisation and rehabilitation
- Unnecessary tracks will be assessed and rationalised and those that are left open are classified as either "all weather" or "limited access" tracks. All weather tracks, most of which are low in the landscape and traverse dieback areas may be used at all times, while limited access tracks, most of which are higher in the landscape and traverse dieback-free areas may be used only in dry soil conditions by clean vehicles.
- Vehicles are not permitted to leave formed roads and tracks to minimise the risk of spreading dieback

Conservation II Zone [Waterways and Wetlands]

- Minimise Phytophthora spread through a process of track rationalisation and rehabilitation
- Unnecessary tracks will be assessed and rationalised and those that are left open are classified as either "all weather" or "limited access" tracks. All weather tracks, most of which are low in the landscape and traverse dieback areas may be used at all times, while limited access tracks, most of which are higher in the landscape and traverse dieback-free areas may be used only in dry soil conditions by clean vehicles.
- Vehicles are not permitted to leave formed roads and tracks to minimise the risk of spreading dieback

Conservation III Zone

- Minimise Phytophthora spread through a process of track rationalisation and rehabilitation
- Unnecessary tracks will be assessed and rationalised and those that are left open are classified as either "all weather" or "limited access" tracks. All weather tracks, most of which are low in the landscape and traverse dieback areas may be used at all times, while limited access tracks, most of which are higher in the landscape and traverse dieback-free areas may be used only in dry soil conditions by clean vehicles.
- Vehicles are not permitted to leave formed roads and tracks to minimise the risk of spreading dieback

Conservation IV Zone

- Minimise Phytophthora spread through a process of track rationalisation and rehabilitation

- Unnecessary tracks will be assessed and rationalised and those that are left open are classified as either "all weather" or "limited access" tracks. All weather tracks, most of which are low in the landscape and traverse dieback areas may be used at all times, while limited access tracks, most of which are higher in the landscape and traverse dieback-free areas may be used only in dry soil conditions by clean vehicles.
- Vehicles are not permitted to leave formed roads and tracks to minimise the risk of spreading dieback

References

- National Threat Abatement Plan for Phytophthora cinnamomi
- D0082587 Land Management A3
- D0087513 Assessment for the presence of Phytophthora cinnamomi

Hydrology

Anglesea Heath is drained by Marshy Creek and Salt Creek flowing southeast into the Anglesea River estuary to Bass Strait. For most of their length, these waterways exist as *Melaleuca squarrossa* [Scented Paperbark] swamps. These unique swamps, on a porous peaty soil, are of State significance for the conservation of threatened species, including the Grey Goshawk. The waterways close to the Anglesea River mouth provide habitat for a rare fish, the Spotted Galaxias *(Galaxias truttaceus)*.

The convergence of these two creek systems into the Anglesea River takes place in the Mining Area. Salt Creek has been diverted around the mine in a constructed channel for part of its length and joins with Marshy Creek just north of the mine haul road. The Anglesea River between the haul road and Coalmine Road is termed the 'mixing zone' and has been partially modified to receive wastewater from the ash pond system and mine reclamation pond. While its function is this instance is to remove contaminants from the wastewater before it leaves the Alcoa site, it remains an important area of significant vegetation and wildlife habitat.

Aims

- Maintain riparian and wetland ecology and health

Strategies

- Ensure siltation and turbidity do not detrimentally effect water quality
- Develop appropriate management programs to protect intact vegetation for aquatic and riparian fauna

Actions

Conservation II Zone [Waterways and Wetlands]

- Implement control measures where water quality is compromised by soil disturbance and road crossings
- Enhance existing fauna habitat through revegetation works and pest plant removal
- Develop procedures to protect fauna habitat (fallen timber, hollow trees, dead trees)
- Implement action plans where necessary for the protection of threatened, significant and localised flora species which may include the revegetation of degraded areas and pest plant removal
- Establish additional habitat for avian fauna i.e. nestboxes

Land Management Plan

Cultural Heritage

Anglesea falls within an area originally occupied by the Wathaurong tribe and traditionally under the terms of the *Aboriginal and Torres Straight Islander Heritage Protection Act 1984*, the Wathaurong Aboriginal Cooperative Ltd has been the appropriate liaison organisation for all issues pertaining to aboriginal cultural management. However since the introduction of the *Aboriginal Heritage Act 2006* it is a requirement that Aboriginal organisations or groups become Registered Aboriginal Party (RAPs) in order to manage and protect Aboriginal cultural heritage in Victoria. The Wathaurong have not yet been accepted as a RAP therefore liaison defaults to Aboriginal Affairs Victoria (AAV).

Brendan Marshall (Austral Heritage Consultants) was commissioned by the Department of Conservation and Natural Resources to undertake an archaeological survey of the Angahook-Lorne State Park and Anglesea Heath in 1995. The study area was approximately 6,000 hectares but included only a small part of Anglesea Heath.

The legislation and consent for the *Mines (Aluminium Agreement) Act* 1961 does not require Alcoa to undertake archaeological surveys for incorporation into the mine planning process. However current corporate standards requires the completion of an archaeological survey as part of the collation of pre-mining baseline data.

Aims

- Protect the aboriginal cultural heritage
- Protect significant archaeological sites

Strategies

- Encourage further archaeological studies within Anglesea Heath to identify sites requiring management and protection
- Develop site protection mechanisms in conjunction with the Wathaurong Aboriginal Cooperative Ltd for existing and newly identified sites
- Protect and manage Aboriginal sites in consultation with Wathaurong Aboriginal Cooperative Ltd and the Heritage Services Branch of Aboriginal Affairs Victoria (AAV)
- Establish and maintain close and cooperative communications with the Wathaurong Aboriginal Cooperative Ltd and AAV

Actions

Conservation I Zone

- Restriction on earth works without completion of an archaeological survey or inspection by a representative of the Wathaurong Cooperative

Interim Conservation I Zone

- Restriction on earth works without completion of an archaeological survey or inspection by a representative of the Wathaurong Cooperative
- Implement an archaeological survey for 2014 Mining Area
- Develop Procedures to ensure protection of archaeological sites identified from survey
- Develop memorandum of understanding with Wathaurong Aboriginal Cooperative for area to be cleared and further archaeological sites that may be identified

References

- D0082587 Land Management A3
- Marshall, B. (1995) An Archaeological Survey of the Angahook-Lorne State Park and the Alcoa Lease Area, Anglesea, Victoria, Department of Conservation and Natural Resources

Land Management Plan

- D0087515 2003 Archaeological Survey
- D0108571 2005 Archaeological Investigation Survey
- D0145127 2006 Archaeological Investigation Survey
- D0146022 2007 Archaeological Investigation Survey
- D0147441 2007 Memorandum of Understanding Alcoa and Wathaurong Cooperative
- D0208450 2010 Cultural Heritage Management Plan (CHMP)

Land Management Plan

Fire Management

Fire has played an integral part of the biological evolution in Australia. Our vegetation has evolved with fire and many species have adapted either to survive fire or re-colonise after fire. Some species depend on fire to maintain or increase population levels.

Within the Mining area, Alcoa has adopted protocols from 'Building in a Wildfire Management Overlay' (CFA documentation) for asset protection. This protocol addresses vegetation management based upon vegetation type, aspect and slope to reduce the risk from wildfire.

Alcoa plays an important role in assisting with the protection of Anglesea from wildfires with either the Lease (Anglesea Heath) or Alcoa freehold present on three sides of the township. For the freehold areas, Alcoa maintains of series of slash breaks adjacent to assets and property. A review of our slashing program has ensured our activities are strategic and satisfy all fire prevention requirements whilst not compromising the integrity of the significant heathland communities. This review was in consultation with Department of Sustainability and Environment, Parks Victoria, Surf Coast Shire, Powercor, VEMCO and the CFA.

The Department of Sustainability and Environment is responsible for fire management within Anglesea Heath. Current fire protection measures are in accordance with the Otway Fire Protection Plan (DCNR 1995) and the Code of Practice for Fire management of Public Land in Victoria (DCNR 1995).

Aims

- Protect human life, property and natural values from the adverse effects of fire
- Minimise the adverse effects of fire protection and suppression activities on floristic values

Strategies

- Establish and maintain strategic firebreaks to protect assets
- Manage understorey fuel load with selective pest plant removal

Actions

With reference to the Fire Management Zone Map for the Power Station and Mine:

Inner zones:

- Grass must be no more than 100mm in height;
- Leaf litter must be less than 10mm deep; and
- There must be no elevated fuel on at least 50% of the Inner zone. Begin with the removal of all Coast Wattle (dominant elevated fuel) and other pest plant species. Revaluate to assess remaining elevated fuels.

Outer zones:

- Grass must be no more than 100mm in height;
- Leaf litter must be less than 20mm deep; and
- There must be no elevated fuel on at least 50% of the Outer zone. Begin with the removal of all Coast Wattle (dominant elevated fuel) and other pest plant species. Revaluate to assess remaining elevated fuels.

In addition:

Conservation I Zone

- Implement pest plant removal (primarily Coast Wattle) to significantly decrease understorey fuel load for fire protection
- Maintain 25m slash break at strategic locations as agreed to by CFA, DSE and Surf Coast Shire i.e. the boundary of Alcoa freehold and residential areas of Anglesea and boundary of mining area
- Reestablish emergence/fire access only on road between Fraser Avenue and Coalmine Road
- Maintain fire access only roads through Alcoa freehold off Wilkin Street

Interim Conservation I Zone

- Implement pest plant removal (primarily Coast Wattle) to significantly decrease understorey fuel load for fire protection

Conservation II Zone [Waterways and Wetlands]

- Implement pest plant removal (primarily Coast Wattle) to significantly decrease understorey fuel load for fire protection

Conservation III Zone

- Implement pest plant removal (primarily Coast Wattle) to significantly decrease understorey fuel load for fire protection

Conservation IV Zone

- Implement pest plant removal (primarily Coast Wattle) to significantly decrease understorey fuel load for fire protection
- Maintain 25m slash break at strategic locations as agreed to by CFA, DSE and Surf Coast Shire i.e. the boundary of Alcoa freehold and residential areas of Anglesea and along diversion channel

References

- D0083020 Otway Fire Protection Plan (DSE 2003)
- Code of Practice for Fire management of Public Land in Victoria (DCNR 1995)
- D0082587 Land Management A3
- Alcoa Critical Incident Management Manual

Community Use

Many individuals and groups use parts of Alcoa freehold for recreation. Recreational users have varying levels of impact on environmental values, however each of the activities, depending on their nature and volume, can lead to environmental degradation if not managed appropriately. While Alcoa freehold utilised by an array of recreational users, the main use is by trail bike riders, horse riders, four-wheel drivers, cyclists and walkers. These popular activities rely on the use of a road and track network within the Alcoa freehold, the surrounding Anglesea Heath and council managed land. The largely unmanaged recreational use of Alcoa freehold, especially the creation and use of informal tracks, has resulted in detrimental impact on the heath's values, and is currently unsustainable.

Aims

- Provide opportunities for appropriate recreational use
- Protect environmental and cultural values of Alcoa freehold land

Strategies

- Promotion of responsible use of Alcoa freehold land
- Establish walking track linkages with Anglesea Heath and the Surf Coast Walk
- Promote permitted passive recreational opportunities (walking only)

Actions

Conservation I Zone

- Community access on areas of Conservation I Zone freehold only
- Permitted Recreation

  Walking: Many vehicle tracks within Alcoa freehold and Anglesea Heath are used by walkers who enjoy the area's natural attractions. There are currently no designated walking-only tracks in Anglesea Heath. A section of the Surf Coast Walk traverses the eastern and northern boundaries of Alcoa freehold and this section of the walk is on a vehicle track. Threatening processes such as Phytophthora, pest plants and erosion will need to be considered during the investigation of a network of walking tracks.

  Dog Walking: Currently some visitors to Anglesea Heath walk their dogs along vehicle tracks. To protect the fauna and other natural values of Anglesea Heath, dogs are permitted on a lead in the Conservation and Recreation Zone only. Dogs are not permitted in the Conservation Zone that borders Alcoa freehold land. Dog will be permitted on the Alcoa freehold land and encouraged to be kept on a lead.
- Provide on-site information and signage at strategic points to orientate and inform recreational users of permitted recreational opportunities on Alcoa freehold
- Create an walking track circuit utilising existing well maintained tracks
- Continue to promote vehicle tracks as the primary location for walking opportunities
- Minimise habitat fragmentation through a process of track rationalisation and rehabilitation
- Develop an action plan (A3) for the management of the Alcoa freehold adjacent to Fraser Avenue and the Anglesea River
- Implement action plan (A3) for the management of the Alcoa freehold adjacent to Fraser Avenue and the Anglesea River which may include the following activities: fencing, signage, rehabilitation of eroded tracks, revegetation of degraded areas and pest plant removal.

Interim Conservation I Zone

No community access

Land Management Plan

Conservation II Zone [Waterways and Wetlands]

No community access

Conservation III Zone

- Permitted Recreation

  Current arrangements involve the utilisation of the Alcoa freehold adjacent to Camp Road for horse agistment and part of a BMX track.

  The level of past disturbance and the absence of significant natural values provide an opportunity for community use of Alcoa freehold land, as long as provision is made for other actions stated within this management plan i.e. pest plant removal, fire protection.

- Develop an action plan (A3) for the management of the Alcoa freehold adjacent to Camp Road
- Implement action plan (A3) for the management of the Alcoa freehold adjacent to Camp Road which may include the following activities: fencing, signage, rehabilitation of eroded tracks, revegetation of degraded areas and pest plant removal.

Conservation IV Zone

No community access

References

- D0204847 Management Zone Map
- D0082587 Land Management A3
- D0079261 Horse Paddocks A3
- D0082588 BMX Track A3
- D0082589 Fraser Avenue A3