

# WA Mining Group

Environmental Improvement Plan 2014 - 2018



The Element of **Possibility**™



# 2017 EIP Update

WA Mining's current EIP came into effect in 2014 and covered the 2014-2016 period. The 2014 – 2016 EIP is being extended for an additional two years, to 2018. This follows a business review of the EIP that recommends adjusting the document's frequency to provide scope for longer term objective and target achievement for environmental improvement projects.

Please find to follow a status update on each of the actions and commitments. As illustrated in this update, we continue to work on the targets in the current EIP and address additional improvements through our standard internal processes. Alcoa remains very proud of our world class rehabilitation and environmental practices.

If you wish to discuss this matter further, please contact Luke Gossage, Senior Environmental Scientist on 9530 2724 or by email [luke.gossage@alcoa.com.au](mailto:luke.gossage@alcoa.com.au).



**Suellen Davey**

Environmental Manager

Alcoa Mining Operations, Western Australia

# Environmental Improvement Plan 2014-2018

## February 2017 Update

### Dust

Objective	Action	Progress Update
Understand dust mining operations. Emissions from	Quantify dust generation sources at the mine site.	Ongoing. Alcoa has collected baseline dust generation data for vehicles utilising the haul road system. Interim internal dust targets have been identified and Alcoa is now trialling road management options for reducing dust generation.
	Investigate feasibility of developing a dust model.	Ongoing. The current focus for Alcoa is on establishing baselines and dust management process / water use efficiencies.

### Air quality

Objective	Action	Progress Update
50 per cent of wood residue from clearing recycled/reused.	Undertake trial of mulching waste wood for inclusion in rehabilitation.	Complete. Incorporation of woody waste (in relatively large quantities) into the soil profile resulted in the reduced effectiveness of vegetation establishment.
	Continue partnerships with third parties to maximise utilisation of wood residue and investigate new opportunities.	Ongoing. Alcoa is currently working with various third parties to utilise wood residue, including timber harvesting, mulch, and charcoal production. Other opportunities are also under development.
	Review opportunities to utilise wood waste for energy generation.	Ongoing. Working with third parties, Alcoa is exploring various uses for wood waste generated on the mine.

### Noise

Objective	Action	Progress Update
Compliance with Environmental Protection (Noise) Regulations 1997.	Implement noise management practices to ensure compliance with Environmental Protection (Noise) Regulations 1997.	Ongoing. In addition to existing noise management practices, Alcoa has developed a live noise model for predicting noise impacts at neighbouring properties as a result of mining activities. This system has been implemented at Huntly Mine, and is planned for Willowdale operations.
	Implement a noise management strategy to effectively manage noise impact on local communities	

## Water Use

Objective	Action	Progress Update
10 per cent reduction in licence water use intensity from 2013 actual.	Identify practical opportunities for water use reduction and implement.	Ongoing. Current projects are focussed on improvements to haul road watering efficiency and water supply operations.
	Identify practical opportunities for increasing waste water reuse and implement.	Complete. Storm runoff water collection from mine site infrastructure has been implemented and maintained.
	Investigate the use of roaded catchments within mine areas.	Complete. Investigation conducted but not pursued. The potential for roaded catchments is limited by pit suitability, pumping infrastructure and lack of extra capacity in existing storages under 'pump-back' scenarios.
Increase water inflow to licensed water sources.	Investigate the use of rehabilitated mine pits to enhance infiltration into Water Corporation dams.	Complete. Investigated but not pursued due to uncertainties in quantifying the water benefit and associated water sharing agreements.
	Investigate opportunities for rehabilitation thinning in catchments of licensed water sources to improve surface water runoff.	Complete. Investigated and successfully implemented in the Banksiadale Dam catchment which forms a major licensed water source for the Huntly Mine.

## Water catchment protection

Objective	Action	Progress Update
Minimise salinity risk in mining areas within Intermediate Rainfall Zone (IRZ).	Continue Trial Mining Project (TMP) in the IRZ and communicate results.	Ongoing. Continuous monitoring of the TMP over the past 26 years, with annual reporting to government agencies. Trial results indicate that there is no mining related stream salinity or streamflow response. Monitoring of IRZ mining areas is ongoing, however, under current climatic trends, salinity risk is low and expected to decline further.
	Identify and monitor salinity risk in new/future IRZ mining areas.	
Manage water quality within public drinking water supply catchment areas.	Investigate the potential for nutrient runoff from mining rehabilitation areas.	Complete. Investigated in 2015, reviewing unmined and mined catchment areas. No detectable increase in nitrogen or phosphorus in runoff from mined catchments.
Zero mining related turbidity events at compliance turbidity monitors and minimise turbidity events at local turbidity monitors.	Investigate all turbidity events to determine root cause and develop actions to minimise risk of reoccurrence.	Ongoing. There have been no recorded water turbidity exceedances at Compliance Monitoring Points during the EIP period to date.
	Identify practical opportunities to improve drainage management and implement.	Ongoing. Alcoa is currently reviewing possible improvements to risk assessment methodology, and improvements to engineered water interception techniques (i.e. water shots).
Zero Government reportable loss of containment events and minimise internal loss of containment events.	Identify practical opportunities to further reduce hydrocarbon spills and implement.	Ongoing. Alcoa's equipment maintenance strategy is focussed on reducing potential for infield incidents. There have been four Department of Mines and Petroleum reportable loss of containment events since 2014, all of which were completely remediated without environmental impact.

## Biodiversity management

Objective	Action	Progress Update
70 per cent species similarity and 100 per cent species richness rehabilitation/ unmined forest.	Increase production of recalcitrants.	At the time of the EIP development in 2012, recalcitrant production from the nursery reached 210,000 plants. During the EIP period, recalcitrant production numbers have increased, with approximately 324,000 in 2013, 587,000 in 2014, 486,000 in 2015, and 433,000 in 2016. Plant production numbers fluctuate based on the amount of available rehabilitation area at the time of production.
	Undertake trials to assess factors affecting survival and growth of recalcitrant species.	Complete. A long-term trial investigating recalcitrant species was re-assessed in 2015. The results, published in the journal <i>Plant Ecology</i> , found that survival and growth were promoted by protection from animal grazing and reducing competition from other understorey and tree species.
	Investigate alternative approaches to contour ripping.	Ongoing. Under review.
	Undertake trials to assess the effect of fertiliser on plant diversity in rehabilitation.	Complete. Trials published in the journal <i>Forest Ecology and Management</i> in October 2015. Results support a move to lower fertiliser application rates, benefiting rehabilitation similarity to Forest Reference Plots (reduced dominance of some legume species and reduced short-term annual species).
	Improve understanding of climate effects on plant species distribution.	Ongoing. A PhD student in collaboration with Curtin University is currently researching.

40 per cent of rehabilitation area receives direct return topsoil.	Use research and operational knowledge to prioritise direct return plan.	Ongoing. Current rehabilitation practices have resulted in an increase of direct return topsoil to approximately 35%.
Protect threatened fauna species that occur within the mining area.	Develop and implement a biodiversity action plan.	Ongoing. A Biodiversity Action Plan for Alcoa's mining operations in Western Australia was finalised in 2015. The Action Plan incorporates recommended actions from the existing Threatened Fauna Species Management Plan. Implemented actions include a range of measures to protect critical habitat and monitoring for potential impacts from mining operations.
	Implement recommendations from Alcoa's Threatened Fauna Species Management Plan.	
	Investigate improvements to procedures for the conservation of threatened black cockatoo species.	Ongoing. Results from monitoring of nest tree usage in proximity to mining operations, and the persistence of significant habitat trees on pit edges, are anticipated to inform the effectiveness and potential refinement to current procedures.
Major functional invertebrate groups are represented in rehabilitation.	Research the value of restoration in providing habitat for ecologically important functional groups of invertebrate.	Ongoing. A PhD student project in collaboration with Curtin University is undertaking research which is due for completion in 2017.
Increased stakeholder confidence in long term rehabilitation development.	Develop models of longer-term jarrah growth and yield in rehabilitated forest stands.	Action to be reviewed.
	Increase the number of permanent monitoring plots.	Complete. Additional permanent monitoring plots in both older rehabilitation and forest reference areas have been established.
	Investigate options for remote sensing for monitoring rehabilitation.	Ongoing. Use of remote sensing data is under investigation. Alcoa utilises Landsat imagery to assess variation between forest and rehabilitation vegetation density. Alcoa is also currently investigating the use of Light Detecting and Ranging (LIDAR) data for use in the assessment of rehabilitation against our Completion Criteria.

## Dieback management

Objective	Action	Progress Update
Minimise spread of Phytophthora dieback attributable to mining operations.	Develop eradication procedure for dieback haul roads and stockpiles.	Ongoing. In collaboration with Murdoch University, Alcoa is undertaking a Dieback Following project on selected haul roads within the McCoy Mine Region. The project is due for completion in 2017 and preliminary results indicate that eradication from a dieback infected haul road is achievable within a 2-year period.
	Investigate options to improve dieback hygiene procedures and implement where practical.	Complete. Alcoa has implemented the use of vehicle wash down units on selected light vehicles, and improvements to drainage at set wash down points.
Forest values improved in unmined areas degraded by dieback.	Review opportunities to improve Dieback Forest Rehabilitation prescriptions to meet forest land use objectives.	Complete. Dieback Forest Rehabilitation treatments have been assessed for effectiveness. Results indicate that treatment may conflict with other forest use situations, i.e. Higher tree cover in drying landscape.
	Investigate the biodiversity values of dieback affected areas.	Complete. Investigatory works have been undertaken and published by third parties. Complete
	Assess benefits of removing eastern states eucalypt species from non-mined dieback forest areas.	Action to be reviewed.

## Waste Management

Objective	Action	Progress Update
Reduce waste to landfill from 2013 actual.	Continue to improve the recycling program.	Ongoing. Improvements to recycling program ongoing in collaboration with the Alcoa cross-site waste team.
	Promote recycling programs within the WA Mining workforce.	Ongoing. Alcoa has undertaken an extensive review of all waste management practices. A Waste Permitting system is in place for the appropriate disposal of all waste material. This is conducted in conjunction with toolbox talks, inductions, and the use of the '3 bin system'.
	Identify practical opportunity for tyre recycling and implement.	Ongoing. Currently under investigation.
	Identify practical opportunity for conveyor belt recycling and implement.	Complete. Supply contracts for bauxite conveyor now include requirements for the removal and recycling of waste conveyor.

# WA Mining Group

Environmental Improvement Plan 2014 - 2016



Advancing each generation.







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For more information on Alcoa's Environmental Improvement Plans, or to view a complete set of these plans please visit our website [www.alcoa.com.au](http://www.alcoa.com.au)

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# 2014 – 2016

# Environmental Improvement Plan for WA Mining Group

## Overview and acknowledgements

In April 2006, Alcoa of Australia (Alcoa) released its first Environmental Improvement Plans (EIP) for each of its sites in Western Australia. EIPs are a voluntary initiative by Alcoa and a first for our industry in this state.

This EIP forms part of the WA Mining Group's operational plan for 2014 – 2016. It sets clear targets for improvement and identifies the actions and initiatives that will be implemented to achieve the targets.

We recognise that input from stakeholders is vital which is why several stakeholders assisted in the development of this EIP including:

- Community and neighbours
- Non-government environmental organisations
- Universities
- Regulators
- Alcoa employees

Alcoa is committed to the communities surrounding our mining operations and we acknowledge that initiatives based on ideas from community members help us to continually improve. Alcoa believes that this plan will give its local communities a stronger sense of connection and ownership of its activities, which include improving environmental performance and developing more sustainable operating practices.

Our special thanks are extended to everyone involved in producing this plan, particularly the Mining EIP Stakeholder Steering Committee – you committed much of your personal time to assist us and for that we are grateful. The consultation process proved that the community, government and industry can collaborate successfully and work towards a shared vision.



**Simon Butterworth**  
General Manager  
Western Australian Operations



**Mal Briggs**  
WA Manager of Mines

# Overview of Alcoa of Australia's operations

Alcoa has been sustainably mining, refining and smelting in Australia since 1963 and is active in all major aspects of the aluminium industry. The company employs more than 5000 people in its primary products business in Australia.



### Alcoa of Australia's principal operations in Western Australia are:

- Huntly Mine
- Willowdale Mine
- Kwinana Refinery
- Pinjarra Refinery
- Wagerup Refinery
- Bunbury Port



### Alcoa of Australia's principal operations in Victoria are:

- Portland Aluminium Smelter
- Anglesea Power Station and coal mine
- Point Henry Smelter (closing 1 August 2014)

Perth, Western Australia, is home to Alcoa of Australia's headquarters and it is where the aluminium production process starts.

The Huntly and Willowdale bauxite mines in the Darling Range south of Perth supply bauxite to Alcoa's alumina refineries in Kwinana, Pinjarra and Wagerup. These refineries extract alumina from the bauxite. The Huntly mine remains the world's largest bauxite mine.

Alcoa's two aluminium smelters are in Victoria at Point Henry in Geelong and in Portland. Portland Aluminium is a joint venture between Alcoa of Australia (55 per cent), which manages the operations; CITIC Resources Australia Pty Ltd (22.5 per cent); and Marubeni Aluminium Australia Pty Ltd (22.5 per cent). Alcoa's operations in Victoria also include a coal mine and power station at Anglesea which supplies electricity to Point Henry Smelter.

## WA Mining Operations Overview

Bauxite mining commenced at Jarrahdale in 1963, to supply the Kwinana Refinery. The Huntly Mine was established in 1976 to supply the Pinjarra Refinery and, due to closure of the Jarrahdale Mine in the early 1990s, the Kwinana Refinery. This expanded capacity makes Huntly the biggest bauxite mine in the world. The Willowdale Mine was established in 1984 and supplies bauxite ore to the Wagerup Refinery.

The mining process consists of:

1. Pre-mining environmental and heritage surveys
2. Exploration drilling to identify ore bodies suitable for mining
3. Salvage of marketable timber by the Forest Products Commission
4. Vegetation clearing of areas to be mined
5. Topsoil and overburden removal
6. Breaking caprock by blasting or ripping to expose the viable bauxite
7. Removal of viable bauxite
8. Crushing and conveying bauxite to the refineries
9. Rehabilitation of areas disturbed by mining. The rehabilitation process consists of:
  - Landscaping
  - Ripping to remove compaction
  - Return overburden and topsoil
  - Contour ripping and seeding
  - Recalcitrant planting of species unable to be established from seed
  - Fertilising to improve establishment and early growth of trees and understorey
  - Rehabilitation monitoring and management
10. Relinquishment of rehabilitated mined regions to the state





# Air quality management

## Greenhouse gases

Alcoa established a global goal to reduce greenhouse gas emissions under its direct control by 25% by 2010.

This goal was achieved in 2003. Alcoa set a new target to reduce total carbon dioxide equivalent intensity by 30% from the 2005 levels in Global Primary Products (mining, refining and smelting) by 2020 with the target of 35% by 2030. In 2013 a 25.5% reduction was achieved, years ahead of schedule.

Through productivity improvements and technological innovation Alcoa will continue to target a reduction in the greenhouse intensity of its operations while striving to increase production.

In addition to the generation of greenhouse gases via fossil fuel use, Alcoa burns wood residue generated during clearing operations. Wood residue is the product remaining after all usable timber is removed by the Forest Products Commission or contractors. Options for use of wood residue are continually assessed.

## Dust

Dust generated by mining operations is mainly caused by mobile equipment operation. Dust can be considered a nuisance if it affects neighbouring properties, however it is not considered a health risk in low concentrations.

## Noise

WA Mining operations are transient and as a result can be located near to residential areas. Noise is monitored to assess potential impacts on neighbours. Ongoing assessment is required to confirm the operations remain within the Environmental Protection (Noise) Regulations 1997.

Primary sources of noise from the mines include:

- Blasting of the hard cap rock ore layer
- Mobile equipment such as dozers, scrapers, trucks
- Fixed plant such as conveyor belts, transfer stations and crushers



**Table 1: Air quality improvement targets**

*Dust*

Objective	Action
<b>Understand dust emissions from mining operations.</b>	Quantify dust generation sources at the mine site. Investigate feasibility of developing a dust model.

*Air quality*

Objective	Action
<b>50 per cent of wood residue from clearing recycled/reused.</b>	Undertake trial of mulching waste wood for inclusion in rehabilitation. Continue partnerships with third parties to maximise utilisation of wood residue and investigate new opportunities. Review opportunities to utilise wood waste for energy generation.

*Noise*

Objective	Action
<b>Compliance with Environmental Protection (Noise) Regulations 1997.</b>	Implement noise management practices to ensure compliance with Environmental Protection (Noise) Regulations 1997. Implement a noise management strategy to effectively manage noise impact on local communities. Continue to investigate and implement practical operational and blast noise reduction strategies.



# Water management and conservation

## Water use

Alcoa draws water from Darling Range surface water sources under licences issued by Department of Water. Additional water is collected via stormwater runoff and treated wastewater.

Approximately 80 per cent of water used at the mines is for haul road dust suppression. Other uses include vehicle and equipment cleaning, drinking water, crusher plant cleaning and dust control, garden reticulation, toilet and shower facilities and fire control.

The mine's water supply relies on surface water flows. In low runoff years extra water is purchased from the Water Corporation.

## Water catchment protection

Large sections of WA Mining operations fall within public drinking water supply catchments. Alcoa is required to ensure operations do not affect the water quality or quantity collected by the dams. Potential risks to drinking water quality are turbidity, salinity and hydrocarbon contamination.

Alcoa has implemented strict controls to minimise the risk of hydrocarbon contamination including mobile equipment maintenance requirements, spill response and clean up procedures and sumps on major dam/stream crossings.

Alcoa is not permitted to allow turbid water runoff from the mining operations. To manage this requirement Alcoa has developed strategies to manage drainage in mining areas, these include sumps on haul roads and checks for appropriate drainage control implementation prior to significant rainfall events. Turbidity is monitored on streams that feed the water catchment dams. Data from the turbidity monitors is checked after significant rainfall events to assess whether there has been any turbid water runoff from the mining operations.

Alcoa is continuing research into the potential for salinity impacts resulting from mining operations in the Intermediate Rainfall Zone (IRZ). Alcoa has not identified any significant operational risks that may result in increased salinity in streams to date.



### *Water use*

Objective	Action
<b>10 per cent reduction in licence water use intensity from 2013 actual.</b>	<p>Identify practical opportunities for water use reduction and implement.</p> <p>Identify practical opportunities for increasing waste water reuse and implement.</p> <p>Investigate the use of roaded catchments within mine areas.</p>
<b>Increase water inflow to licensed water sources.</b>	<p>Investigate the use of rehabilitated mine pits to enhance infiltration into Water Corporation dams.</p> <p>Investigate opportunities for rehabilitation thinning in catchments of licensed water sources to improve surface water runoff.</p>

### *Water catchment protection*

Objective	Action
<b>Minimise salinity risk in mining areas within Intermediate Rainfall Zone.</b>	<p>Continue Trial Mining Project (TMP) in the IRZ and communicate results.</p> <p>Identify and monitor salinity risk in new/future IRZ mining areas.</p>
<b>Manage water quality within public drinking water supply catchment areas.</b>	<p>Investigate the potential for nutrient runoff from mining rehabilitation areas.</p>
<b>Zero mining related turbidity events at compliance turbidity monitors and minimise turbidity events at local turbidity monitors.</b>	<p>Investigate all turbidity events to determine root cause and develop actions to minimise risk of reoccurrence.</p> <p>Identify practical opportunities to improve drainage management and implement.</p>
<b>Zero Government reportable loss of containment events and minimise internal loss of containment events.</b>	<p>Identify practical opportunities to further reduce hydrocarbon spills and implement.</p>



# Rehabilitation and biodiversity management

*Alcoa's rehabilitation objective is to re-establish a functional jarrah forest ecosystem that fulfils a range of forest land uses including conservation, timber production, water catchment protection and recreation. The jarrah forest is renowned for its diverse flora, being one of the most plant species-rich forests in the world.*

Alcoa has developed a set of rehabilitation completion criteria that describe characteristics that must be achieved before hand back to the State Government. In addition, Alcoa has set internal targets beyond the requirements of the completion criteria, some of which are included in this plan.

The jarrah forest is home to a rich array of fauna, many unique to the south west of Western Australia. Recolonisation by mammals, birds, reptiles and invertebrate groups into rehabilitated forest is a key indicator of rehabilitation success. Effective fauna management during mining and rehabilitation involves monitoring and minimising impacts on fauna species and maximising the potential for re-colonisation following mining operations.

Alcoa completes pre-mining flora and fauna surveys before entering a new mine region. If rare or protected species are found during the surveys, management plans are developed to minimise the potential for mining to impact the population.

Objective	Action
<b>70 per cent species similarity and 100 per cent species richness rehabilitation/ unmined forest.</b>	<p>Increase production of recalcitrants.</p> <p>Undertake trials to assess factors affecting survival and growth of recalcitrant species.</p> <p>Investigate alternative approaches to contour ripping.</p> <p>Undertake trials to assess the effect of fertiliser on plant diversity in rehabilitation.</p> <p>Improve understanding of climate effects on plant species distribution.</p>
<b>40 per cent of rehabilitation area receives direct return topsoil.</b>	<p>Use research and operational knowledge to prioritise direct return plan.</p>
<b>Protect threatened fauna species that occur within the mining area.</b>	<p>Develop and implement a biodiversity action plan.</p> <p>Implement recommendations from Alcoa's Threatened Fauna Species Management Plan.</p> <p>Investigate improvements to procedures for the conservation of threatened black cockatoo species.</p>
<b>Major functional invertebrate groups are represented in rehabilitation.</b>	<p>Research the value of restoration in providing habitat for ecologically important functional groups of invertebrate.</p>
<b>Increased stakeholder confidence in long term rehabilitation development.</b>	<p>Develop models of longer-term jarrah growth and yield in rehabilitated forest stands.</p> <p>Increase the number of permanent monitoring plots.</p> <p>Investigate options for remote sensing for monitoring rehabilitation.</p>

# Dieback management

*Dieback, caused by the pathogen *Phytophthora cinnamomi*, has been present in the jarrah forest for more than 80 years and is thought to affect over 2000 native plant species in Western Australian. It is one of Alcoa's priorities to minimise dieback spread as a result of mining operations.*

Dieback is spread via soil and water movement. Natural spread is about one metre per year up gradient but significantly more down gradient due to surface and groundwater movement.

Dieback can also be spread by moving infected soil and plant material. Alcoa has implemented dieback management procedures to minimise dieback spread, including:

- Map the presence of dieback throughout the mining envelope
- Keep dieback infested and dieback-free soils separate during all stages of the mining and rehabilitation process
- Monitor and audit the spread of dieback from the mining areas to ensure procedures are effective
- Design mine pits and haul roads to prevent water flowing into dieback-free forest
- Clean vehicles and machinery before movement from a dieback area into a dieback-free area



Objective	Action
<b>Minimise spread of <i>Phytophthora</i> dieback attributable to mining operations.</b>	<p>Develop eradication procedure for dieback haul roads and stockpiles.</p> <p>Investigate options to improve dieback hygiene procedures and implement where practical.</p>
<b>Forest values improved in non mined areas degraded by dieback.</b>	<p>Review opportunities to improve Dieback Forest Rehabilitation prescriptions to meet forest land use objectives.</p> <p>Investigate the biodiversity values of dieback affected areas.</p> <p>Assess benefits of removing eastern states eucalypt species from non-mined dieback forest areas.</p>





# Waste management

*Alcoa's WA Operations aim to minimise the amount of 'landfill' waste generated by its operations. The WA Operations waste team has implemented a number of recycling initiatives to enable progress toward minimising generation of 'landfill' waste:*

- A three-bin system for recyclable, landfill and worm food (organic) waste
- Individual recycling systems for specific wastes such as batteries and printer cartridges

Organic waste is sent to the worm farm where it is used for composting and landscaping at the refinery. Worm food consists of material such as food wastes, shredded paper and paper towel; it includes 'anything that lived'. The worm farm has been in operation since 1995 and each year processes approximately 100 tonnes of waste from Alcoa's Western Australian operations.

Objective	Action
<b>Reduce waste to landfill from 2013 actual.</b>	<p>Continue to improve the recycling program.</p> <p>Promote recycling programs within the WA Mining workforce.</p> <p>Identify practical opportunity for tyre recycling and implement.</p> <p>Identify practical opportunity for conveyor belt recycling and implement.</p>



## Community involvement

The WA Mining Operations community consultation process begins with the five year mine plan. In the five year mine plan Alcoa identifies properties that are located within a zone of potential impact by mining operations in relation to noise, dust, encroachment or any other aspect that may affect the property. Once neighbours have been identified, Alcoa consults neighbours individually to provide an opportunity for community members to comment on the proposed plan.

Community engagement is fundamental to managing operations and projects for Alcoa. It ensures Alcoa has the appropriate

focus on aspects considered of most importance to the communities in which it operates and creates new opportunities to work in partnership on local issues.

Where a specific focus group is required a working group may be developed to allow for a team of Alcoa and community members to address specific community concerns. Currently there are working groups active for the Keysbrook Hills Community Group in relation to dust and water.

Further information on Alcoa's community and stakeholder engagement work is available at [http://www.alcoa.com/sustainability/en/info\\_page/community\\_stakeholder.asp](http://www.alcoa.com/sustainability/en/info_page/community_stakeholder.asp)

## Environmental regulation and management

Alcoa is committed to meeting all Environmental Regulations applicable to its operations. The Alcoa WA Mines operate under the Alumina Refinery Agreement Act 1961 and subsequent Amendment Acts. Under these Acts and the Environmental Protection (Alcoa – Huntly and Willowdale Mine Sites) Exemption Order 2004, Alcoa require mining plans, including proposed vegetation clearing, to be approved by the Minister for State Development via the mining Management Planning Liaison Group (MMPLG). The MMPLG oversee all of Alcoa's WA bauxite mining operations.

The MMPLG is chaired by the Department of State Development (DSD) on behalf of the Minister for State Development. Other State Government agencies represented on the MMPLG are the Department for Parks and Wildlife (DPaW), Water Corporation (WC), Department of Water (DoW) and the Department of Mines and Petroleum (DMP).

Sub-committees of the MMPLG have been established to oversee specific aspects of mining operations. The sub-committees include:

- Mine Operations Group (MOG) – Oversee and report to the MMPLG on the environmental (including forest clearing) and community issues arising from the operational activities conducted at Alcoa's mines.
- Bauxite Hydrology Committee (BHC) – Investigate and report on the influence of mining operations on the salinity balance of soil and waters.
- Comprehensive, Adequate, Representative Informal Reserves Evaluation Committee (CARIREC) – Established as a result of a process being agreed to by the MMPLG and the EPA to evaluate Alcoa's planned incursions into CAR Informal Reserves within Alcoa's mining lease as required under the Regional Forest Agreement. CARIREC reports its findings and recommendations to the MMPLG, which in turn makes its recommendation direct to the EPA on the acceptability of Alcoa's proposals.

Alcoa's commitment to the EIP 2014 – 2016 is voluntary. It both complements and exceeds the requirements of its environmental regulation requirements.

## Environmental Protection Licence

The Huntly and Willowdale *Environmental Protection Act 1986* licences are administered by the Department of Environment Regulation (DER) which sets emission limits and other conditions to ensure environmental impacts are managed.

Specific areas covered by the licence include:

- Reporting
- Waste water discharge

Alcoa's corporate Environmental Management Systems (EMS) have been certified to ISO14001:2004 and each location in WA is certified to this international standard through an external certifying body. ISO14001 requires each location to identify activities with the potential to significantly affect the environment, define the controls in place to manage those risks and develop action plans for improvement.

The EMS enables Alcoa to meet its environmental licence requirements and commitments made in the EIP. Further information on the Alcoa EMS can be found at [http://www.alcoa.com/australia/en/info\\_page/enviroverview.asp](http://www.alcoa.com/australia/en/info_page/enviroverview.asp)

## National Pollutant Inventory

The National Environment Protection Council (NEPC) launched the National Pollutant Inventory (NPI) in 2000. It provides communities with environmental emission data and aims to satisfy community demands for this information as well as assist governments and industry with environmental planning and management. Emissions to air, land and water are reported.

The NPI is published on the Australian Government's National Pollutant Inventory website [www.npi.gov.au](http://www.npi.gov.au) This database contains information about emissions from large operations and the estimates of emissions from smaller business activities such as petrol stations, dry cleaners, fast food outlets and other sources including transport, home heating and cigarette smoking. WA Mining reports to the NPI annually. To help people understand what NPI data means, the NPI website provides contextual information. The aluminium industry has added further information, which can be found on the Australian Aluminium Council website: [www.aluminium.org.au](http://www.aluminium.org.au)

## Other links of interest include:

Australian Greenhouse Office:  
[www.greenhouse.gov.au](http://www.greenhouse.gov.au)

Minerals Council of Australia:  
[www.minerals.org.au](http://www.minerals.org.au)

Western Australian Department of Environment Regulation:  
[www.der.wa.gov.au](http://www.der.wa.gov.au)

Western Australian Environmental Protection Authority:  
[www.epa.wa.gov.au](http://www.epa.wa.gov.au)

Centre for Excellence in Cleaner Production:  
[www.cleanerproduction.curtin.edu.au](http://www.cleanerproduction.curtin.edu.au)

Greening Australia:  
[www.greeningaustralia.org.au](http://www.greeningaustralia.org.au)

# How aluminium is made

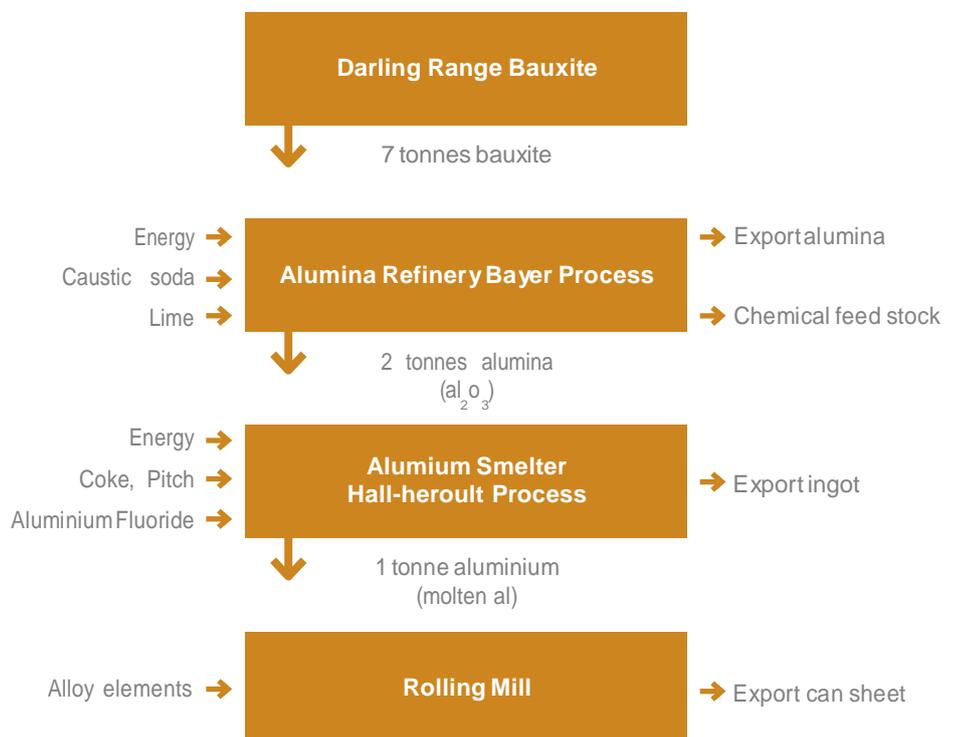


## From bauxite ore to versatile metal

The aluminium making process starts with a chemically altered and weathered rock known as bauxite. Its colour and texture looks little more than ordinary gravel. However, its careful extraction from mines in the Darling Range of Western Australia start a process which since the beginning of the 20th century has revolutionised the transport, building and other high technology industries.

By mixing bauxite with caustic soda, and then pressure heating, Alcoa extracts alumina in a fine white powder form. Alumina is shipped to aluminium smelters in Victoria and exported around the world.

The alumina is then smelted at very high temperatures and an electric current passed through it to form aluminium – one of the world's most versatile metals.



# From dirt to aluminium

## Mining and Rehabilitation



### Preparation of mining area

After clearing of timber and other material, topsoil and overburden are carefully removed and returned after mining when the areas are being rehabilitated.



### Bauxite mining

A 4-5 m layer of caprock and bauxite is removed using large excavators or loaders and haul trucks.



### Crushing plant

Ore is taken to a crusher where it is crushed into smaller pieces.



### Ore conveyors

The ore is then transported by conveyor belt and rail to the refineries for processing.



### Rehabilitation

After mining, topsoil and overburden are returned to the area and the site is prepared for revegetation.

## Refining Process



### Digestion

Finely ground bauxite is mixed with hot caustic soda solution to dissolve the alumina from the bauxite. Every seven tonnes of bauxite makes two tonnes of alumina.

## Smelting Process



### Dissolving alumina

Alumina is dissolved in an electrolytic bath of molten cryolite within a large lined furnace known as a "pot". There are hundreds of pots at a typical smelter.



### Chemical process

Alumina is made up of aluminium and oxygen, which need to be separated to produce the metal. Every two tonnes of alumina makes one tonne of aluminium.



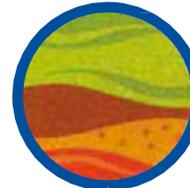
### Calcination

The alumina hydrate is washed, then heated to remove water, leaving a pure dry alumina in the form of a fine white powder. This is cooled and stored, then shipped to smelters for processing.



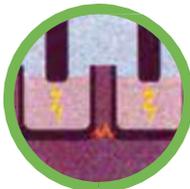
### Precipitation

The liquid containing alumina hydrate is then cooled in large open tanks and seed crystals added, causing the alumina to crystallise out of solution.



### Clarification

Insolubles, such as sand and mud, are settled and filtered out, leaving a solution of dissolved alumina hydrate.



### Reduction process

A high electric current is passed through pots via carbon blocks. The current flows continuously from the carbon block (positive) through the alumina/cryolite mix to the lining of the pot (negative), and then on to the next pot.



### Forming aluminium

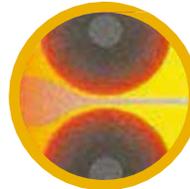
Electricity maintains the temperature of the process at about 950°C and enables the alumina to split into aluminium and oxygen, with aluminium settling to the bottom of the pot.



### Casting

The molten aluminium is cast at a temperature of just over 700°C to form ingots.

## Rolling Process



### Hot rolling

Aluminium ingot is reheated to around 600°C, then passed through a hot finishing mill where it is reduced in thickness to 3-6mm.



### Coiling

The aluminium strip from the hot rolling mill is coiled and cooled before being sent to the cold rolling mill.

## Recycling Process



### Final processing and casting

Molten aluminium is transferred to a holding furnace and then cast into ingots. Recycling aluminium consumes only five per cent of the energy required to make new aluminium, with no loss in quality.



### Initial processing

Coated aluminium (painted or lacquered) is processed through a gas fired rotary furnace before being sent to a "melter" where it is mixed with uncoated or new aluminium.



### Classification

Upon receipt at the Alcoa Australia Rolled Products' Yennora recycling centre, the recycled aluminium is classified so the optimal end use and processing path can be determined.



### Preparation

Recycling aluminium starts with preparation for transporting, which involves compaction to improve the density of the aluminium and to reduce freight, storage and handling costs.



### Sheet finishing

Most sheet products require a finishing step such as cleaning, coating and slitting. All products are trimmed to customer specified widths.



### Cold rolling

The aluminium coil is further reduced (to as thin as 0.24 mm) by three passes through a cold rolling mill. Exit speeds of cold rolling mills are as high as 1000metres per minute.