



like sand through an hourglass  
...this is the soil to rehabilitate our mine

alcoa anglesea

environment report

february

2008



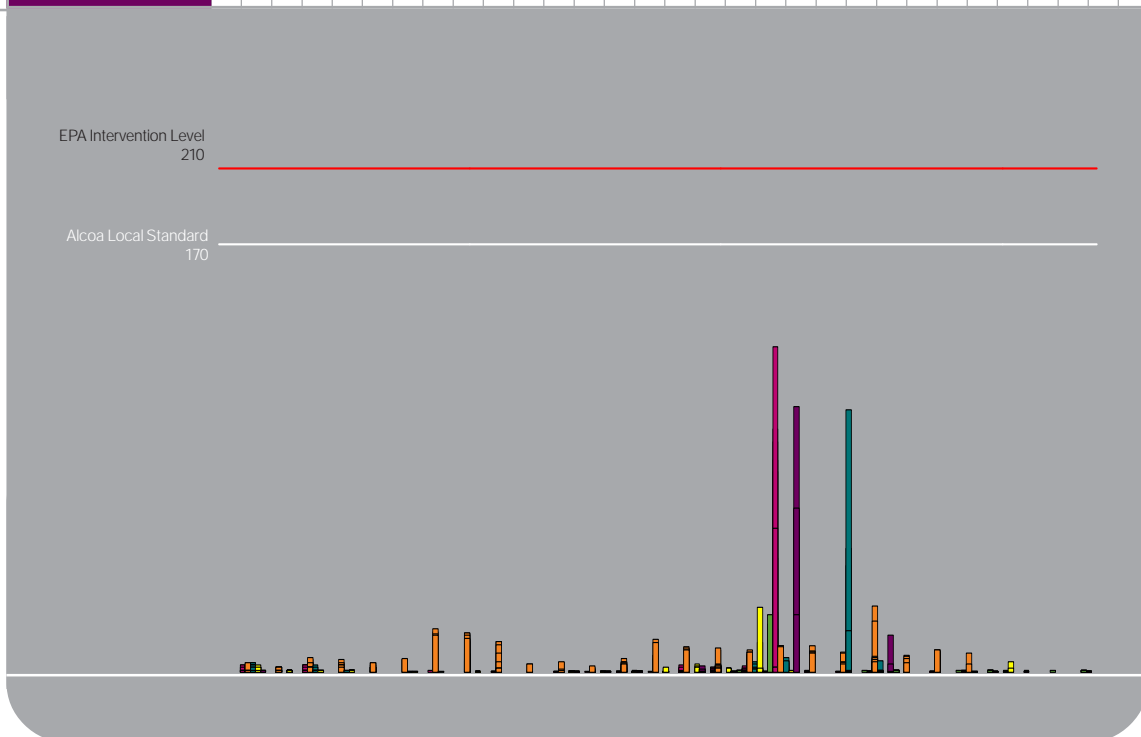
australia's aluminium

# air

Air Monitoring	Average	Maximum
Stack Monitors		
Opacity g/m <sup>3</sup> 10-minute average	0.069	0.099
Stack SO <sub>2</sub> kg/min 1-hour average <b>Licence limit</b> 111.34kg/min	76.30	90.74

Ambient Monitors	Average	Maximum
SO <sub>2</sub> 1 hour ppb		
Community Centre	< 1	23
Primary School	1	129
Mt Ingoldsby	4	26
Scout Camp	1	104
Camp Wilkin	< 1	26
Camp Road	< 1	106

Ambient Monitors																													
SO <sub>2</sub> Maximum 1 hour averages (ppb)																													
Date	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Community Centre	0	0	0	0	0	0	-	-	0	0	0	0	0	0	0	0	0	1	23	0	0	1	1	0	1	1	-	1	1
Primary School	0	4	2	6	5	4	-	17	-	-	14	16	13	1	4	2	5	13	12	-	10	3	9	11	9	4	26	7	9
Mt Ingoldsby	0	3	0	3	0	0	0	1	0	0	0	0	0	0	0	3	2	3	129	1	0	1	0	0	1	0	1	0	0
Scout Camp	0	4	0	3	1	0	0	0	-	-	-	-	-	-	-	-	-	-	6	0	1	104	5	0	0	1	1	0	0
Camp Wilkin	0	3	1	1	1	0	0	0	0	0	0	0	0	1	1	3	2	2	26	0	0	0	0	0	0	0	4	0	0
Camp Road	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1	1	106	0	0	15	0	0	0	0	1	0	0



# water



## Water Storage

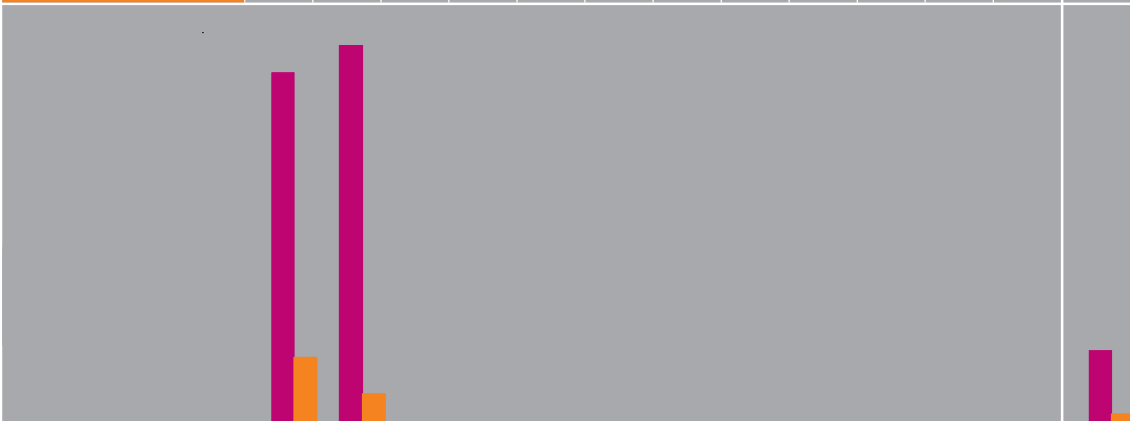
Barwon Water storage levels for the Geelong system at 30.5% capacity. Stage 4 restrictions apply with a Daylight Savings exemption to permit limited residential garden watering.

Water Discharge	February	Total
ML		
Ashponds (SP1)	122	257
Mine (SP4)	0	0

Water Monitoring 05/02/2008	SP1 Ashpond		SP4 Mine		SP3 Final	
	EPA limit	Lab Result	EPA limit	Lab Result	EPA limit	Lab Result
pH	4-10	8.2	3-9	-	5-9	6.8
Susp. Solids	100	< 4	100	-	30	< 4
Colour	50	5	50	-	50	6
Aluminium	10.00	0.20	10	-	5.50	0.07
Iron	10.00	0.17	0	-	4.00	0.25
Zinc	0.40	0.01	2.0	-	0.30	0.21

## WATER WATER USAGE PER MONTH (ML)

Date	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	TOTAL
Town Water	1.4	0.9											2.3
Bore Water	279	304											583
Mine Water	53	24											77



## soil research

Topsoil is considered a precious commodity at Alcoa Anglesea. Whilst overburden is in abundance, the thin sliver at the surface that we call topsoil is all we have to rehabilitate the open cut mine. Or is it? Is overburden just dirt or a valuable resource in disguise?

This summer, Vacation Student Ellen Palmer has been out and about getting her hands dirty to answer that very question. What are the physical and chemical characteristics of the different layers within the soil profile compared to our topsoil? Can we get plants to grow in overburden?

To test this theory rye corn seedlings were planted in two soils currently used in our mine rehabilitation process: topsoil and subsoil; as well as overburden: orange sandy clay, grey sand found near the coal seam and a combo of orange sandy clay + orange sand. The plants were separated into two watering regimes to test if water availability also affected plant growth. Half of the plants were watered every day (thanks Wayne and Ian for the weekend watering!) and the other half were watered every third day.

And the results....rye corn successfully grew in all of the soil/overburden types. The plants grew the tallest in the topsoil and grew the least in the orange sandy clay. On average, the plants that were watered every day irrespective of the overburden type grew slightly more than the ones watered every three days.

So topsoil's the best...but don't chuck out the rest just yet. The subsoil was the next best for plant growth despite a higher sand content, less nutrients and less organic matter compared to the topsoil. Sandy soils are known to retain fewer nutrients compared to those that contain large amounts of clay and organic matter. Subsoil is the next layer immediately below the topsoil

in the natural soil profile. It is returned to the mine rehabilitation at a depth of 100mm. However in the gully systems the subsoil can reach depths of over one metre. This presents an opportunity to save the 'extra' as a media in which to grow plants for future rehabilitation activities.

The orange sandy clay was not very beneficial to plant growth because its physical properties caused it to cement together as it dried. Soil tests also found that it had low amounts of Calcium which is an essential plant nutrient. This meant water and roots found it hard to move through the soil and the plants couldn't find enough water or nutrients to grow very tall. The problems found in the orange sandy clay were alleviated when combined with orange sand. Adding more sand stopped the orange sandy clay from cementing which helped water and roots to move through the soil and allowed the plants to grow taller.

The plants in the grey sand found near the coal seam actually grew better when they were watered less. It was also found to contain the least amount of nutrients of all the soil types. When it was watered every day the few nutrients that were in it may have washed away causing plants to grow less while the soil that was watered every third day was able to keep some of the nutrients allowing the plants to grow taller.

Whilst nothing can truly replace the diversity of the natural seedbank within the topsoil, its availability is limited. If another layer of the overburden can sustain plant growth there is potential for areas to be revegetated and rehabilitated. These results indicate that by combining overburden with topsoil we may be able to make the topsoil stretch further or by combining different overburden types together we have a soil capable of sustaining plant life.

### ANIMALS OF THE ANGLESEA HEATH

#### GOLDEN ORB SPIDER (*Nephila edulis*)

Size: females body 2 - 4 cm, male 5mm  
 Colour: silvery-grey to plum coloured bodies and brown-black, often yellow banded legs. Males red-brown to brown in colour  
 Distribution: Orb weaving spiders are found throughout Australia  
 Habitat: dry open forests and woodlands, coastal sand dune shrubland and mangrove habitat

The Golden Orb Weavers build large, semi-permanent orb webs. The strong silk has a golden sheen. These spiders remain in their webs day and night and gain some protection from bird attack by the presence of a 'barrier network' of threads on one or both sides of the orb web.

Sometimes their strong webs manage to trap small birds or bats, and the spider will wrap them and feed upon them. More common prey items include flies, beetles, locusts, wood moths and cicadas.

### GOLDEN ORB SPIDER



LAND

RAINFALL (mm)

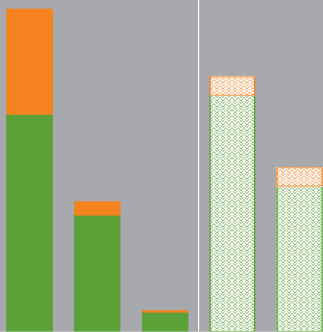
Month	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	TOTAL
2008 Rainfall	19.8	35.8											55.6
1968-2007 Average	44.5	42.7											87.2



WATER

TOWN WATER USE (ML)

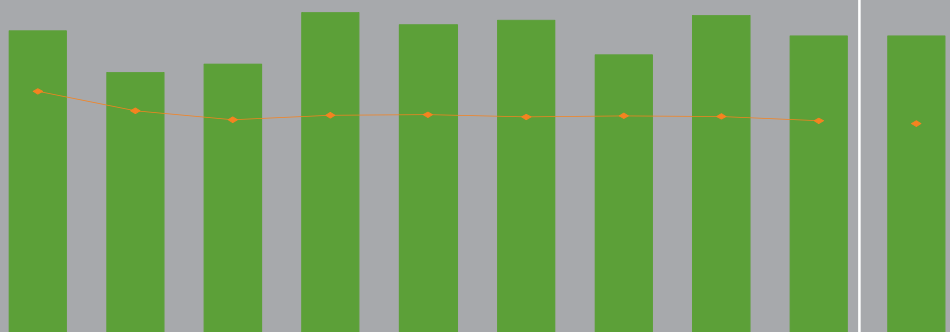
	2000	2007	2008	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Process	23.9	12.8	2.1	1.3	0.8										
Amenity	11.6	1.5	0.2	0.1	0.1										



AIR

GREENHOUSE GAS (GHG) TOTAL (Mt) & GHG EMISSION EFFICIENCY (t/MWh)

	1990	2000	2001	2002	2003	2004	2005	2006	2007	2008
GHG Mt	1.42	1.23	1.27	1.50	1.45	1.47	1.31	1.49	1.40	1.40
◆ GHG t/MWh	1.34	1.24	1.19	1.21	1.21	1.20	1.21	1.20	1.18	1.16



# environmental improvement

Environmental Management Targets	February	2008 Total	Forecast	2008 Target
Reportable Environmental Incidents	0	0	0	0
Monthly EHS ASAT Audit Completion (%)	100	100	100	90
Air Emission Targets	February	2008 Total	Forecast	2008 Target
Ambient SO <sub>2</sub> ( no. readings > 210ppb)	0	0	0	0
Stack SO <sub>2</sub> (no. hrs > 100kg/min)	0	0	0	0
SO <sub>2</sub> Load Reductions (lost MWh)	17	24.5	147	N/A
GHG Efficiency (t CO <sub>2</sub> e/MWh)	1.16	1.16	1.16	1.20
Opacity (10 min av > 0.25g/m <sup>3</sup> normal operation)	0	0	0	0
Water Targets	February	2008 Total	Forecast	2008 Target
Town Water (ML)	0.9	2.3	13.8	14.2
Bore Water (ML)	304	583	3498	2370
Waste Targets	February	2008 Total	Forecast	2008 Target
Waste to Landfill (t)	0.0	0.0	0.0	8.0
Solid Prescribed Waste to Landfill (t)	0.0	0.0	0.0	0.0
Mine Rehabilitation Targets	February	2008 Total	Forecast	2008 Target
2008 Area to Clear (ha)		0.0		0.0
2008 Area to Rehabilitate (ha)		0.0		0.0
2007 Mine Rehabilitation Species Richness (%)		N/A		100

## OUR ENVIRONMENT AND OUR EMPLOYEE

**Ellen, welcome to Anglesea...you have spent your summer holidays with us, what have you been up to?** I have been at Anglesea for a 12-week Vacation Student Placement. I am currently conducting a research project into the physical and chemical properties of the soils within the mining area that may support plant growth. I have also been working on the development of a database for the information collected by the yearly botanical monitoring of the mine rehabilitation areas.

**What interested you in doing vacation work with Alcoa?** Alcoa has a good reputation. It's also a local organisation that offers work experience relevant to my field of studies so I decided to apply.

**What have you achieved during your work experience at Alcoa?** I've gained quality experience, met new people, and applied the knowledge gained from my studies.

**What are your plans after your research project is complete?** Hopefully get another job in the same sort of field. I want to get as much experience as possible.

...ELLEN PALMER

