



## **+ Bactivate** Case Study - Mining

# Transforming mine site overburden without moving topsoil.

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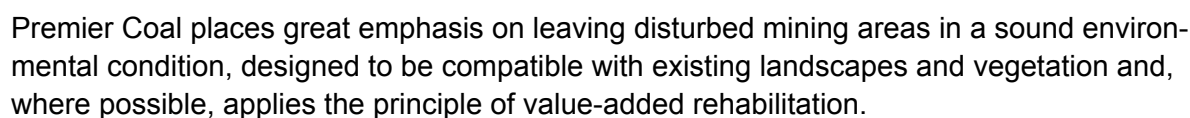
How WA Eco Plant's unique revegetation solution with **Bactivate** premium microbial soil conditioner, achieved outstanding commercial and environmental outcomes for...



In collaboration with



The Premier Coal Mine is situated five kilometres east of the townsite of Collie in Western Australia's south west. The mine was first established in 1950 and was acquired by Yancoal in 2011. Total production from 1950 to 2010 has been approximately 90 million tonnes from five underground mines and six open cut operations.



Land and its uses surrounding the Premier Coal mine site includes State Forest, private property, beef and sheep farming, viticulture, aquaculture and tourism. The mine's activities are clearly visible from a number of public roads including Crossman Road which links Collie to the Wheatbelt.

Dust associated with overburden dumps have been identified as an environmental concern requiring an effective solution to abate the creation and free movement of dust. This is of particular importance during the dry and windy months.





## Dust Abatement Trial Planning

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Premier Coal's environmental division sought a sound rehabilitation and cost effective solution to mitigate the movement of dust from a section of overburden within 300 metres of the Crossman Road. The area is calculated at 6.11 Hectares. Premier Coal agreed to trial a revegetation and stabilisation system over the area using a system being developed by WA Eco Plant.

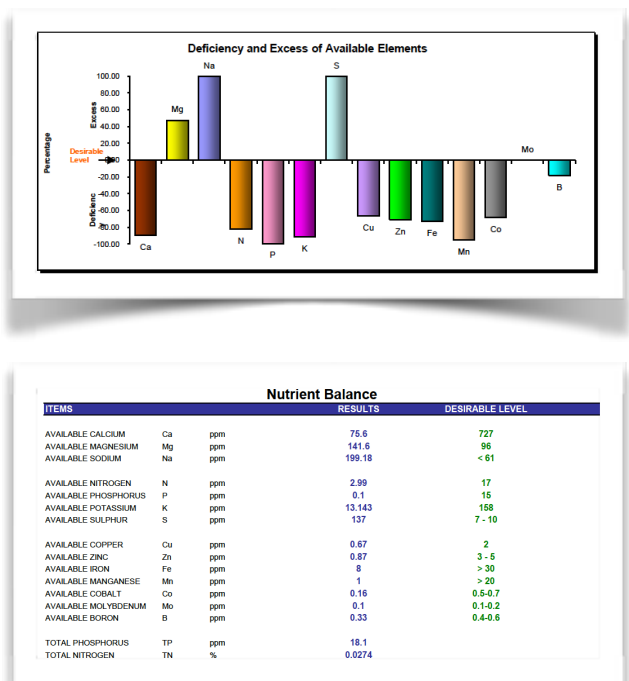
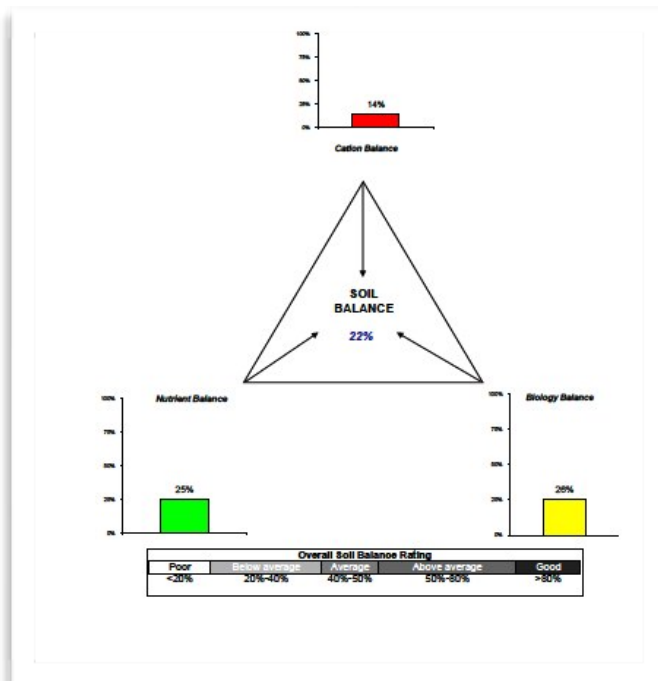
Upon completion of the mining operations the area will be eventually required to be returned back to its former land use being grazing pasture. Native flora is not required to be re-established. The pasture will include a selection of grasses and clover species that are suitable for the environmental conditions.



## Soil Sampling

WA Eco Plant collected a number of soil samples across the 6.11 Hectares, with areas of significant visible difference were sampled accordingly. The samples were analysed by SWEF Laboratories (Melbourne), applying the Complete Soil Balance Analysis test.

Soil balance was tested at being marginally above a “poor” rating of 22%, with significant deficiencies across most available nutrients.



Nutrient Balance				
ITEMS			RESULTS	DESIRABLE LEVEL
AVAILABLE CALCIUM	Ca	ppm	75.6	727
AVAILABLE MAGNESIUM	Mg	ppm	141.6	96
AVAILABLE SODIUM	Na	ppm	189.18	< 61
AVAILABLE NITROGEN	N	ppm	2.99	17
AVAILABLE PHOSPHORUS	P	ppm	0.1	15
AVAILABLE POTASSIUM	K	ppm	13.143	158
AVAILABLE SULPHUR	S	ppm	137	7 - 10
AVAILABLE COPPER	Cu	ppm	0.67	2
AVAILABLE ZINC	Zn	ppm	0.87	3 - 5
AVAILABLE IRON	Fe	ppm	8	> 30
AVAILABLE MANGANESE	Mn	ppm	1	> 20
AVAILABLE COBALT	Co	ppm	0.16	0.5-0.7
AVAILABLE MOLYBDENUM	Mo	ppm	0.1	0.1-0.2
AVAILABLE BORON	B	ppm	0.33	0.4-0.6
TOTAL PHOSPHORUS	TP	ppm	18.1	
TOTAL NITROGEN	TN	%	0.0274	

## Pasture Seed Selection

Soil sample results were provided by WA Eco Plant to Symmond's Seeds to evaluate and determine the species and application rate of grass best suited to the soil conditions, climate and required environmental outcome.

Symmond's Seeds recommended seed mix and application rates.

## Earthworks and Seeding

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WA Eco Plant performed all site works. The entire area was shallow ripped with multi tynes, several small scattered mounds were levelled and profiled. The grass seed mixture, microbial soil conditioner (*Bactivate*) and a small amount of other inputs were spread via a multi-spreader.

## Topsoil Component Replaced with *Bactivate*

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The availability, environmental benefits and costs associated with the reuse of topsoil are issues faced by most mining companies.

Native seed diversification, available nutrient, microbes and soil structure are important elements of healthy topsoil, these values are gradually lost without the timely reuse or appropriate storage of topsoil. When calculating the true cost to remove, store and reapply topsoil the costs can be significant and often constitute a majority of revegetation treatments. If the topsoil qualities have become inert the steps and expenditure taken to accommodate the use of topsoil can often be of little benefit and costly.

WA Eco Plant's newly developed revegetation procedure does not involve the use of topsoil, rather the soil biology and nutrient is provided through the inclusion of *Bactivate*.

*Bactivate* is a premium microbial soil conditioner composed of 5 specific bacillus species that enhance plant growth and protection. A lack of technical information and the inability to identify exactly what biology is being applied, has to-date, limited the appreciation and use of microbial soil conditioners - *Bactivate* now changes this.

It is now known that the beneficial bacteria in *Bactivate* stimulate plant growth and provide protection. They are used as bio-fertilisers and biological control agents to benefit unproductive and stressed soil environments.

*Bactivate* is a culture of beneficial bacteria formulated with a suitable carrier material that helps soils improve their nutrient status and encourages proper plant growth and protection. These beneficial bacteria:

- increase phosphorous uptake
- make atmospheric nitrogen available and readily accessible to roots
- promote the growth of roots by releasing plant regulation substances
- protect the roots from pathogenic micro-organisms and create a healthy
- environment for outstanding plant growth and performance

*Bactivate* granules were incorporated into the area to be revegetated at a rate of 250 kg per hectare. *Bactivate* in 25 Kg bags was supplied by Growise (West Australian State Distributor) to WA Eco Plant.

## Watering Regime

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Only 46mm of rainfall was recorded in Collie from seeding (24 April) through to a more significant rainfall event (40 days later). WA Eco Plant initially watered the site with a water truck to maintain soil moisture helping to support the light level of early grass germination. The watering included the additional of *Bactivate Bioboost* liquid to support and enhance the introduced soil bacteria and also *Bactivate Seaweed Solution* a concentrated seaweed liquid.

WA Eco Plant management believe the very low rainfall associated over the germination period may have reduced the germination capacity and also some early germinates may have perished.

The successful outcome was still achieved given the dry conditions. This provided a further validation of the support *Bactivate* was able to supply to the developing pasture.

## Germination Record

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Grass germination was evident after 13 days from seeding. Soil moisture was drying, more germination was evident in moisture gaining sites.





15mm of rainfall fell on the 2<sup>nd</sup> and 3<sup>rd</sup> June providing for follow on germination and continued growth of existing germination. The clover germination was also noted.





## A Successful Outcome - On Multiple Fronts

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By August 2015, stabilisation and revegetation had been achieved, with a thick cover of pasture established across the overburden site.

The 6.11Ha site had been completely transformed from a barren landscape devoid of all nutrient and vegetation to a thriving paddock that is a healthy pasture suitable for grazing, as per the client's original rehabilitation brief.



The trial was also a resounding success from a commercial perspective. The WA Eco Plant method (incorporating Bactivate) was **substantially** more cost effective than traditional topsoil removal, storage and reapplication.

Not only has the WA Eco Plant method delivered an outstanding commercial outcome but it has established a healthy soil biota that will underpin successful growth outcomes well into the future.

*"The WA Eco Plant method using Bactivate has transformed this inert overburden dump, providing a groundcover with the potential to retain run-off in winter and prevent dust generation in summer; while also substituting the need for topsoil application."*

*The mining industry more than ever is looking for innovative companies to bring genuine innovation and results to the table. WA Eco Plant is a definite innovator in mine site revegetation and rehabilitation",* said Colm Harkin, Premier Coal Limited - Senior Environmental Advisor.

WA Eco Plant's unique revegetation method has proven to be an effective tool for the establishment of pasture on degraded sites. Further trials are being conducted to establish native flora back over disturbed areas.