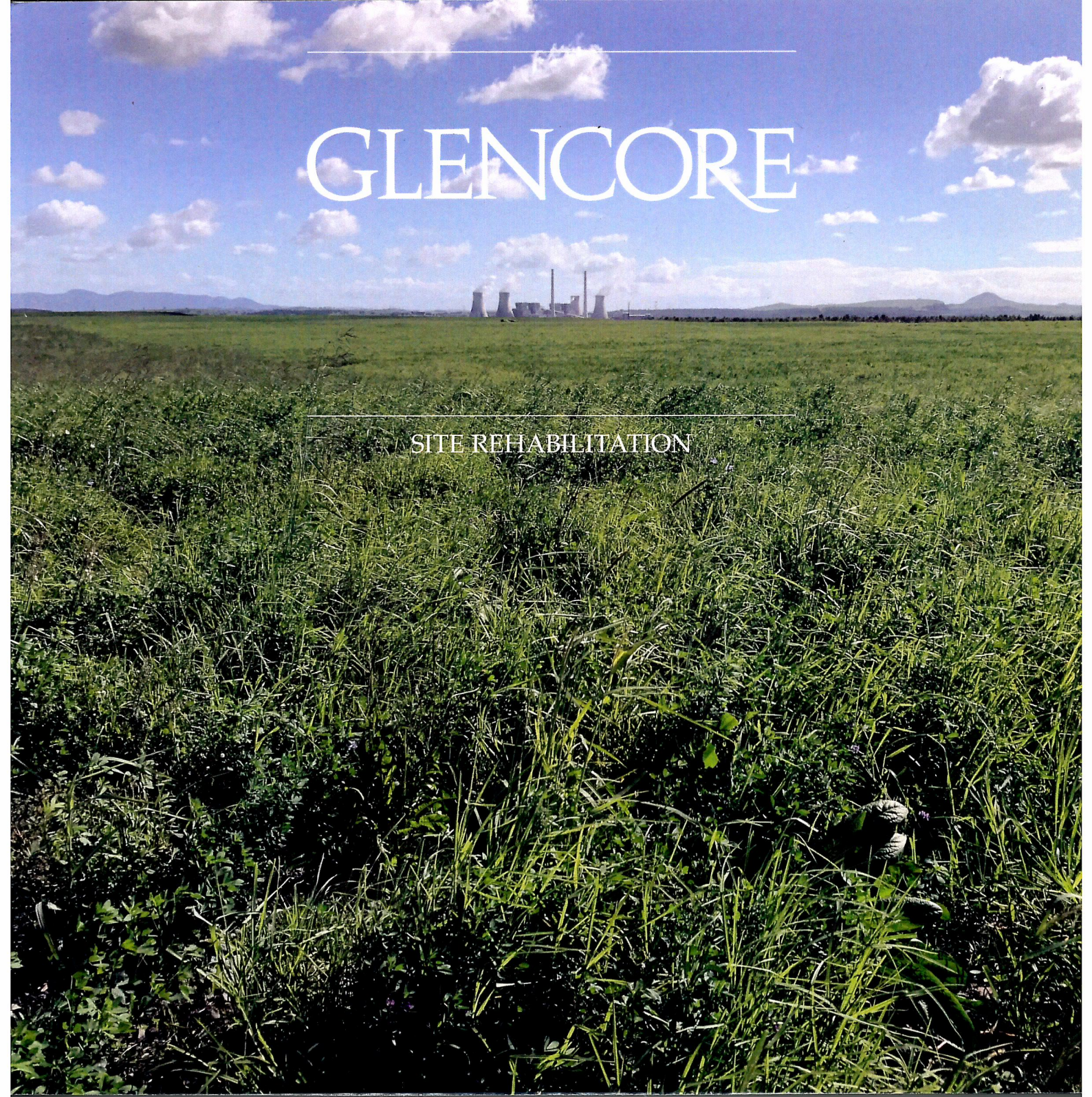


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# GLENCORE

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SITE REHABILITATION





## About Glencore

Glencore has operated in Australia for nearly 20 years and, following its acquisition of Xstrata in 2013, became one of the world's largest, diversified natural resource companies.

We employ around 155,000 people in 50 countries with involvement in both the resources and agriculture sectors.

Glencore Coal (GCAA) is one of Australia's major coal producers.

We operate 13 mining complexes across NSW and Queensland – incorporating 17 operating mines – providing work for more than 7,000 people.





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## Rehabilitation

To protect the health and welfare of our employees, GCAA has a program known as SafeCoal in place across all sites. The SafeCoal rules are non-negotiable.

GCAA takes a similar approach when it comes to looking after the environment.

We have in place at all sites land management and rehabilitation requirements that aim to minimise our active mining footprint and assist with making sure mined land is returned to either self-sustaining native ecosystems, agricultural use or other suitable purposes that meet requirements set down by Government. The final land use design is done in consultation with our communities.

This strong focus on rehabilitation is driven by Senior Executives and cascades throughout the business.

The revitalised approach commenced in 2010. This more systematic approach has seen more challenging rehabilitation targets set and achieved, has helped address rehabilitation backlogs at some sites and created a process by which progress towards rehabilitation goals can be measured.

In fact, as of January 2017, our operations have rehabilitated over 11,500ha of mined land to native vegetation or grazing pastures.

During 2016 alone our operations rehabilitated over 1,000ha of mined land, planted more than 100,000 tubestock and seedlings, used more than 1,000,000 cubic metres of topsoil and sowed almost 19.5 tonnes of seed in meeting their rehabilitation requirements.

Cattle graze rehabilitation pastures at some of our sites and an ongoing trial at our Liddell open cut mine in the Upper Hunter of NSW is demonstrating that mined land can be returned to productive pasture.

Our work in rebuilding Ravensworth State Forest at Mt Owen open cut mine in the NSW Upper Hunter has been recognised internationally, and has been used as the model for published guidelines on re-establishing native vegetation on disturbed land.

Our Newlands Open Cut operation in central Queensland is the first in Bowen Basin coal mining history to have mine spoil certified by regulators as being successfully rehabilitated while operations continue.

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## Rehabilitation in mine planning

Our commitments to landform design and rehabilitation progress are an important part of our life of mine planning and budget processes.

Each of our sites prepares an Annual Rehabilitation and Land Management Plan (ARLMP) as part of the budget cycle.

This not only provides for effective planning, but also ensures that rehabilitation programs are resourced, budgeted and delivered.

The plans include targets for disturbed land, shaping and seeding; forecasts for rehabilitation across the life of mine to avoid large, end-of-mine legacies; and plans to address legacy issues and/or rehabilitation backlogs.

To implement rehabilitation plans, an integrated approach involving mine planning, production and rehabilitation functions is required so that rehabilitation works can be incorporated as far as practicable into the day to day operation of the mine.

While machinery movement is underway, it provides an opportunity to integrate any selective material handling requirements and final landform goal increments within the short range earthmoving equipment forecasts of mine schedulers.

This provides for the efficient utilisation of mining fleet for rehabilitation (bulk shaping) works and the most cost-effective rehabilitation outcome.

Progressive rehabilitation also serves to reduce our active disturbance footprint and minimise the rehabilitation liability at the end of the mine life as far as practicable.

Annual rehabilitation inspections and continuation of longer-term (scientifically-based) monitoring programs provides a measure of the quality of rehabilitation works, and a means to continually assess and improve our performance.



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## Guiding Principles

We understand and accept the responsibility of managing the land we own as productively and sustainably as possible, and to ensure that we rehabilitate and restore mined land progressively during the mine life as well as after mining activities have finished.

There are social and economic factors behind this focus on progressive rehabilitation.

First and foremost, Governments and the communities in which we operate expect mining companies to deliver progressive, quality rehabilitation.

Poor rehabilitation leaves a difficult post-mining legacy for both the industry, the community and Government.

During mining operations, failure to minimise active disturbance footprints can and does contribute to dust emissions from open cut sites.

There are commercial considerations as well.

Poor quality rehabilitation can:

- Require major, and costly, ongoing maintenance
- Prevent the surrender of mining leases or return of security deposits
- Limit options for land disposal once mining has finished
- Impact on new project approvals

## Driving performance

To assist with driving performance, Key Performance Indicators (KPIs) have been developed and form a part of each site's performance incentive scheme. These apply to Senior Management, Mine Managers, Mine Planners, Mine Production and Environmental personnel.



## Results

Since the introduction of improved internal requirements for planning and implementation of rehabilitation across our sites, our increased focus on this area has delivered outstanding results.

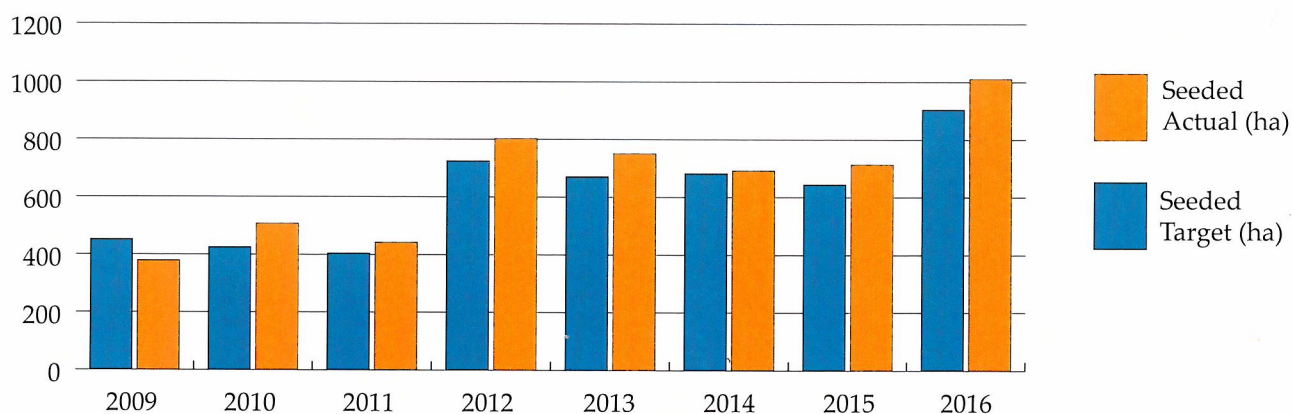
5 Year Rehabilitation Performance 1 Jan 2012- 31 Dec 2016 (ha)	GCAA	NSW	QLD
Total Disturbance	6,726	3,379	3,347
Total Rehabilitation	4,021	2,263	1,758
% of Disturbed Land Rehabilitated	60%	67%	53%

In 2017, we are planning to rehabilitate more land than we disturb in both NSW and Queensland.

2017 Rehabilitation Budget (ha)	GCAA	NSW	QLD
Amount of Disturbance	1,067	474	593
Rehabilitation Target	1,129	481	648

## Actual Land Rehabilitation vs Budget

NSW results only for 2009-2011





## Case studies

### Bulga Coal

Located near Singleton, in the NSW Upper Hunter, our Bulga Coal operations recently received approval for a life of mine extension.

Based on feedback from local communities, Bulga's mine plans included provision for a landscaped screen that has been designed to minimise noise and visual impacts from our operations on neighbouring villages.

The screen runs along the western edge of our open cut mine from one end to the other and is on schedule for completion and rehabilitation by the end of 2018.

It has been designed to look like a natural landform with the height varying by up to 30 metres. Once complete, the screen will be approximately 8km in length and 70 metres at its highest point.

Construction of the outer-face of the screen is taking place during daytime only to reduce noise impacts on the community.

Bulga Coal has committed to re-establishing two endangered ecological communities as part of the rehabilitation across the mine, which includes the screen:

- Central Hunter Grey Box-Ironbark Woodland (2,200ha)
- Central Hunter Ironbark Spotted Gum-Grey Box Forest (250ha)



#### 5 Year Rehabilitation Performance 1 Jan 2012 – 31 Dec 2016 (ha)

Total Disturbance	1153
Total Rehabilitation	423
% of Disturbed Land Rehabilitated	37%
Statutory Target (e.g. Mine Operations Plan, Plan Of Operations)	353





*Above and below, progress on the landscaped screen that is minimising noise and visual impacts from our Bulga open cut mine.*





## Case studies

### Clermont

Clermont is an open cut mining operation located in central Queensland's Bowen Basin, 12 kilometres from the town of Clermont and 110km north-west of Emerald.

Since taking ownership of Clermont mine in June 2014, our mine team has been focussed on delivering quality rehabilitation on site through re-shaping of waste rock dumps and addressing rehabilitation backlogs.

Shaping work on the mine's Northern Waste Rock Dump began in 2015, after design work commenced in 2014.

Preferred design profiles of the embankments were a tri-linear concave slope with an inward sloping bench configuration.

Each tri-linear "lift" contains gentle slope changes of equal length, while surface water management for each landform has been developed in accordance with catchment and existing conditions. This mimics how landforms naturally erode, and thus makes this landform more sustainable.

A key aspect of water management was development of a large, lined open channel which conveys run-off from each respective embankment bench to facilitate discharge of surface water.



#### 2 Year Rehabilitation Performance (Only 3 years data available for Clermont post Glencore acquisition) 1 Jan 2015 to 31 Dec 2016 (ha)\*

Total Disturbance	299
Total Rehabilitation	162
% of Disturbed Land Rehabilitated (ha)	54%
Statutory Target (e.g. Mine Operations Plan, Plan Of Operations)	136

*\*Note: Glencore began operational management of Clermont mine from 1 June 2014*





*Shaping work (above) on Clermont's Northern West Rock Dump and rehabilitation progress (below).*





## Case studies

### Collinsville

Collinsville is Queensland's oldest coal mine, having operated for almost 100 years.

It is located in the northern part of the Queensland Bowen Basin, roughly 270km south-east of Townsville.

The mine's Garrick East Open Cut void was a 20ha area which stored approximately 350 megalitres of mine-affected water.

The void was rehabilitated in late 2015 with the targeted final land use an open woodland, containing a mix of grass, tree and shrub species.

The void was dewatered before backfilling of the pit commenced, using material sourced from overburden removal at other operational areas on site.

Approximately 1.45million cubic metres of material was hauled, placed and profiled to form the current Garrick East rehabilitation landform.

The method of backfilling is being implemented at other open cut voids on site at Collinsville.



#### 5 Year Rehabilitation Performance

1 Jan 2012- 31 Dec 2016 (ha)

Total Disturbance	82
Total Rehabilitation	168
% of Disturbed Land Rehabilitated	206%
Statutory Target (e.g. Mine Operations Plan, Plan Of Operations)	157





*(Clockwise from top left). The transformation of Collinsville's Garrick East open cut void from 2015 to today.*





## Case studies

### Liddell

Our Liddell open cut operation in the NSW Upper Hunter has been conducting a trial on mined land that has been returned to grazing pasture.

The aim of the trial is to demonstrate that mined land can be used as productive pasture post-mining.

Performance of the soil and pasture on the rehabilitated land is being closely monitored to assess performance of pastures across a range of climatic conditions, and to ascertain that the desired soil fertility and pasture composition is maintained.

The trial started in 2012 and results from three completed phases to date have shown that cattle on the rehabilitated pasture are performing better than those on natural pasture and that tropical grass species selected for the rehabilitated pasture are also performing better than natural pasture.

The performance of both cattle and pasture will be used to help provide information for other Glencore mine sites, as well others across the industry



#### 5 Year Rehabilitation Performance 1 Jan 2012- 31 Dec 2016 (ha)

Total Disturbance	139
Total Rehabilitation	245
% of Disturbed Land Rehabilitated	176%
Statutory Target (e.g. Mine Operations Plan, Plan Of Operations)	241





*Cattle grazing on rehabilitated pasture at Liddell open cut mine (above) with more mined land returned to pasture (below).*





## Case studies

### Mangoola

Our Mangoola open cut operation was the first in the NSW Upper Hunter to incorporate natural landform in its rehabilitation and is widely regarded as an industry benchmark.

The mine's entire pit disturbance area – some 1300 hectares – is being returned to landform and vegetation consistent with surrounding undisturbed land.

Traditional overburden rehabilitation techniques use uniform slope angles and flat top dumps (or hills) with contour drains and drop structures to manage water flow down the slopes.

Although this style of rehabilitation met the mine's approval conditions, it was not considered an appropriate fit for the landscape surrounding Mangoola.

Following a successful natural landform trial in December 2012, the mine revised final landform plans for the entire disturbance footprint.

#### 5 Year Rehabilitation Performance 1 Jan 2012- 31 Dec 2016 (ha)

Total Disturbance	732
Total Rehabilitation	366
% of Disturbed Land Rehabilitated (ha)	50%
Statutory Target (e.g. Mine Operations Plan, Plan Of Operations)	353



Potential environmental benefits of this project include:

- Better water quality through stability of landform
- Reduced erosion potential
- Reduced maintenance due to lack of specific water management structures
- Increased biodiversity due to a range of topographic relief, appropriate planning for vegetation communities and habitat augmentation, which creates a more familiar terrain for fauna species.
- More visual appeal in landform which, over time, will blend with the surrounding vegetated landform.





*Mangoola's natural landform rehabilitation (above and below) is considered an industry benchmark in the NSW Upper Hunter.*





## Case studies

### Mt Owen

Mt Owen open cut mine has operated adjacent to Ravensworth State Forest in the NSW Hunter Valley since 1993.

The forest is one of the largest areas of remnant woodland in the region.

Remnants like these provide habitat for native plants, animals and microbes, including a number of threatened species such as squirrel gliders, spotted-tailed quolls, as well as several species of bats.

Ravensworth State Forest was used for grazing and as a source of timber for more than 100 years. There has been no logging since 1986 and no grazing since 1995.

Mt Owen has been working with Government agencies and the University of Newcastle to reconstruct forest and woodlands in areas disturbed by mining, and in surrounding biodiversity offset areas that had previously been cleared for grazing.



The rehabilitation and adjoining biodiversity conservation areas being established at Mt Owen will provide an area five times larger than the original remnant woodland. This will provide a linkage to other areas of natural vegetation, providing corridors along which native animals can move as they search for food and breeding areas.

Around 220 species of native fauna have been recorded in Ravensworth State Forest and the adjoining Mt Owen Complex, including 28 threatened birds, bats and small mammals.

Our rehabilitation work has received international recognition.

#### 5 Year Rehabilitation Performance 1 Jan 2012- 31 Dec 2016 (ha)

Total Disturbance	97
Total Rehabilitation	202
% of Disturbed Land Rehabilitated (ha)	208%
Statutory Target (e.g. Mine Operations Plan, Plan Of Operations)	159





Mt Ovens mine has been recognised internationally for its work in rebuilding Ravensworth State Forest.



## Case studies

### Newlands

Glencore's Newlands coal complex has achieved a first in Bowen Basin coal mining history with official Queensland Government certification for rehabilitation of overburden spoil.

Glencore has worked collaboratively with the Department of Environment & Heritage Protection to progressively certify 73.48ha associated with part of an overburden dump at Ramp 7. Rehabilitation of the proposed certification area was undertaken in three sections in 1995, 1997 and 1998.

The requirement that Newlands achieved was to provide habitat suitable for flora and fauna within overarching objectives of being safe, stable, non-polluting and sustainable.

#### 5 Year Rehabilitation Performance 1 Jan 2012- 31 Dec 2016 (ha)

Total Disturbance	1309
Total Rehabilitation	638
% of Disturbed Land Rehabilitated (ha)	49%
Statutory Target (e.g. Mine Operations Plan, Plan Of Operations)	533



Glencore recently received certification in June 2017 for the rehabilitation.

It is the first time that rehabilitation of coal mine overburden spoil has ever been certified and provides a constructive way forward for both Government and the mining sector in encouraging further certification of progressive rehabilitation.

Glencore will be using the key learnings from the Newlands certification case study to look for additional opportunities to obtain certification in other areas of the site along with its Collinsville, Oaky Creek and Rolleston mines.

Newlands is also successfully rehabilitating open cut mine voids, returning them to landform consistent with surrounding areas.





Newlands mine is successfully rehabilitating open cut voids (above and middle) and has established a Bowen Basin coal mining first for certification of rehabilitated overburden (below).





## Case studies

### Oaky Creek

Our Oaky Creek coal complex in central Queensland's Bowen Basin today supports two underground mining operations and a coal processing plant.

Since the closure of open cut operations in 2006, Oaky Creek has focussed on integrating coal processing processes with rehabilitation requirements across the surface operations.

Raw coal is processed through a coal handling processing plant, producing both product coal and waste coal (coarse reject and tailings).

This waste product is being returned to the land from which it originated as backfill for previously mined out open cut voids.

Once the volume of tailings and/or coarse reject has reached maximum design fill levels and is stabilised to design specifications, it is capped with loose earth (previously mined out open cut voids).

#### 5 Year Rehabilitation Performance 1 Jan 2012- 31 Dec 2016 (ha)

Total Disturbance	544
Total Rehabilitation	323
% of Disturbed Land Rehabilitated	59%
Statutory Target (e.g. Mine Operations Plan, Plan Of Operations)	264



Native seed mixes are then sown over these areas and lightly "ripped" (ploughed) to stabilise the surface until sufficient plant growth has occurred. The seed mix has been chosen to suit post-mine land use of native habitat zones.

All rehabilitation work is timed to take advantage of local weather conditions, particularly using wet season rainfall.

Oaky Creek is also looking at continuous improvement in rehabilitation, either through research institutions and bodies, or direct measurement and monitoring onsite.





*Above, an Oaky Creek mine void after shaping and seeding in December 2015 and, below, with dense vegetation in April 2017.*





## Case studies

### Rolleston

Rolleston Open Cut mine is located in the southern part of Queensland's Bowen Basin, approximately 16 kilometres west of the Rolleston township and 140 kilometres southeast of Emerald.

Rolleston mine is surrounded by agricultural land, mainly used for beef cattle grazing and dryland cropping. Open grassland is the dominant vegetation type within the mine and surrounding areas.

As part of Rolleston's rehabilitation commitment, large areas of the mine are being returned to pastures for grazing.

A fundamental component of this rehabilitation work is the management of its topsoil resources.

Topsoil provides an essential growth medium for vegetation, which helps stabilise rehabilitation slopes that are prone to erosion.

The presence of seven major soil types at Rolleston mine requires topsoil resources to be carefully characterised and handled.

#### 5 Year Rehabilitation Performance 1 Jan 2012- 31 Dec 2016 (ha)

Total Disturbance	1115
Total Rehabilitation	466
% of Disturbed Land Rehabilitated	42%
Statutory Target (e.g. Mine Operations Plan, Plan Of Operations)	429



These resources have been comprehensively mapped through chemical and physical analysis and a site guideline has been developed to provide information on each soil type, typical topsoil depths, recommended stripping depth, recommendations for assessing potential for deeper stripping, and recommendation for use on rehabilitation areas.

Direct transfer of stripped topsoil to areas of rehabilitation is undertaken wherever possible. This results in the lowest cost for the operation and the best rehabilitation outcome as it helps to preserve soil seed banks and soil microbes.

This attention to detail has allowed Rolleston mine to successfully rehabilitate more than 600ha of mined land to grazing pasture.



Rolleston Operations



*Rolleston mine is successfully returning mined land (above) to grazing pasture (below).*





## Case studies

### Ulan

Our Ulan Coal complex in central-west NSW has a long history of mining, dating back to the 1920s.

The site currently support two underground mines and a coal processing plant. The site's open cut mine ceased operating in 2014.

The site now has almost half of its footprint settled in revegetation appropriate to the local environment. The rehabilitation is providing sustainable outcomes for endangered communities, ecological diversity and protection of water flows and quality for the life of the mine and beyond.

Overburden areas are rehabilitated to specifically support communities of Greybox and Ironbark woodlands, consistent with the pre-disturbance environment. Seeds for the rehabilitation are sourced from within the Ulan-owned land and processed to high levels of quality control by a local supplier.

Seeding design matches the appropriate community based on the aspect of the rehabilitated landform.

#### 5 Year Rehabilitation Performance 1 Jan 2012- 31 Dec 2016 (ha)

Total Disturbance	181
Total Rehabilitation	199
% of Disturbed Land Rehabilitated	110%
Statutory Target (e.g. Mine Operations Plan, Plan Of Operations)	108



Rehabilitation of the *Acacia ausfeldii* threatened species, previously untried, has also been successfully introduced into the site's rehabilitation and the species is thriving.

Three interconnected Biodiversity Offset areas, a total of 1345ha, were established in 2012. Plantings for regeneration of endangered communities include White Box Woodland, Yellow Box Woodland and Blakely's Red Gum.

Ulan's White Box Woodland planting program is one of the largest ever undertaken in NSW, with 100,000 trees planted in offset areas to connect extensive areas of native vegetation to the west of the operations with the Durrigerie State Conservation Area and Goulburn River National Park to the north and east of the site.



*Ullan now has almost half of its footprint settled in revegetation appropriate to the local environment.*



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## Case studies

### Westside

Westside open cut mine operated on the north-western shores of Lake Macquarie, NSW, for 20 years up to February 2012.

The mine closure plan divided the site into different rehabilitation domains with different completion criteria developed for each area.

Extensive surface preparation activities for rehabilitated areas began as soon as possible after completion of mining.

These included the following:

- Spoils and topsoils were characterised to determine the need for soil ameliorants (e.g. gypsum, lime, fertiliser) and their application rate
- Topsoils or suitable alternatives were spread across areas to be rehabilitated
- Erosion control measures (e.g. catch drains, sediment dams, silt fences, mulches) were put in place to minimise soil loss
- Structures such as tree hollows, logs and other woody debris were incorporated into the final landform to improve the habitat value of rehabilitated areas
- Habitat structures, including nest boxes, were installed where practical.



Revegetation comprised native vegetation communities characteristic of the local environment and landform type.

Today, the site supports second generation tree seedlings, with flora species such as spotted gum, swamp paperbark, red mahogany and black she-oak.

Recent monitoring found 69 different fauna species within the Westside rehabilitation, including seven threatened species such as grey-headed flying fox, masked owl, greater broad-nosed bat, little bent wing bat, powerful owl and squirrel glider.



Westside Operations



Westside mine during operations (above) and what visitors see from the same spot today (below).





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## Care, maintenance and monitoring of rehabilitation

We also require our sites to plan and budget for care and maintenance of rehabilitated land.

These plans may include requirements for weed control, pest control, fertiliser application, stormwater management, re-seeding or re-planting, erosion control and fencing.

Rehabilitation on GCAA land is not considered "established" until it meets rigorous rehabilitation objectives and success (completion) criteria, which are developed to the satisfaction of Government.

To achieve this, vegetation cover must be functional and sustainable, erosion must be controlled, and desirable long-term species need to be present and well-established.

Where land is being returned to grazing uses, appropriate stocking rates and other important aspects of grazing management such as pasture improvement and stock rotation are established in consultation with experienced professionals such as agronomists.

Our sites are also required to implement monitoring programs that combine physical inspections with long-term, scientifically-based monitoring.

This is essential for evaluation of rehabilitation quality, to identify any maintenance work that may be needed, and to review progress of rehabilitation against a site's success (completion) criteria.





GLENCORE