

Upper Hunter Mining Dialogue

Final and Temporary Rehabilitation Principles and Commitments

REPORT BY THE BLOOMFIELD GROUP
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Final and Temporary Rehabilitation Principles and Commitments

Introduction

The nine coal producers of the Upper Hunter, through the Upper Hunter Mining Dialogue have agreed to this set of principles and commitments with regard to final and temporary rehabilitation. The Principles and Commitments have been developed with advice and guidance from the UHMD Joint Working Group – Land Management which is a stakeholder and industry group.

The Upper Hunter Mining Dialogue has two five-year goals with regard to land management:

- *Goal 1 To decrease the time that disturbed areas are left without final or temporary cover, recognising that different mining operations are at different points in rehabilitation.*
- *Goal 2 To achieve a consistent level of best practice, quality, integrated rehabilitation – both within the industry and with future land uses - across the Upper Hunter and to be a responsible steward of the land.*

The primary focus of the Rehabilitation Principles and Commitments is to contribute to Goal 1. A number of other projects are underway to progress Goal 1. The industry participants in the UHMD acknowledge the importance of clear goals for rehabilitation developed through consultation with community and regulators, continuing to improve rehabilitation techniques and sharing innovative and successful rehabilitation techniques within the industry. Projects under Goal 2 focus on continuous improvement of rehabilitation practices.

Principles and Commitments

The Upper Hunter coal producers will publicly report against the Principles and Commitments on an annual basis. The reporting will be aggregated by the NSW Minerals Council and shared with the community. Table 1 sets out the six principles and provides a description of how each will be reported against.

Table 1 – Principles and Commitments

Principle	Reporting
<p>Principle 1 – Include rehabilitation planning in mine planning</p>	<p>At Rix’s Creek Mine (RCM), rehabilitation is integrated into the mine planning process. In the weekly short-term production meeting, rehabilitation designs are discussed with the site management team and resources are allocated to ensure that RCM’s rehabilitation commitments in accordance with the subsequent Mine Operations Plans are achieved. From every stage within the rehabilitation process, the environmental department, mine planners, surveyors and production personnel work as a collective team to ensure that the progressive rehabilitation is achieved.</p>
<p><i>Planning for rehabilitation should be integrated into the mine planning process and should include allocating adequate and dedicated resources to achieve the planned rehabilitation outcomes.</i></p>	
<p>Principle 2 – Undertake progressive rehabilitation</p>	<p>During 2017 rehabilitation was carried out to any area’s shaped to final landform design – this ensured rehabilitation is as close as possible to the active mining areas. The integration of final GPS landform design into each overburden dump bulldozer assists this process. This will continue during 2018.</p>
<p><i>Companies should undertake rehabilitation progressively, with the objective of ensuring that rehabilitation is as close as possible to active mining.</i></p>	
<p>Principle 3 – Minimise time that disturbed areas are left without vegetation</p>	<p>Employment of a rehabilitation contractor ensures rehabilitation is commenced within 12 months of land becoming available and in fact rehabilitation is usually commenced well within 12 months. RCM have previously conducted aerial seeding over disturbed areas for dust mitigation.</p> <p>For areas designated for trees over pasture, a pasture cover crop is generally sown into the rehabilitated area in the first instance to stabilise the ground and minimise erosion. A tractor with a mulcher implement slashes the cover crop area. A tractor then uses the ripper tines to rip strips along the slope of the rehabilitated area and leaving strips of pasture cover crop intact. The strips that are ripped by the Tractor are sown with tree seed. This process works very well in minimising erosion and riling on sloping batters that are designated for tree seed.</p>
<p><i>Companies should actively seek to minimise the time that land is left without cover during mining. This should include:</i></p> <ul style="list-style-type: none"> ▪ <i>Taking steps to ensure that rehabilitation is commenced within 12 months of land becoming available for rehabilitation</i> ▪ <i>Utilising methods of temporary rehabilitation¹, such as aerial seeding of over burden and other disturbed areas where permanent rehabilitation has not commenced.</i> 	
<p>Principle 4 – Prioritise areas of rehabilitation and temporary cover to reduce impacts</p>	<p>Rehabilitation and temporary cover is given the highest priority where the area has potential for offsite impacts and areas that are seen by the public every day. This includes tree screens/ bunds, strategic planting of over storey species in areas to fit in with the existing landscape and habitat corridors (remnant or rehabilitation), shaping of overburden batters facing New England Highway/main roads and dumps that are designed to tie in with unmined surrounding landscapes.</p>
<p><i>Companies should prioritise rehabilitation and temporary cover in those areas where leaving land exposed will have the most impact. The following areas should be considered to have priority:</i></p>	

¹ Temporary rehabilitation describes reshaping, revegetation and other rehabilitation techniques that are used for purposes other than final rehabilitation. This includes such initiatives as seeding overburden emplacement areas to reduce erosion, which are only temporary.

Principle	Reporting
<ul style="list-style-type: none"> ▪ Areas that have the greatest impact on visual amenity, such as areas that face townships, residences, or the highway ▪ Areas that have the potential to generate dust leaving the site ▪ Areas that are important for biodiversity, such as rehabilitation adjoining or providing connectivity to remnant vegetation. 	
<p>Principle 5 – Meet target for rehabilitation progress identified in the Mining Operations Plan</p>	<p>Rix's Creek Mine endeavors to meet its MOP rehabilitation commitments on an annual basis in line with actual production and disturbance limits. RCM anticipates being in line with the MOP targets at the end of 2018</p>
<p><i>Each company should meet the annual target for rehabilitation quantity (area) set in the Mining Operations Plans for each of its mines.</i></p>	
<p>Principle 6 – Set quality targets for rehabilitation in the Mining Operations Plan and implement a monitoring program to measure performance</p>	<p>2017 Rehabilitation Monitoring Results refer below.</p>
<p><i>Each company should include quality targets for the various types of rehabilitation in the Mining Operations Plan for each of its mines. A monitoring program to measure the performance of rehabilitation areas against the quality targets should be implemented at each of its mines.</i></p>	

Contextual information

<p><i>This section provides an opportunity for each company to provide some commentary or contextual information regarding their reported results. Such information could include advice on:</i></p> <ul style="list-style-type: none"> - Any material changes to the site (i.e. expansions, acquisitions or divested assets); - Why any figures may have changed since the last reporting period 	
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Rehabilitation Monitoring 2017

Monitoring was independently assessed by consultants AECOM and was undertaken between 16th and 23rd November 2017 and included the assessment of a total of 39 monitoring sites including:

- 35 rehabilitation sites comprising 22 sites located in areas of pasture rehabilitation and 13 sites located in areas of tree rehabilitation; and
- Four analogue sites located in undisturbed areas and comprising three sites in native pasture communities and one site in regenerating native woodland.

Rehabilitation monitoring was undertaken in accordance with BCL's monitoring protocol and included the assessment of a range of performance metrics relating to ground cover, landscape function, erosion, vegetation, weeds and soil properties. Based on the analysed and interpreted field collected data, an overall assessment of rehabilitation performance and condition was undertaken against the relevant rehabilitation objectives and completion criteria defined in the Mining Operations Plans (MOPs) for the Rix's Creek South (RCS) and Rix's North (RCN) operations.

Rehabilitation performance summary

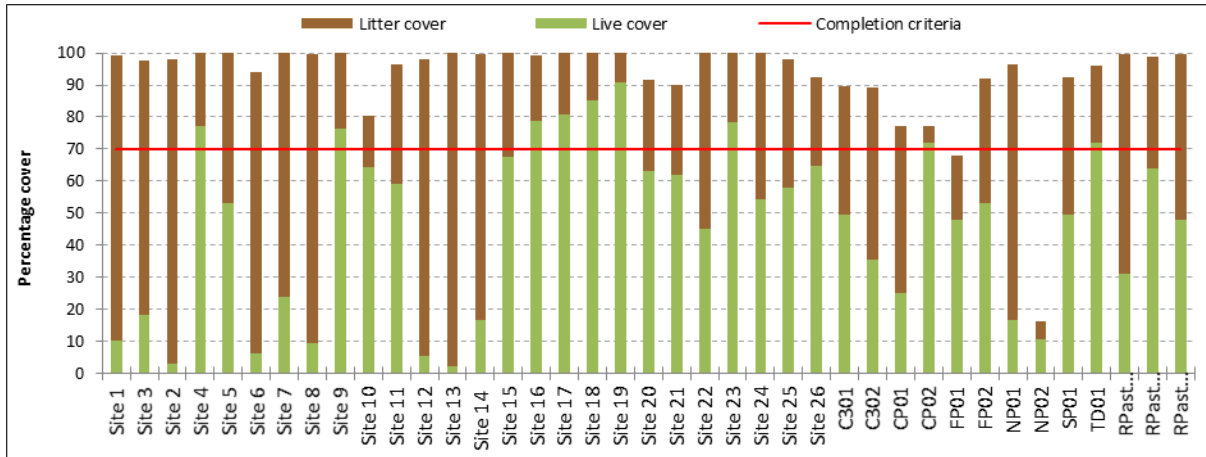
This report identified weed incursion as the main issue currently impeding rehabilitation performance across the site, particularly with widespread occurrence and locally severe infestations of Galenia (*Galenia pubescens*), and more localised incursions of Prickly Pear (*Opuntia spp.*), Coolatai grass (*Hyperhenia hirta*) and *Acacia saligna*. In total, 12 of the 35 monitoring sites supported weed infestation levels exceeding the target benchmark of 15% weed cover and will require control works to be implemented.

However and assuming successful management and control of the site's weed population, the monitoring results obtained in 2017 showed that rehabilitation condition was very satisfactory across the site and, when compared to previous years monitoring results, generally trajectory towards achieving the ultimate rehabilitation objective of re-establishing safe and stable landforms compatible with the surrounding landscape and with a land capability suitable for grazing (i.e. class IV-V). The key findings of the 2017 monitoring are summarised below.

Ground cover

Ground cover protection was generally excellent and the benchmark of 70% cover was met at 33 of the 35 rehabilitation monitoring sites, with 27 sites achieving >90% ground cover. Of the two monitoring sites not meeting the benchmark in 2017, one consisted of young rehabilitation (i.e. still in the vegetation establishment phase) while the other showed deficiencies in the soil/growing media which likely hindered the successful establishment of vegetation.

Ground cover was provided in the form of vegetative grass cover and organic litter, with grass cover typically dominating in pasture areas and litter cover dominating in tree areas.



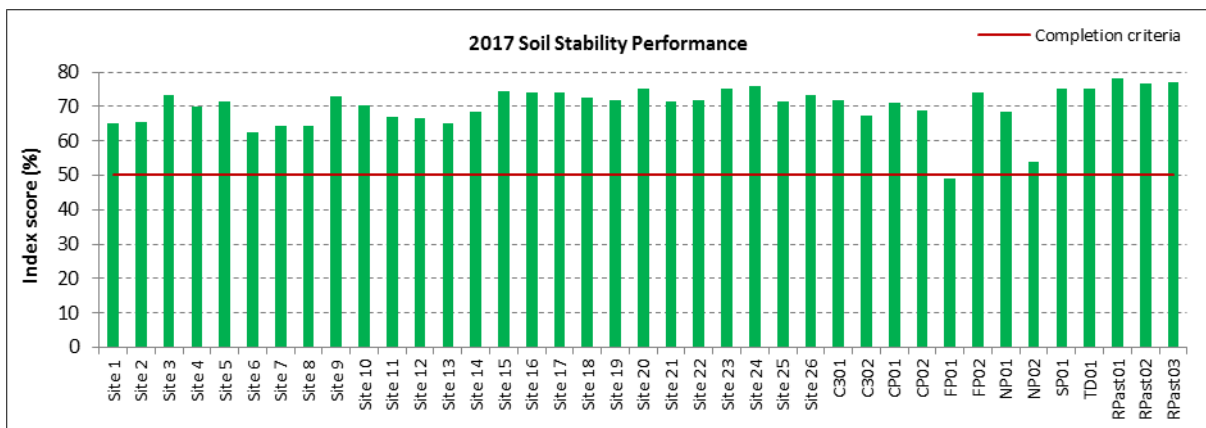
Landscape function

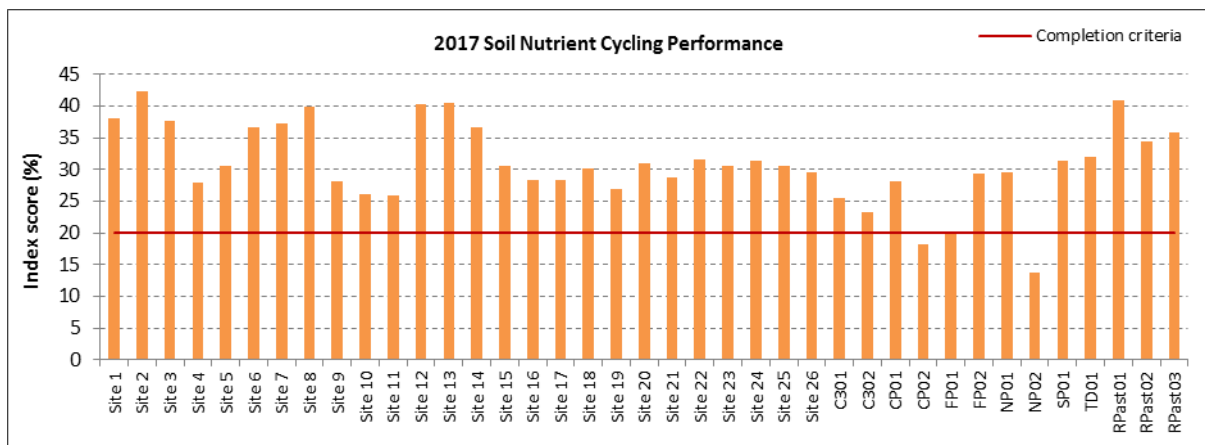
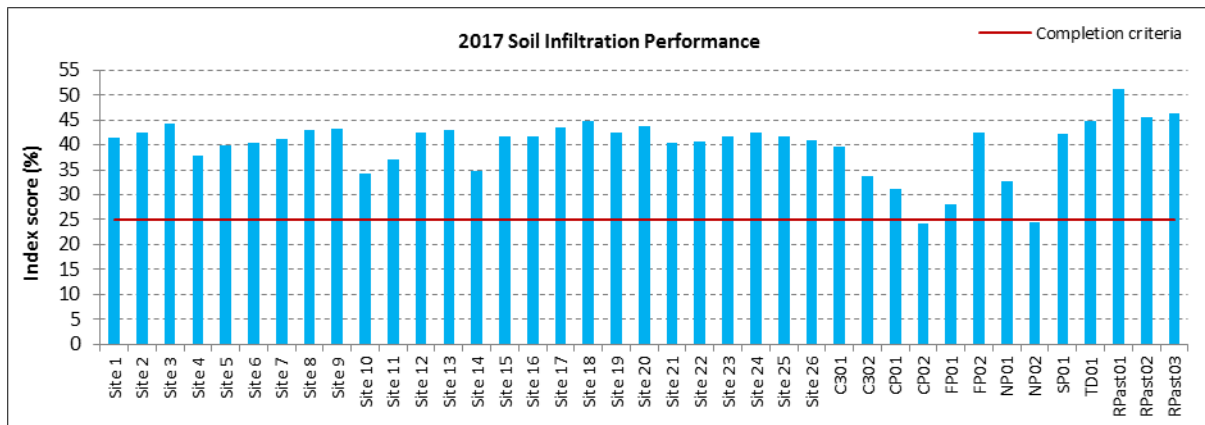
Landscape function was assessed using the Landscape Function Analysis (LFA) tool developed by the CSIRO, which relies on visually assessed indicators of soil surface processes to gauge how effectively a hillslope is operating as a biophysical system. It is mainly based on processes involved in surface hydrology: rainfall, infiltration, runoff, erosion, plant growth and nutrient cycling.

Consistent with previous monitoring years, the 2017 results highlighted good landscape function performance across most of the rehabilitation monitoring sites, as follows:

- The soil stability benchmark was met at 34 of the 35 monitoring sites;
- The soil infiltration benchmark was met at 33 of the 35 monitoring sites; and
- The soil nutrient cycling benchmark was met at 32 of the 35 monitoring sites.

Generally, lower landscape function index scores (i.e. not achieving the benchmarks) were recorded for those sites which showed poorer ground cover protection performance.





Landforms stability

As a function of the high vegetative cover achieved throughout, excellent soil and slope stability were observed across all monitored areas, with no severe erosion processes recorded that had the potential to compromise the overall landform stability and integrity.

Pasture performance

Rehabilitated pastures were typically dominated by exotic grasses aligned to the MOPs revegetation seeding mixes and comprising species suitable for the district which are known to produce productive pastures across the Hunter region. Dominant pasture species across the site typically consisted of *Chloris gayana* (Rhodes grass), *Cenchrus clandestinus* (Kikuyu), *Setaria sphacelata* (Setaria) and *Megathyrus maximus* (guinea grass). Leguminous species were also recorded at a majority of the pasture monitoring sites, however they consistently occurred at low abundance.

With the exception of areas of pasture rehabilitation across RCN which were actively grazed, herbage biomass (i.e. amount of feed available to cattle) was generally high across all areas with a recorded average pasture yield of 2,800 kg DM/ha.

Sampling and analysis of grass foliage was undertaken at a subset of monitoring sites across RCS to determine feed quality and enable calculations of indicative carrying capacities. These indicated that in their current condition, the rehabilitated pastures could support satisfactory dry stock stocking rates of between ~1.9 and 8.1 animals per hectare.

Tree rehabilitation performance

Rehabilitated tree areas typically showed excellent surface accumulation of deposited leaf litter, and good woody vegetation establishment, growth and health condition across the site.

Vegetative ground cover was generally sparse with highly variable species composition between the monitoring sites including either or a combination of exotic grasses, native grasses and/or weeds.

Most areas of tree rehabilitation across RCS consisted of *Corymbia maculata* (Spotted Gum) forestry plantation trials and consequently showed relatively poor species diversity, although in several locations some natural recruitment of acacia shrubs was noted to occur in the mid-storey. Other areas of tree rehabilitation (i.e. other than forestry plantations) at RCS and across RCN showed a greater species diversity and contained a range of local endemic eucalypt and acacia species.

Stem densities across the rehabilitated tree sites ranged from 100 stems/ha to 1,050 stems/ha with an average of ~540 stems/ha. Foliage projective cover ranged from 5.0% to 40.0% with an average of ~22%. Finally, most areas of older tree rehabilitation showed signs of active natural regeneration in the form of flowering/fruited species or presence of second generation seedlings.

Soils

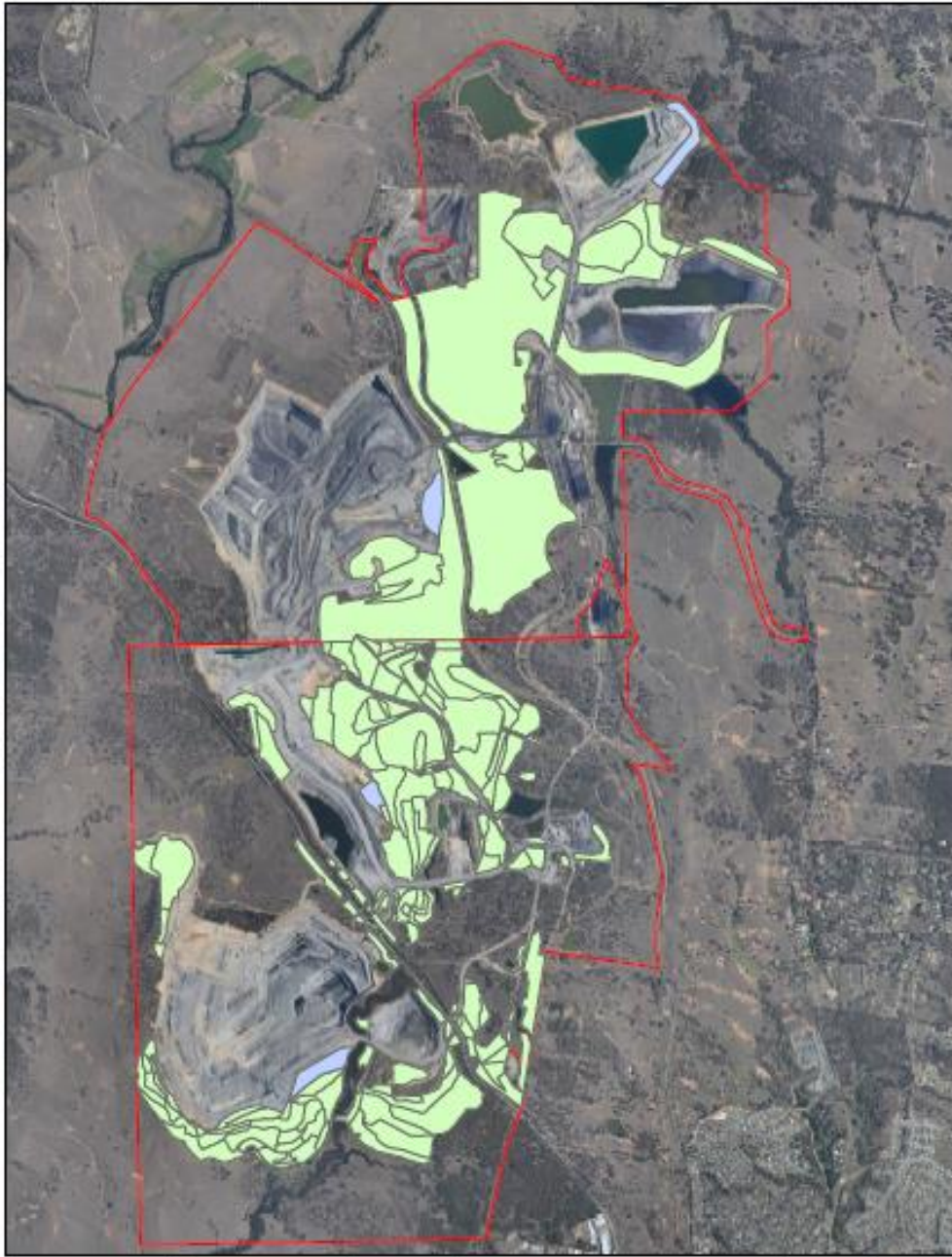
The soil profile assessments undertaken in 2017 showed that a satisfactory topsoil layer had been spread, with an average cover depth of ~180mm across all rehabilitated areas. Topsoil texture generally consisted of sandy clay loams or silty clays, which are typically associated with slow to moderate infiltration rates.

Soil testing results highlighted highly variable pH levels ranging from strongly acidic to strongly alkaline, however soil pH levels were within the benchmarks (i.e. comprised between 4.5 and 9.0) at most locations (34 of 35 monitoring sites, with only one sample returning a pH of 9.1). In addition, soils were consistently non-saline and generally non-sodic, with only 5 of 35 samples returning elevated levels of sodicity.

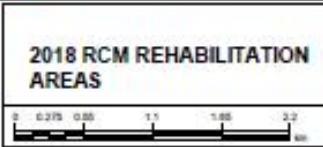
Overall, soils across the rehabilitated areas generally showed properties that were conducive to the successful establishment and growth of vegetation.

Future rehabilitation priorities

<i>This section provides an opportunity for each company to provide details on rehabilitation activities at their site/s for the upcoming year.</i>	Figure attached over the page shows 2018 rehab commitments
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Legend	
	RCN Rehabilitation 2018
	RCG Rehabilitation 2018
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